Minutes

INTERACT III, Station Managers' Forum IV

Tehnical staff workshop

Hybrid meeting
25-26 November 2021
Kilpisjärvi Biological Station, Finland

Contents

Minutes

All videos from this meeting are available online:

Thursday - Technical workshop part 1:
Morning: https://youtu.be/GzGqgd5eKjk
Intro to station tour: https://youtu.be/W4Ck55EFs_E
Afternoon: https://youtu.be/78oDt8S4nZs

Friday - Technical workshop part 2:
https://youtu.be/uafYmjnBqC4

Presentations are available at: https://eu-interact.org/resources/presentations-interact-iii/

Technical staff workshop – day 1

Welcome

Morten Rasch welcomed all participants to the meeting. Due to the ongoing covid-19 pandemic, this workshop was held as a hybrid meeting, allowing participants to join online. 28 participants were present at the meeting and 11 people participated online.
The technical staff workshop was organised by a group of station managers from CEN, CHARS, Zackenberg/Villum, AWIPEV and Arctic Station. The workshop started with a round of introduction of the participants, their affiliation and a short description of their main challenge experienced from the technical staff perspective.

Some challenges mentioned:

- Expanding or renovation of old stations, new storage facilities.
- Isolated station, transportation of supplies (long waiting time).
- Handling of logistics.
- Coordination of many people.
- New and changing regulations, being updated on this.
- Operate a research vessel.
- Lack of resources and money, lack of staff, finding qualified personnel that will stay.
- High running costs.
- Use of solar panels and wind turbines.

The complexity of managing a cold region station

By Morten Rasch

When Morten started as a young station manager, he was really happy to meet with people working with similar challenges and problems (in the SCANNET network – a Scandinavian predecessor to INTERACT). It is a complex portfolio to run a research station. The safety issues in the Arctic are much more complex than at university campuses. A research station is a complex piece of research infrastructure, normally being situated in a remote setting, close to or far from a local community and normally being maintained by very few people.

Competences availability – plenum session – guiding questions:

1. Is lack of staff with relevant competences an issue in relation to the run of your research station?
2. Are relevant competences for run of your research station available in the local community?
3. Do you mainly employ local staff or staff from outside the local community? Reason?
4. Does your station have a policy in relation to employing local staff versus staff from outside the local community?
5. Do your station have any policy in relation to educating local people for functions of relevance to your station?

Discussion points:

The objective of Nunavut Article 23 (in the Nunavut Agreement between Canada and the Nunavut Settlement area) is to increase Inuit participation in government employment in the Nunavut Settlement Area to a representative level. The issue is not a lack of competences, but rather lack of certification and lack of credentials. Programmes to acquire certification are now available.

Many stations seek to hire local staff. It gives a good contact with the local community and local staff often knows more about local safety concerns and how to do things in the Arctic, sometimes referred to as 'hidden knowledge' by outsiders.

In some places, it can be difficult to hire indigenous/local people that have the expertise to maintain complex station operations (technical equipment and supply systems) and complicated maintenance tasks. It can be a good idea to make a list of community members who can help with specific tasks. This list of competences in the local community can then be given to the researchers who can hire local people for specific tasks. Some communities that are frequently visited by scientists, may experience researcher fatigue, if visiting scientists frequently seek their advice or information without compensating them for the time they spend.

It can be difficult to find people who will live for longer periods at remote stations or in remote communities. If a station is located near a settlement, local community members can be a good long-term solution if possessing or trained to have the required competences.

The research station has to become part of the community and try to hire as many locals as possible. It can be difficult to hire people from the south who are willing to live in the North. One solution have been to make 'developmental' positions, where local people are hired and after 1 year they can enter a permanent position. Also students can help after school or locals can take care of e.g. monitoring activities or drone piloting.

One station also require researchers to submit a 'community engagement plan', describing what they will do and how they intend to report their results back to the local community.

It is also important to document all tasks, so in case of need of an external engineer, for example, it will be possible for them to step in. Fragile, when only one person knows the job, and not all can acquire the same skills.

Overall, there are many challenges in running a remote station and therefore some challenges related to hiring staff. In areas where employment of indigenous or local staff is regulated, stations are more motivated to hire locals and are also happy with the staff.

Common challenges experiences by technical staff: Break out session and plenum presentation

All participants were separated into groups coming from either a small-medium sized station or a large station. All groups were asked to list and briefly describe main challenges experienced by technical staff.

A1. Challenges on small-medium sized research stations – Online Break-Out room:

- Lack of accommodation and how to solve this; rent huts, local accommodation. Too expensive to use local hotels.
- Specific labs are often needed at research stations for preparation/analyses of samples, but can be a challenge to operate and maintain.
- National regulations may dictate that a station is not allowed to offer a specific service if these are available from local service providers.
- Finding staff with relevant competences is often difficult for remote stations – especially where maintenance staff needed.
- Energy supply and sustainable solutions can be a challenge to operate – wind turbines are sensitive to harsh winter conditions, batteries are heavy and expensive.
- Problems with lightning with respect to safety in the field but also energy supply systems (and hence also impact on research and monitoring efforts).
- Challenges with general safety at unstaffed/small stations with few staff members and lack of knowledge of local landscape, climate and environmental hazards.
- Problems with animals destroying equipment and cables and bears can be a significant safety issue.
- Tourists and 'unwanted' guests – some sites, which does not have local support, may experience vandalism to the monitoring sites. Smaller equipment attracts less attention, local engagement/outreach and information signs can help reduce vandalism.
- Challenge to develop online information systems with limited human and financial means.
- In general small equipment solutions are recommended for monitoring to minimize weight, energy demand, attention attraction
- Cheap solutions needed for stations with small operation budgets.

A2. Challenges on small-medium sized research stations:

Legislation

- In Svalbard it needs to be clear what legal system stations operate under. When is it Svalbard legislation and when is it the national legislation of the station owner country.

Personnel

- Lack staff and funding to look after equipment – easier to get funding for equipment than staff.
- Some stations have one year contracts for employees – stay on site.

Safety

- Important to revise safety protocols after serious incidents or 'near misses'.
- Kluane Lake Research Station has clear regulations on what the station provides and are clear on liability issues.

Infrastructure

- Problems with drinking water – either due to pollution or due to lack of snow in winter.
- Access can be a problem to stations with no public transportation.
- Wind generator can get destroyed in strong winds.
- Variable currents in solar power.

<u>B1. Challenges on big research stations – Online Break-Out room</u>

Safety issues

- Differences in capabilities among the scientists coming, which may have implication on how visitors are handled. Station managers and staff are not experts in all fields, but are trained (AWIPEV). However the level of training and responsibility given to station personal is different for the different research stations in Ny-Ålesund, Svalbard. Each safety situation is different, so hard to say how exactly the rescue chain looks like for each single event. Gaps are still being found. Example: visitors in town last summer that were not affiliated with a certain research station but went into the field.
- At WARC work in the field can be far away from the station. They have sat phones, Iridium. Sometimes visitors fly further away from the station (maybe 4 hours by helicopter) and then station personal cannot do a rescue operation.
- CEN stations are located in different places (up to 4,000 km away from each other). Communication is important. Use of radios and InReaches, Iridium phones. Similar to what AWIPEV is having.

Logistics

- For CEN: Help by external partner at one station. But in Quebec, it is CEN itself organizing the logistics. Managing people and instruments is difficult. Every site has different vehicles, so difficult to keep track of the different maintenance / equipment / spare parts. Differences in funding for each site makes it hard to have a coordinated/uniform logistics platform.
- AWIPEV is quite spoiled with all the infrastructure around and the supply boat frequency, so despite the remote location the station is well equipped and serviced (Kings Bay runs logistic operations in Ny-Ålesund supporting the entire research community there).
- AWIPEV has some electric vehicles, but battery handling can be difficult in the cold.

Science help

- More support from WARC on science projects since Covid-19 came in, both field work and "static". Now more support from and training of local communities.

B2. Challenges at big research stations

- Access to food, supplies can be challenging.
- Waste – how to take away waste, old vehicles. Permits needed in some places to transport outdated vehicles to other sites for treatment.
- Political jurisdictions: who owns the station, and who runs it – need for clear responsibilities.
- Military involvement: can help access to sites, may request report on activities in station area. Different opportunities for collaboration in the arctic countries.
- Safety: shot guns allowed in some countries but not allowed in others. This can make it difficult to agree on common practices across countries.
- Power supply: most uses diesel, renewable energy systems often not sufficient alone due to low solar influx and problems with wind turbines.
- Data sharing: Is a complicated task requiring skilled staff. It may be difficult to ensure data sharing by external scientists.

Most challenges have been presented – and some of them are addressed in the INTERACT books, but this will be integrated on the revised and web-based version of the INTERACT Management Planning Handbook.

The next book coming up is about reducing the impact of research stations – if anyone has some good pictures of sustainable energy solutions, please send them to the SMF team.

Morten has earlier suggested that INTERACT could make an INTERACT Arctic Safety Manual. Lightning in Alpine areas is a phenomenon that has not been addressed before, and will be good to include. Lightning has also been experienced in other regions with INTERACT stations.
Hornsund will share their new and revised procedures on safety, which can also be included in the new Arctic safety manual.

A final discussion topic raised by AFRY: Is there a lack of knowledge or missing areas of expertise in the Arctic that could be brought forward to engineering schools? Some suggestions were data management – especially in connection with remote sensing and GIS data.

Inspired by this discussion, Morten suggested that INTERACT contact APECS and maybe make a 'project idea bank' that could inspire for example master students from technical universities, who would like to work at a research station. SMF will contact APECS, and try to develop and formalize this idea further.

Environmental awareness – challenges of knowing current impacts and possible mitigation means

By Scott Johnson

A presentation of the CHARS station and how a research station can lessen the impact of the environment. Cambridge Bay has a population of c. 1,800 people (83% Inuit) and the communities in Nunavut are geographically isolated and accessible only by air and sea.

- Every community has fuel delivered once per year, usually in August or September.
- Water supply is normally from lakes. One community gets water from glacial run off. Water delivered to homes as needed.

- Sewage pumped into lagoons.

Potential projects that may result in new sustainable solutions:

- Small Wind Turbine.
- Tidal power.
- Biofuels.
- ARENA - Arctic Remote Energy Network Academy.
- Hamlet of Cambridge Bay collaboration:
    - Waste to energy technologies.
    - Smart home subdivision.
    - Heritage park renewable energy sources.
    - Sewage treatment.
- BeAST: Bioelectrical Anaerobic Sewage Digester.
- GTC -Gwich'in Tribal Council co-develop multi-year agreement to;
    - Develop waste water treatment.
    - Air quality monitoring.
    - Solar monitoring – ascertain efficacy of solar projects and Polar Knowledge supported position.
- Resource Monitoring.

Students on Ice programme: *Students on Ice* leads educational expeditions to the Arctic and Antarctic for international high school and university students. Students learn about the complexities of climate-related issues, and innovative climate research in the North. This year (2021), CHARS had visits from students of age 18-20, all making short reports on different topics.

Sorting of garbage is limited. Compost facilities does not work in winter. Some places have an incinerator to burn garbage – also helps problems with polar bears close to the towns.
Difficult to ship things in and out.

Power supply systems at the station and in the field

CEN station network (nine stations in INTERACT)

By Denis Sarrazin

The CEN network consists of many stations, and all have solar panels. Some stations are linked to the power grid of a town and the production from the solar panels helps reduce the CO_2 footprint of the local community, as more energy is produced than used at the stations.

Four sites are off-grid and autonomous sites are equipped with battery bank and solar panels.
A new 'Near Net Zero Carbon Building' will integrate three sources of renewable energy: solar energy, bioenergy (biomass / heating with torrefied pellets) and geothermal energy (vertical solution). The geothermal energy solution will consist of 16 boreholes, each 25 m deep (400 m in total) that can provide about 70% of the heat demand for the building. Loss of efficiency after a winter. The geothermal energy will not be a threat to the permafrost.

Renewable energy at research stations in north east Greenland

By Jørgen Skafte

Solar panels were established three years ago at Villum Research Station. Construction consists of A 15 kW solar panel facing south and connected to the local grid. The annual production is 12,850 kWh. It takes 1 gallon of fuel to bring 1 gallon to the station. Therefore, any sustainable energy solution is extremely profitable.

There has not been measured any effect of the snow on the solar panel production.

Zackenberg Research Station have funding for establishing solar panels and to test different designs. The Construction will consist of:

- 24 panels, south-facing, inclination of 45°.
- 24 panels, facing east/west, inclination of 15°.
- 24 panels, south-facing, vertical.
- 24 panels, vertical, bifacial.

Two new generators 30 kVA has been bought and a battery capacity 2 kWh will be established as back-up to ensure continuous energy supply.

Mukhrino Field Station energy system

By Evgeny Zarov

The energy consumption is divided by half going to the house and the other half to field equipment. Most of the devices are installed in peatland, with energy consuming devices such eddy co-variance towers or anemometers. Energy sources from solar panels, wind and a gasoline generator. The generator is close to the house and charge the lead-gel batteries when charge is below 40%. Plan to change the batteries in the future due to both inefficient charging technology and group connection of all batteries. Plan of getting new LiFePO4 batteries, solar panels ad wind generator. Also experienced problems with lightning, damaging power supply system and field equipment.

Vehicle management

CEN vehicles management

By Denis Sarrazin

The most challenging aspect in relation to electric vehicles is that most northern communities are serviced by diesel power plants, hence electric vehicles would not be driven by renewable energy. Even if 95% of our power is generated through hydro-electric dams, transportation of this power over vast distances is limited and very expensive. It is therefore utopian to consider using or replacing the vehicles with electric driven motors. Using vehicles in remote areas is challenging – CEN operated numerous stations and different budgets and availability has led to a vehicle fleet of many different types of vehicles. There are vast territories to cover, so the need for reliable vehicles is high. Different vehicles, types, brands are purchased over the years, which makes it difficult to manage and maintain a fleet of vehicles since not two vehicles are alike. Use of vehicles need to be planned well in advance to ensure availability. Safety is the most challenging aspect of vehicle management, with inexperienced drivers and challenging driving conditions.

Vehicle management at Toolik Field Station

By Donie Bret-Harte

Toolik Field Station (TFS) provides access to a small fleet of vehicles (trucks and one van) for use by researchers. During a "normal" year, there are three trips per week between Fairbanks and Toolik Field Station during the busy summer field season, c.600 km between Fairbanks and TFS

Considerations for management:

- Choice of vehicles.
- Outfitting vehicles.
- Driver training.
- Creating a culture of safe driving.
- Communications.
- Maintenance (regular).
- Scheduling (booking system available).

Fuel type: electric vehicles does not work at present, due to long distances. Communications equipment is placed in cars for safety reasons; CB radios ('Citizen Band' radios to contact other vehicles on the road), Satellite phones (to report problems or delays) and InReach trackers (allow TFS staff to follow vehicle location and behaviour, deters users from speeding).

Vehicle management at UNIS

By Fred S. Hansen

UNIS is now evaluating their environmental impact and is aiming to reduce use of motorized transportation as well as activity in remote areas. The cars used at UNIS use c. 9,400 litres of diesel every year. Possible solutions will be to shift to electric vehicles when possible and appropriate (related to local power production), and reduce number of cars. The snow scooters use about 20,000 liters of fuel every season. Possible solutions will be to reduce use of snow scooters and length of excursions and shift to electrical-scooters. Tracked vehicles are used for transport and logistics and use about 9,500 liters of fuel every season. Solutions are a shift to more modern machines, as electrical machines are not realistic in near future. Boats uses about 23,000 liters of fuel every season. Electrical boats are not realistic in near future, but can be an option in local waters (Isfjorden). Bicycles are being introduced as transport in town.

Technical staff workshop – day 2

Field safety technologies

Safety Aspects, Gear and Technologies at French-German Arctic Base, AWIPEV

By Dirk Mengedoht

Aspects of safety:
It is important to have standards and synchronize what is trained at all stations. People need to document that they have adequate training before going into the field. The qualification and attitude of the station team is important – should be supportive, advice and maintain equipment and vehicles at the station. When teams go into the field, they enter information about the group, location and expected time of return into an online website 'AWIPEV Excursion'. The system gives an alert if teams are late. VHF radios are used close to the station and PLB / emergency beacons (for boats) are part of the standard field package. Maps and compasses are not used - people are more familiar with GPS. Liability: People going into the field need to sign a document concerning liability.

The online excursion tool is made by AWIPEV developers and quite new, but can be shared with the Station Managers' Forum, if this is of interest to others stations.

Field safety technologies, CEN stations

By Denis Sarrazin

Apprehension and management of the risks – it is important to go over all of these aspects with the students in order for them to take into account the risks that they could encounter and better prepare for them. The students are offered training sessions at the university. Courses include training of behaviour in the field, wild animals, disturbance like light, noise, etc. They will also need to go over the research protocols and security protocols, try field equipment before deployment, discuss the feasibility of their plans, identify contingency plan or emergency plan and follow a firearms training course.

Field Safety and Equipment, CHARS

By Aili Pedersen

CHARS has an operation team that can help with:

- Field technologies and logistics - in kind support.
- Equipment usage.
- Research support.
- Storage space.

The operations team can do remote work for external researchers, are responsible for field safety training and guidance of external researchers. All research groups need to submit a safety plan; i.e. who to contact if you get injured. There is a guideline for the safety plan, but it is also possible to bring your own plan.

CHARS will share their safety plan with the Station Managers' Forum.

INTERACT SMF will look into the possibility of a safety demonstration course. It will not be possible to make a course that can be used at all stations, because circumstances, infrastructures, competences and resources differ.

Means of Communication – LEO Satellites and data transfer

By Harvey Hipperson

The Iridium® Satellite Network consist of 66 Low-Earth Orbit (LEO) cross-linked satellites operating in six orbital planes each with eleven satellites. Communications are cross-linked from satellite-to-satellite and grounded at teleport locations around the world. Iridium network uses cross-links to create a mesh network for voice and data communication. Supports both Ground-to-Air and Air-to-Ground communications. Voice and data traffic is routed through the network for service delivery. pole-to-pole connectivity.

Data transfer options include:

- Short-Burst Data: Real-time, two-way messaging.
- Iridium Edge Pro.
- Iridium Edge Solar.
- Iridium Certus® 100, 200 and 700.

Harvey will send an updated price list about the above mentioned product list to SMF.

High-speed Satellite-based Broadband - Emerging opportunities at northern latitudes

By Elmer Topp-Jørgensen

Low Earth Orbit satellites orbit around the Earth with an altitude above Earth's surface between c. 500 and 2,000 kilometers above ground (geostationary satellites are at an altitude of c. 35,000 km above ground). LEO's can orbit the earth in any direction – hence can also cover polar areas. Travel around the Earth in c. 2 hours – 28,000 km/h.

<u>Advantages of LEO broadband satellites</u>:

- No cables needed to connect remote areas.
- Reduced 'friction' in space (1.0) vs fibre (1.47) – signals travel faster.
- Optimum frequency in fibre – more frequencies possible in space.
- Reduced latency compared to medium-high orbit satellites.

<u>Barriers</u>

- Enough satellites to ensure good arctic coverage – operational for 3-5 years, then replaced (old satellites thrusted into earth atmosphere to burn up).
- Establish ground centres connected to the terrestrial WWW – mitigated with Intra-Satellite Links (ISL).
- More complicated ground controls at user sites (satellites are moving).
- Higher frequencies more affected by weather (rain, snow, etc.).

- Regulatory permissions needed in each country.

SpaceX, Telesat, Oneweb and Amazon all aim at becoming operational 2022-2023, but not all will cover the Arctic (currently Telesat and Oneweb seems like best options, then Starlink, while Amazon seems not to cover the northern latitudes). Elmer will continue to follow the development of LEO satellites (feel free to contact Elmer if you hear about new opportunities for satellite-based broadband).

Autonomous measuring stations, CEN

By Denis Sarrazin

The SILA Network comprises c. 100 automated measuring stations acquiring data on a variety of climate and environmental variables in Northern Quebec and the eastern Canadian Arctic. The remote stations are equipped with stand-alone sensors and cameras. Data is transmitted automatically via Iridium, but site visits is still required once per year for maintenance and download of full data sets. Data validated at CEN and data published at Nordicana D.

Open floor

Field safety in regard to diversity, equity and inclusion

By Verena Mohaupt

Being a woman is not itself a risk, but being a woman in a world designed for men can put women at risk. Poorly fitting Personal Protective Equipment (PPE) is a particular problem for women - 'standard' PPE, especially safety harnesses, are not designed to accommodate breasts or hips. Furthermore, toilet issues and menstruation can be a challenge in an arctic setting, and there is a need for open dialogue about these issues, sharing of experiences and identification of 'solutions' and best practices. Include information in field safety manuals – also the new INTERACT safety manual should include this aspect. If people of all genders do fieldwork, we need to make it safe for everybody.

Permanent station staff as the backbone of continuous data series, examples from Research Station Samoylov Island

By Anne Morgenstern

Since 2013, the new station has year-round operation and permanent station staff. There is a permafrost long-term observatory at Samoylov Island, and the staff are also doing regular sampling of the Lena River. Having local staff at the station year-round has been the key to successful long-term monitoring efforts, especially in a Covid-19 situation, where local staff could assist with measurements, while being off-limits to many scientists. Data is available via dashboard: https://lena-monitoring.herokuapp.com/

Autonomous monitoring platforms for gradient studies at Zackenberg Research Station

By Marie Frost Arndal

A project called Greenland Gradient is testing and setting up advanced autonomous measurement stations near Zackenberg Research Station to cover climate and ecosystem gradients. The stations are fully autonomous year-round. The autonomous monitoring platforms collect data on air, ice, soil, rivers and the sea. Data is transmitted daily by satellite to researchers (automatic data transfer via Iridium). It is impossible for the researchers to be physically present all year round and the autonomous measurement stations may therefore act as the researchers' extended arm that can work all year round. Greenland Gradient forms the basis of a larger initiative – Greenland Integrated Observing System (GIOS), a new coordinated network of sustainable long-term research infrastructures in Greenland. GIOS is representing not only the entire Greenland but also covers a climate gradient representing the Arctic as a whole.

Wrap up of meeting

By Morten Rasch

Morten Rasch thanked all participants and due to time restrictions, evaluation sheets will be send out to all participants. General comments focused on a need of a better sound system and microphones, so the online participants can participate in the discussion and hear all comments. Morten hereafter closed the fourth SMF meeting and the Technical Staff Workshop.