Svalbard Integrated Arctic Earth Observing System

Deliverable 8.1
Scientific Coordination and Integration Plan

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The scientific integration strategy is covered also in the concept paper of SIOS-KC (version 28.09.2013)

1. The objective of scientific coordination and integration

The objectives for Task 8.1 is to discuss and suggest how the best possible communication between scientist can be reached – covering different scientific disciplines represented in and around Svalbard. The aim is to develop the SIOS community on a ground enabling better communication between the scientist within similar disciplines, cross-border the different scientific platforms and improve the communication with the Earth system science with a goal to provide the modeling community also with better data.

This document describes the structure of scientific integration aiming at a development into a world-class regional observation platform of global environmental change.

This scientific integration plan aims to develop a multidisciplinary international structure in order to integrate Arctic observations from Svalbard into a world-class Earth Observing System. It will therefore:

- build on existing infrastructure
- strengthens links between SIOS partners
- improve the observational network

The key elements of this structure are **focus-driven projects** selected by a **steering board** and supervised by the director and permanent staff of the **Knowledge Centre**.
This structure of scientific integration will be adaptive, dynamic and inspiring.

2. The benefit of integration

Svalbard is the most international and easiest accessible research site in the Arctic. Much of the research on Svalbard is focusing on understanding regional environmental change. However, more effort should be made to combine data sources and to expand their relevance in a cross-disciplinary integrative way. This will improve knowledge and create more efficient research in the area.

The benefits of an integrative approach are improved sharing of data and knowledge, the constant evaluation of strategies and techniques, the optimization of resources and a widened research focus for the scientists involved.

SIOS scientific integration aims at providing a cooperative effort, using regional data of environmental change and linking these into a global perspective studying the Earth System as such. It will optimize observational strategies and techniques across scientific disciplines and research groups.

The success of integration requires transparency and sharing of knowledge, data and research infrastructure which all can be achieved by an effective, proactive and supportive SIOS Knowledge Centre.

3. The structure of scientific integration

The essential structure for scientific integration is based upon teams working on a specific focus-driven project with clear prioritization guidelines coming from SIOS steering board, This can also be a joint field work programme (summer schools, master or PhD-courses etc).

Integration of scientific approaches and practice will bridge the gap between what is traditionally educated in a classroom and the real-world experience of working out in the field, which is something unique for the research in Svalbard.

The SIOS steering board (or an advisory board) should be able to select issues for focus-driven projects and campaigns which will merge and open up resources from various SIOS member states. It should combine the SIOS goals and accomplishments with scientific and political insights to define follow-ups or to re-direct to new aspects which need development.

A project team should have the ability to focus for appropriate periods of time (days to several months depending on the task) on a specific product. Each project should have clearly defined goals realistic to achieve within the provided time frame. The specific product of a project team can be either answering a scientific question, developing a new technology, providing input to a model, developing a model or a new data product.

Depending on the type of project, the team can be formed by specialists in one discipline or specifically combining specialists from different scientific disciplines. The members of a team should routinely interact and monitor their progress. Each project has to deliver a final product like a joint scientific paper, an improved or new model or a data product. The project should end with recommendations for a follow-up phase or improvement of the observational network. Team members should intensively work together to keep a momentum. The operational time span is based on a commitment up to several months to allow optimal interaction and to safeguard a steady progress.

Scientists assigned to a project team should be temporarily free from other obligations. This element is regarded as an essential part to progress quickly and to create flexibility, synergy and a vibrant, inspiring atmosphere at the Knowledge Centre. The SIOS project teams will bring together the best available experts from SIOS institutions to tackle relevant issues in manners that would not happen otherwise. Bringing together international experts to make a common advance on observational design and methods for Earth system science observations will provide a unique intellectual environment with a special focus. Likewise will an implementation of and access to remote sensing data be of value for the whole ESS community. This will immediately create added value to "single" researchers, be of importance to their publication and outreach rates and make basis for new research groups and new insight.

The Knowledge Centre is a key element in facilitating the focus-driven projects and the workshops for scientific discussions with special focus on the use of existing and the need for (new/upgraded) research infrastructure. The Knowledge Centre must therefore be responsible for providing all practical support and data access for the project teams during their operational time for SIOS-tasks. The Knowledge Centre should therefore have a number of permanent staff led by a managing director (with the "right scientific background") who can create links between SIOS partners and translate the directions of the steering board into action. Permanent staff at the Knowledge Centre will optimize all procedures in relation to the work of the project teams and research groups. KC should be responsible for archiving and/or implementing the products and will deploy information to the steering board and the general public. The director of the KC should be member of the steering board and play a prominent role in the implementation of the project teams. The manager will be responsible for maintaining the focus of the teams, ensuring the progress and delivery of the final products and the coordination between the different research infrastructures and the accessibility to them and their data.

The structure of scientific integration should be adaptive, dynamic and inspiring, allowing a quick response to societal needs and addressing essential scientific and observational gaps. The structure

needs to be ambitious but well-defined and able to grow with experience – as have been pointed out in the concept paper of SIOS KC.

4. The involvement of other parties

SIOS will be a consortium of parties which run together a regional observing platform on Svalbard. The project team members are primarily selected from SIOS partners, but external experts can be assigned to specific tasks (scientific evaluation, lectures, teaching etc.).

A close interaction should develop between SIOS and other organizations in the Svalbard Science Centre e.g. Svalbard Science Forum, UNIS, Norwegian Polar Institute (NPI) and others.

SSF focuses on all international research groups working on Svalbard and organizes workshops on specific themes. Some of these workshops can relate to the ongoing work of SIOS project teams, but also new tasks can evolve or set into force by e.g. the SIOS board. In that case, a broad group of scientists can contribute to a discussion which will improve the product of the project team.

The close proximity of Svalbard Science Centre and the knowledge of its staff will make efficient interaction between them and the Knowledge Centre highly valuable. UNIS and NPI staff are specialists in field-based Arctic research and cover a wide area of science disciplines, many of them relevant to SIOS focus. Their staff can participate or contribute to specific project teams as suitable.

5. Additional integrating activities

Increasing the local scientific capacity is possible by the establishment of an Arctic chairs scheme. The involvement of students as research assistants can support scientific productivity but also help with capacity building and involvement of future generations. Finally joint field campaigns can be used to improve integration and calibration between international research groups ensuring optimal data quality and more effective resource sharing.

5.1 Arctic chairs

Arctic chairs are temporary appointments (up to two years) for well-established experts to specifically interact with their new environment (focus-driven project) and to generate research and/or educational activities. These positions should be based at the Knowledge Centre. In SIOS, an Arctic chair could specifically develop a scientific theme, analyze data or contribute to several project teams. The Arctic chair could also engage in interaction with students at UNIS. Appointments for SIOS chairs should need approval by the SIOS steering board.

5.2 Student involvement

Participation of students could help SIOS with preliminary analysis of data and new insights. SIOS would benefit from a close connection between UNIS (students) and the Knowledge Centre. Here we specifically mean the assistance of students in the collection or analysis of data. The future of Arctic research and the future of SIOS depend on the education of the next generations of young scientists in order to build scientific capacity.

5.3 Joint field campaigns

Joint field campaigns are a powerful tool to optimize integration between international research groups ensuring data handling and more effective use of resources. These are unique moments for

inter-calibration of instruments and discussing variation in techniques and between locations. These field campaigns can have a follow-up in a focus-driven project.

6. Rationale for the chosen approach

Above, a description is made of a structure for scientific integration in SIOS. In discussions about this plan, the decision was made to present a modular, flexible structure with a possibility to grow but also to attract more partners. Within the structure there was need for a process of evaluation. That is why there is a steering board to supervise and evaluate the choice of themes and the project achievements.

The Knowledge Centre has a primary responsibility for implementing the decisions of the steering board. The permanent staff of the Knowledge Centre can grow with time. The influx of temporary committed scientists will convert the Knowledge Centre into a vibrant and research-wise inspiring place. Arctic chairs, student involvement and joint field campaigns can increase scientific capacity. These are not necessary fully funded within the SIOS framework, but can be developed further in close cooperation with e.g. SSF, NPI, UNIS or non-SIOS members.

It might not seem necessary to spend the entire duration of a task at the Knowledge Centre. However frequent personal interaction will be essential. The benefit of using the Knowledge Centre as a working place is not only optimal direct interaction, but it also channels the scientists' focus on the specific task without distraction of normal obligations. An intensive period at the Knowledge Centre will also have long lasting effects on cooperation and commitment. The Knowledge Centre is also regarded as a hub for access to observational data. It will be located close to a pool of logistic facilities and students. Alternative options like interaction via the internet are possible but regarded far less productive.

Single meetings or workshops tend to have a long period of reporting and often miss a follow-up, especially when people are not working in close proximity. This should not happen in SIOS. That is why we have chosen a basis of (small) project teams with a defined task, working intensively for a short period of time to accomplish this task. There is a need for flexibility in the number of team members and the duration of a project. A possible suggestion could be teams of four to six people, which can work for a two to three month period at the Knowledge Centre on a specific scientific task. However, these details are arbitrary and open for discussion.

Project teams can address any type of questions or technological problems and not only scientific objectives. Preferably the team members should come from different SIOS partners and different nations, reflecting their commitment to SIOS. Depending on the product, the team members could share expertise in the same scientific field or be selected to cover different areas of expertise.

Another key point in designing the structure of scientific integration is a minimum of administrative, bureaucratic procedures, and the robust simplicity of the ones necessary for sustaining the structure and evaluation with time.

7. An example of a project team

Any project team should keep in mind the main SIOS objectives and be able to answer the question "How does the end product contribute to the SIOS observation system?"

There are many time series already available and project groups could start with evaluating their use. Most prominent environmental changes on Svalbard relate to the disappearance of sea ice. Can this trend be correlated with data series on air temperature, water temperature, snow cover on the

tundra or ice thickness. Are there specific omissions in sampling design when data sets are combined over space and time? What are recommendations for the most successful sampling strategy?
Can these abiotic trends be linked with monitoring data on biotic parameters like phenology, behavior, reproduction or mortality of plant and animal populations. Can this be done only on a small scale or is extrapolation possible to a regional scale? Which of the biotic data sets can be used to describe ecosystem change? There are many questions to be addressed and SIOS will enable joint efforts in answering and understanding the processes behind the observed changes.

8. Closing remarks

This document presents a structure for scientific integration in SIOS, which builds on existing infrastructure, strengthens links between SIOS partners and improves the observational network. The key elements of this structure are focus-driven projects selected by a steering board and supervised by the director and permanent staff of the Knowledge Centre.

A central element of profound importance for the SIOS project teams is bringing together the best available experts from all SIOS institutions to tackle relevant issues in manners that would not happen otherwise. This strategy will assure SIOS a unique intellectual environment with a special focus. Each focus-driven project should deliver a final product which could be either answering a scientific question, developing a new technology, providing input to a model, developing a model or a new data product.

This design allows further growth and flexibility to accommodate additional integrating activities. This structure of scientific integration is adaptive, dynamic and inspiring. It allows for a quick response to societal needs and addresses emerging scientific and observational questions.
In the believe that SIOS will bring researchers in closer contact, simply by providing access to infrastructure, data and logistics not otherwise accessible in the same magnitude, we see the SIOS-KC as a strong tool for creating added value. Each nation will gain more than what can be achieved alone.

As SIOS PP has progressed, the task on scientific integration is described in more details in the concept paper of SIOS.