A vision for SIOS

The Svalbard integrated Earth observing system (SIOS) shall be a regional observational system for long term acquisition and proliferation of fundamental knowledge on global environmental change (GEC) within an Earth System Science (ESS) perspective in and around Svalbard. SIOS will systematically develop and implement methods for how observational networks are to be construed and thus become a leader regarding observational systems in the Arctic and Polar regions.

Svalbard is a region within the Arctic that provides physical barriers for at least some of the entities and processes that are particularly relevant for a system understanding. This makes it possible to formulate studies where one utilizes the boundaries to separate internal transformations within the region and external factors. Svalbard is also a region with relatively substantial data coverage already as well as infrastructure and access capacity. It, thus, singles itself out as a region of choice to develop the ESS approach. Such an endeavor will provide increased understanding of the region and will significantly advance ESS methods.

A fundamental objective for SIOS is to supply added value to all the investors beyond what their own investments would provide in solitude. The integration and structuring of coordinated observations with clear scientific goals is the means of SIOS to achieve an understanding of changes. The enhancements of infrastructure shall be made to achieve this.

SIOS will enhance Svalbard by establishing an experimental environment where it will be attractive to perform shorter term basic and applied research against the combined backdrop of both the core measurement program and the Knowledge Center. The nature of such basic and applied research will not be restricted by SIOS but can potentially inform subsequent evolution of SIOS monitoring activities.

Core Activities - For mass (and, to a large extent, energy/radiation) exchange and transformation, most couplings between entities emanate from the interfaces between the various Earth system spheres studied within SIOS (ocean, atmosphere, land, space, and biosphere). Notable GEC entities include energy, climatically active species, biologically active species, chemically active species and environmental state variables. The primary goal of SIOS is to provide representative observations in the Svalbard region to elucidate and quantify the roles of the interfaces on the state of the Arctic. SIOS will prioritize variables whose couplings with other entities are hypothesized as being significantly active in Svalbard over decadal and shorter time scales. As a regional study SIOS will also address and develop methods for quantifying boundary fluxes of the observed entities. This core observational program of SIOS will provide a comprehensive set of interlinked systematic observations that are guaranteed to be available over time through mutual commitment by the consortium participants.

The SIOS Knowledge Center – This will compile accrued knowledge in a way that ensures that correct choices are made at future crossroads where prioritizations and directions need to be decided. The core observational program of SIOS will be stable over time yet simultaneously dynamically

adaptable as modifications and expansions are called for, based on the insights attained through the Knowledge Center. The Knowledge Center will provide a venue to enable research, build capacity and inform society. A capacity building activity of paramount importance within SIOS will be the development of new observational techniques for environmental monitoring in frigid and sensitive areas. The Knowledge Center will provide an intellectual environment where sampling strategies and observational practices are developed at the intersections between scientific evaluations, statistical considerations, technical feasibility, cost efficiency, and specific issues related to monitoring in Svalbard. The Knowledge Center will be an international node for developing the science of conducting long term environmental monitoring in Polar Region.