



ICOS SWEDEN Operational Plan 2026

ICOS | National
Network
Sweden



Swedish
Research Council

ICOS Sweden Operational Plan 2026

The ICOS Sweden Steering Committee endorsed this Operational Plan on 2025-11-14 (DNr. STYR 2025/2776). The plan is complemented by other documents from ICOS Sweden, including the Strategic Plan (2025-2028, DNr. STYR 2024/2859) and the Annual Reports including the user statistics (<https://www.icos-sweden.se/documents>).

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1. Introduction to ICOS RI

ICOS - Integrated Carbon Observation System - is a European research infrastructure (RI) for quantifying and understanding the greenhouse gas balance of the European continent and of adjacent regions.

High-precision, standardized observations of the exchange of greenhouse gases and heat between the Earth's surface and the atmosphere form an essential basis for understanding not only our planet's present climate, but also past and future developments. It has also become clear that these studies must be secured beyond the lifetime of a typical research project. The aim of ICOS therefore, is to construct, equip, and operate a network of standardized, long-term, high precision integrated monitoring stations for atmospheric greenhouse gas concentrations and fluxes. The infrastructure is founded in two pillars: 1) research and measurement infrastructure and 2) ICOS ERIC (European Research Infrastructure Consortium), a legal entity for ICOS data release, coordination, and integration of the whole system. A full description of the ICOS RI organization is included in Appendix A.

Stations within ICOS RI separate into three different classifications:

- Class 1 Station: ICOS Ecosystem, Ocean, or Atmosphere Station with a complete equipment setup for measuring the full set of ICOS core variables.
 - Swedish stations in this category: Hyltemossa Atmosphere station, Norunda Atmosphere station, Svartberget Atmosphere station
- Class 2 Station: ICOS Ecosystem, Ocean, or Atmosphere Station with a complete equipment setup for measuring ICOS core variables. Less variables are measured compared to a Class 1 station and ancillary data are determined less frequently.
 - Swedish stations in this category: Östergarnsholm Ocean station; Hyltemossa, Norunda, and Svartberget forest Ecosystem station; Mycklemossen, Degerö, Abisko-Stordalen palsa bog mire Ecosystem stations
- Associated Station: The network of ecosystem sites in ICOS is enlarged with a set of Associated Stations where the requirements in terms of variables collected and standards to follow are different from the Class 1 and Class 2 ICOS stations. In contrast to Class 1 and Class 2 Stations, only calculated fluxes and processed data must be submitted.
 - Swedish stations in this category: Marine Flux Tower Östergarnsholm Ecosystem station

To assure that stations fulfil the requirements set by the ICOS RI measurement protocols, all stations need to pass a three-step labelling process¹ (two steps for Associated Stations). During this process, the stations prove the suitability of the facility and its surrounding, the correctness of the instrumentation, installation as well as functioning of the data transmission. Once the stations have passed this process, they are promoted to the General Assembly to receive label as an ICOS station.

¹ <https://www.icos-cp.eu/about/join-icos/process-stations>

2. Status of ICOS Sweden

The national network ICOS Sweden is the Swedish contribution to this European effort. ICOS Sweden is integrated with and plays an important role in the European ICOS RI. ICOS Sweden has been providing data and helping to compile information on greenhouse gas exchange of typical northern ecosystems to the research community and Swedish stakeholders. Furthermore, ICOS Sweden provides test sites for national inventory systems and databases for advanced research. ICOS Sweden entered its third phase (2025-28) as research infrastructure of national interest, funded by the Swedish Research Council (SRC, DNo. 2023-00172) and the partner institutions of the consortium: Lund University (LU, host of ICOS Sweden), Swedish University of Agricultural Sciences (SLU), University of Gothenburg (GU), Uppsala University (UU), Swedish Polar Research Secretariat (PFS) and Swedish Meteorological and Hydrological Institute (SMHI). The funding will cover the operations at all stations since Östergarnsholm received the ICOS label in May 2025. More information about the organization of the national research infrastructure ICOS Sweden can be found in Appendix B.

Station labelling

ICOS Sweden became fully operational during 2014. In 2016, the station labelling process and the criteria for the different types of stations were specified by ICOS RI.

In spring 2018, all three Atmosphere Stations (Svartberget, Norunda, Hyltemossa) were labelled as Class 1 ICOS RI Atmosphere Stations. Measurements and calibrations following the schedule of the Atmosphere Thematic Centre (ATC) and the Central Analytical Laboratory (CAL) are ongoing; data is transferred automatically to the ATC every 24 hrs.

At the end of 2025, all Ecosystem stations have passed the labelling process. Measurements (automatic data sampling and ancillary vegetation data) are ongoing following the instructions of the Ecosystem Thematic Centre (ETC), which are based on the elaborated protocols for Ecosystem Station measurements². For the Class 2 stations, data is automatically transferred to the ETC via the ICOS Carbon Portal every 24 hrs. Data from the Associated Ecosystem station Östergarnsholm is collected and processed by the station team and uploaded at least once per year.

the only not yet labelled station is the Ocean Station SOOP M/S Tavastland. Data from three months of continuous sampling during winter 2024/25 were sent to and analysed by the OTC. The data did not pass the quality check due to various reasons. The station team is rebuilding the water intake system to minimize problems with clogging and condensation due to too large temperature variations. New data will be sampled once the rebuilding has been finalized. The new dataset covering a three-month period will then be checked again by OTC. The status of all measurement stations in October 2025 is summarized in Fig. 1.

The data delivery status at the Atmosphere Stations (AS) HTM and NOR refers to the data stream for N₂O which is not being sent yet to ATC. At the mire Ecosystem Stations (ES) the data delivery status is lowered by the fact that CH₄ eddy-covariance data has not yet been sent to ETC.

² www.international-agrophysics.org/infopage/articles/y/2018/pub/1/issue/4

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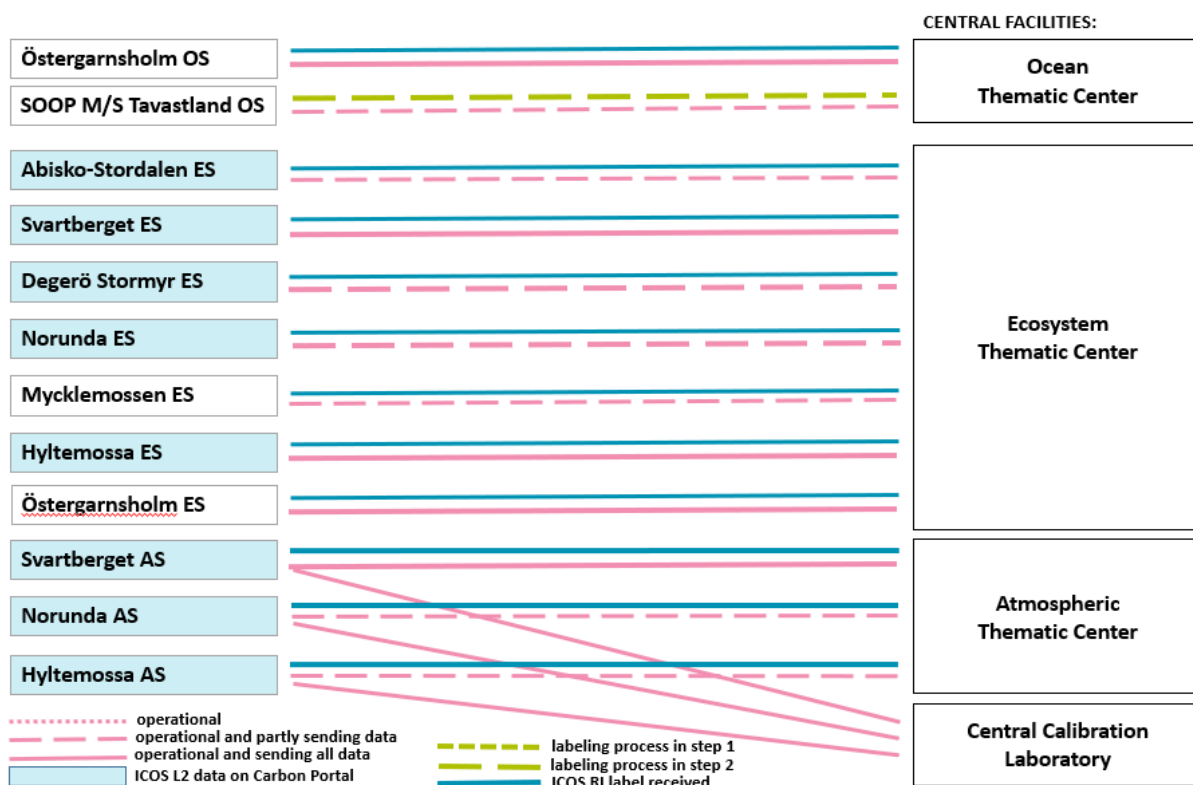


Figure 1. The development status for the delivery of data and information from the ICOS Sweden measurement stations to the ICOS Central Facilities (status November 2025). Coloured lines – status ICOS labelling. AS – Atmosphere station, ES – Ecosystem station, OS – Ocean station.

Data from Swedish ICOS stations

Data from the Atmosphere station is available as raw data (Level 0), near realtime data (Level 1), “fast track release” (Level 1.5, data which went through data control and with calibration functions applied at ATC) and final quality controlled and calibrated data (Level 2). The fast—track data is released twice per year, level 2 data release is scheduled once per year (approx. June).

Data from the Atmosphere stations are automatically prepared for the space program of the European Union Copernicus and integrated in larger data collections like the European ObsPack Compilation (which that is integrated into the global ObsPack data compilation. Both data publications are available on the ICOS Carbon Portal.

Data from the Class 2 Ecosystem stations is available in several data collections. ICOS data streams through ETC include published data as raw data (Level 0), near realtime data (aggregation to half-hourly values and automated quality check, Level 1) and gap-filled, flux-separated, quality checked data (Level 2); these data include so far data from the time of the labelling date of the respective station. Level 2 data is published twice per year where the publication in the second half of the year corresponds to the data level 1.5 of the Atmosphere data. The Ecosystem MSA together with ETC agreed on the possibility to submit data from before the labelling date for Class 2 stations as associated station like data. Data from Associated stations includes PI processed fluxes, preparation of quality checked half-hourly data, submission to ETC at least once per year, gap-filling and flux separation is done by ETC for these data. In 2025, pre-labelling data from SE-Svb, SE-Deg and partly SE-Sto has been

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uploaded to ETC. This data has not yet been processed at ETC. Since earlier, most data from the ICOS Sweden ecosystem network are available and searchable as Swedish National Network data on the ICOS Carbon Portal. In the past, ICOS Sweden contributed to several data collections initiated by the ICOS network. These aimed for (i) fast analyses of consequences of the hot and dry weather during 2018 (Drought 2018), (ii) effects of the warm weather conditions during winter 2019/20. The data sets from these initiatives have been available at the ICOS Carbon Portal since earlier.

Also, data from Ecosystem stations is on automated basis used in larger data compilations like the Copernicus program.

The status of all data on the Carbon Portal and on the SOCAT database from ICOS Sweden stations is summarized in Fig. 2. Level 3 data include all kinds of elaborated products by scientific communities that rely on ICOS data products. The data are not a direct product of the ICOS data stream and publication of these are not mandatory. Furthermore, there are some inconsistencies in what is listed as level 3 data. We thus removed the Level 3 data availability from the graph, but add instead a weblink to the [ICOS Carbon Portal elaborated products webpage](#).

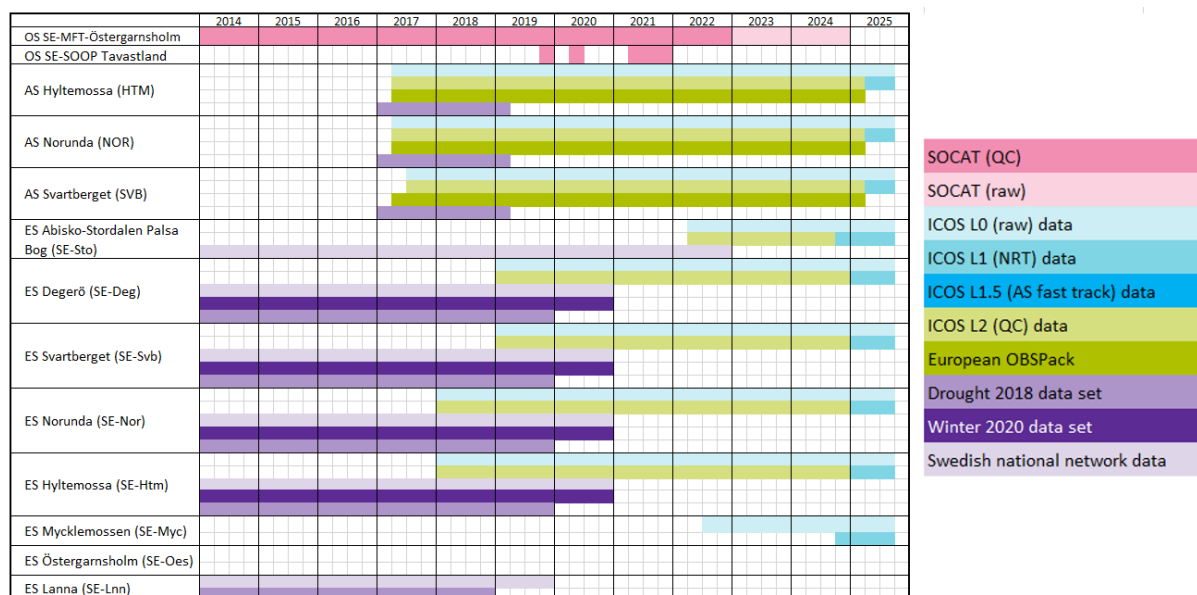


Fig 2. Status of ICOS Sweden data products on the ICOS Carbon Portal and the SOCAT database on 2025-11-17.

3. Planned activities during 2026

General

At the stations, fulfilling the commitments to ICOS RI is of highest priority.

For the not yet certified station, Tavastland, finalising the labelling process including delivery of all data to ICOS RI in operational mode will be the main focus.

The other stations, beside normal operations, will be working on bringing data streams for not yet delivered variables into operational mode.

Together with SITES and ACTRIS Sweden we will streamline outreach activities in 2026 to reach and attract new possible scientific users from related fields to ICOS Sweden data and facilities. The primary goal is to show the benefit of the combined data pool of ICOS, SITES⁴ and ACTRIS Sweden⁵ from the co-located stations for scientific questions. Alongside other initiatives, this will be done by actively contributing to joint efforts by the ICOS community regarding current research questions, and by actively following and contributing to developments in larger European scientific proposals and projects. Three large Science Conferences (Nordic Society for Aerosol Research Symposium in Lund, BioGeoMon in Umeå, ICOS Science Conference in Lund) in Sweden co-organised by either ACTRIS, SITES or ICOS with the possibility of site visits to ICOS stations as well as the active contribution to the Swedish Climate Symposium in Lund will make the RI visible to a large group of international researchers.

As in previous years, the deep involvement in education from school to higher education levels will continue alongside information provision to stakeholders and the general public.

Summary of planned activities

Planned activities divide into 1) measurement stations, systems, and data, 2) management of the organisation, and 3) collaboration and outreach activities. Acronyms are explained in Appendix D.

1) Measurements stations, systems, and data

- At the Atmosphere Stations, teams will continue with the necessary tasks defined in the ICOS RI protocols for atmospheric stations, including regular system tests (more detail in Fig. 3). Concentrations of CO, CO₂, CH₄, N₂O and H₂O will be measured at all Atmosphere stations at three levels. The lowest level is above the tree tops, the highest at the top of the tower. Wind speed and direction (sonic anemometers), air temperature, and humidity are measured at three levels. The cloud base height is measured at each station. Mandatory system leakage tests of the tubing are performed on an annual basis. The indoor sampling system is tested twice a year. All data (gas concentrations, diagnostic values and meteorological variables) are transferred to the ATC on a daily basis.
- The implementation of the gas analysers for N₂O concentrations at the Atmosphere Stations has been completed at SVB and HTM and will be completed at NOR in 2026. The data stream to the ATC has been established at SVB and HTM; this will be done at NOR as soon as the analyser implementation has been finalised and the proper functioning of the analyser has been ensured. The HTM analyser needs to be sent to the manufacturer (US) for repair (status November 2025) after only a few weeks running time in the system.
- All three Atmosphere stations will continue sending near real time ceilometer data to the EUMETNET project E-PROFILE3. Any new developments in the centralised data processing of ceilometer data (e.g. possible data processing by ACTRIS RI data centers) will be followed and actions will be taken when needed.

³ <https://www.eumetnet.eu/activities/observations-programme/current-activities/e-profile/>

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- Svartberget and Norunda will continue to follow the general sampling strategy following the ICOS RI protocol with one flask every third day. These flasks are analysed at the CAL; one flask per month being analysed for carbon isotopes. Hyltemossa as one of the stations being part of the CAMS2-26 project follows a tighter sampling strategy with one flask per day for potential isotope analysis if the atmospheric conditions are given. CAMS2-26 is a research initiative coordinated by the ICOS Head Office within the second phase of the Copernicus Atmosphere Monitoring Service (CAMS2). Its objective is to advance European capabilities for monitoring and verifying fossil fuel CO₂ emissions. A key focus is enhancing CAMS's access to ICOS data, particularly from the Atmosphere and Ecosystem networks. Notably, the project includes ¹⁴CO₂ analyses of flask samples from ten selected ICOS stations, including HTM, to support emission verification efforts. Any changes in the sampling routines are done in consultation with the CRL.
- The ICOS ATC mobile lab will visit Norunda in the second half of 2026. The periodically done comparison measurements at the stations in the network ensures long-term comparability.
- The Ecosystem Stations will follow the strict schedule to fulfil all tasks defined in the ICOS RI protocols and instructions (Fig. 4). The key component of the continuous measurements are the fluxes of ecosystem relevant trace gases (i.e. CO₂ in forests and at the marine site; CO₂ and CH₄ on mires) and energy (i.e. latent and sensible heat). Furthermore, atmospheric (i.e. air temperature, pressure and humidity, wind, radiation balance components and precipitation) and soil meteorological (i.e. temperature, moisture, ground heat flux and water table level) variables are continuously measured within the footprint of the flux system. All sensors require regular maintenance such as calibration, cleaning, filter replacement, change of desiccants and occasional troubleshooting. In addition to the continuous automatic measurements, periodic manual measurements, and discontinuous sampling for analyses are part of the mandatory program to provide necessary information for interpretation and upscaling of continuous measurements. This includes inventories of carbon pools in plant and soil material, as well as periodic measurements of vegetation structural properties, including species composition, tree height and diameter at breast height, as well as phenology cameras and hemispherical canopy images to determine e.g. aboveground biomass and Green Area Index. Leaf and soil samples are sent for chemical analyses which include their C and N contents.
- Östergarnsholm Associated Ecosystem station will with support of the ICOS Sweden support prepare and provide processed data to ETC for final processing and publication on the Carbon Portal.
- The Ocean Stations Östergarnsholm will follow the schedule to fulfil all tasks defined in the ICOS RI protocols (Fig. 5). Access to the buoy is ensured with the help of research vessels.
- Main goal for the team around SOOP M/S Tavastland is the certification of the measurement system onboard. For this, the station team will work in close cooperation with the OTC and colleagues from the ocean community.
- We will continue following the development and updates of ETC instructions for all types of measurements, continuous automatic as well as manual, and we will continue working on adapting our routines to ensure they fulfil ICOS requirements.

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- Continuous below-canopy photosynthetically active radiation measurements will be used to estimate green area index at the forest sites; the difficult task of taking hemispherical pictures (difficult in terms of matching right season, light and weather conditions) has thus been reduced to twice per year.
- The routines for litter sampling have been adjusted to meet both ICOS RI requirements and possibilities at the stations. Litter includes coarse woody litter, fine woody litter and non-woody litter. Non-woody litter has been sampled in litter traps. To reduce the work load, only the total dry weight has been recorded at Svartberget and at two CPs at Hyltemossa since 2023; at SE-Htm, sorting continued at two CPs. Coarse and fine woody litter will be sampled according to the ICOS protocol in late summer where possible. Since the sorting of litter samples is still extremely time consuming, ETC has been testing a new strategy with subsampling of 10% of the samples. Hyltemossa was one of three sites that contributed data to validate the new strategy. First results seem promising, but the final conclusion is still open.
- Norunda: Discussions on how to best provide data from the second eddy-covariance mast to users will be taken up in 2026 again; this data is supposed to pass the full ICOS ETC data pipeline.
- Svartberget, Degerö: central in-house (by the ICOS Sweden support) data processing of the additional eddy-covariance system to be able to deliver reliable data during winter will be re-scheduled to 2026. Since the system does not comply with the ICOS protocols, data processing will have to be done in house. The discussions with ETC on the practicalities around how to make these data best available and visible for users will be taken up again once the data have been processed.
- Station staff will continue to participate in training and working with the standardized measurement protocols and recommended data practices, arranged by ICOS RI and/or ICOS Sweden. Staff will continue to follow up on health and security checks necessary for their working environment.
- The descriptions of all non-ICOS research activities ongoing inside the domains will be updated continuously and we will continue to provide service and support to projects at the stations if time allows.
- The ICOS Sweden personnel will participate in workshops and meetings organized by the ICOS ERIC Head Office and Central Facilities as long as funding is available. The SPI will also participate in the ICOS RI MSA meetings.
- There will be ongoing monitoring of the measurements and service, maintenance and update of systems and follow up of safety rules at the stations.
- Monthly meetings of the research engineers will continue, to ensure active information flow about best practices and problems at the stations.

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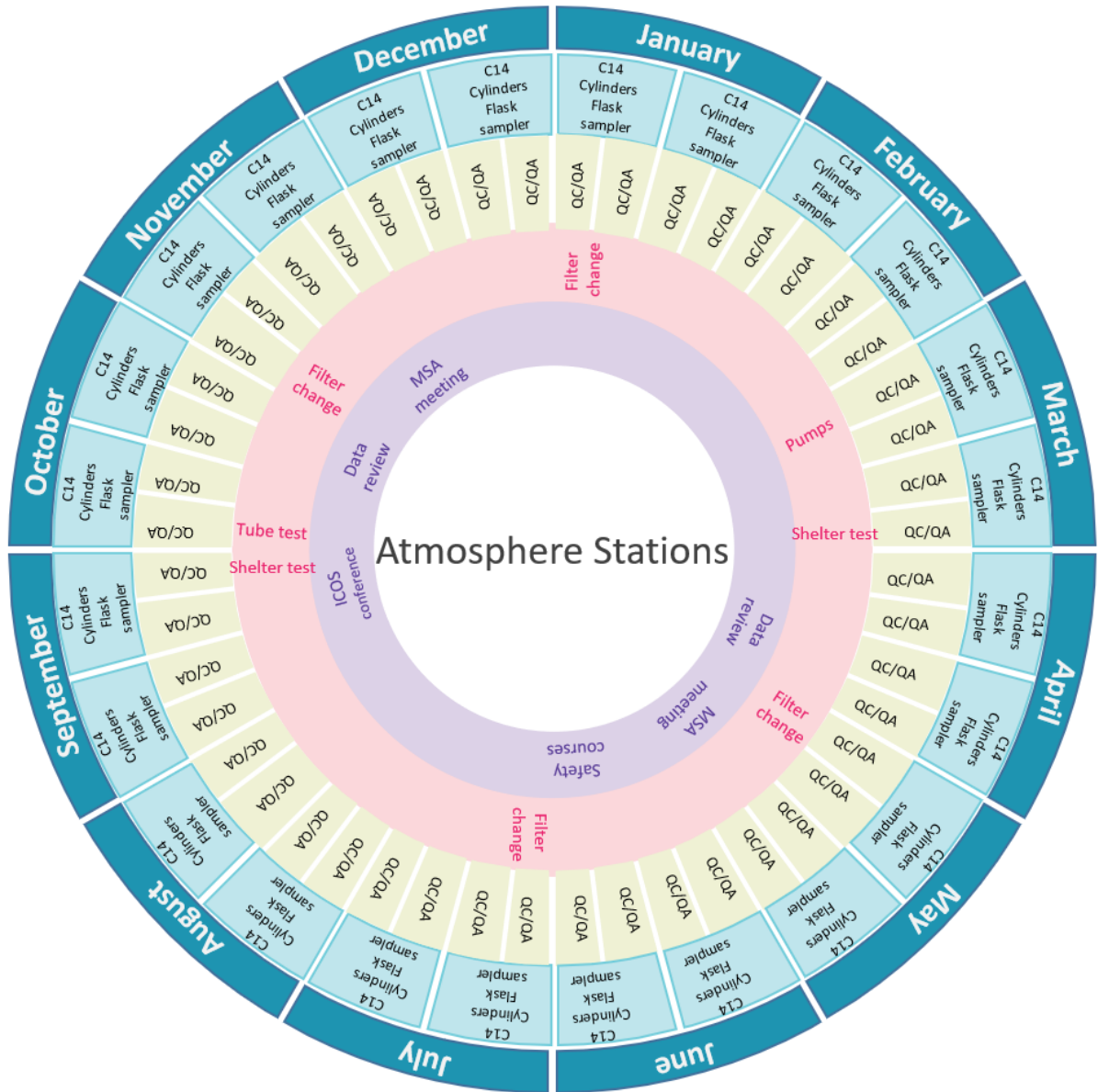


Figure 3: Scheduled regular tasks at the Atmosphere stations within ICOS RI/ICOS Sweden.

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- The coordinator will assist the director with his tasks regarding the operational management of the RI. This includes communication with the station teams in operational questions, preparation of steering documents, report preparations for ICOS ERIC and the SRC, as well as communication with the SRC in case of requests of deviations from the terms of agreement (see below). The coordinator is also in charge of updating the webpage and social media accounts (LinkedIn, BlueSky) and preparing material for general outreach events.
- The reference group (consisting of director, coordinator and representatives for each partner) will actively promote the usage of the ICOS RI in their networks and coordinated by the director of the RI contribute to ICOS RI initiated proposals. On request by the coordination office, the management team will collect information needed for the reporting and steering documents from their stations.
- For internal communication, ICOS Sweden will continue to arrange online meetings every two months for the whole consortium. An in-person management team meeting to discuss the further procedure is planned after publication of the ranking from the SRC need inventory. Additional management meetings via zoom will be arranged whenever a direct exchange seems preferable to an exchange via mail.
- As in previous years, the coordination office will assist the station teams and act as contact point between the SRC and the RI whenever needed (e.g. proposals for deviations in the contract with the SRC (“särskilda villkor”) and as contact point between the RI and the fund manager (“medelsförvaltare”) LU.
- Both reference group and operational management team will proactively work towards better coordinated collaboration between ICOS Sweden, ACTRIS Sweden and SITES and will together with the directors of SITES and ACTRIS Sweden prepare the status report for the SRC which is due in autumn 2026.
- The coordination office will support the ICOS ERIC head office in the preparations and arrangements for the ICOS Science conference, which will be held in Lund, Sweden, in September 2026.
- ICOS Sweden will continue to encourage applications from researchers looking to set up new projects at the stations.
- ICOS Sweden will support and encourage scientists and stakeholders to make use of data measured at the stations.
- ICOS Sweden will also continue to support ongoing activities at all the sites.
- ICOS Sweden will actively take part in relevant conferences.
- The coordination office arranges, manages or attends regular meetings listed in Table 1.

Table 1. List of regular meetings organised or attended by the ICOS Sweden coordination office.

Meeting / Seminar	Time	Place	Target group
Technician Meeting	1/month	digital	Research engineers and Technical & Scientific support
ICOS SE meeting	every 2 months	digital	All ICOS Sweden employees and reference group

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ICOS Sweden reference group meeting	At least 2/year	Digital/in person	Director, coordinator, reference group
ICOS SE steering committee meetings	Mar, Nov	digital	ICOS Sweden Steering committee, director, coordinator
ICOS SE scientific advisory group - steering committee meeting	1/year	In person	ICOS Sweden Steering committee, Scientific Advisory Group, director, coordinator
ICOS RI Comm meeting	2-3/year	digital	Focal points, ICOS head office (HO) representatives, MSA chairs, ICOS CP director
Tri RI meetings	1/month	Digital/in person	Directors and coordinators of ICOS Sweden, ACTRIS Sweden and SITES
ICOS Comms meeting	1/month	digital	ICOS HO communication team, representatives for communication in the national networks
ICOS Science conference organising team meetings	1/month	digital	Coordinator, director, ICOS HO representatives, invited scientists from inside and outside ICOS RI
ICOS Science conference program team meetings	5-6 times	digital	Director, ICOS HO representatives, invited scientists from inside and outside ICOS RI

4. Preliminary financial outcome 2025

At the end of the first year of the funding period (DNr 2023-00172) the RI follows the budget according to plan with slight deviations which will be taken care of well ahead the final year of the funding period. Especially the larger surpluses for LU and SLU will need special attention. The final reporting for the ICOS Sweden Infrastructure Upgrade and Renewal grant (*SRC Diary No 2021-00244*) has been accepted by the SRC and will thus no longer be part of the reporting of ICOS Sweden.

5. Planned budget 2026

ICOS Sweden will enter the second of four years of the current funding period (SRC Diary No 2023_00172). The planned budget for 2026 is available in the document App_D_ICOS_Sweden_2023-00172.pdf. The original deadline for instrument purchase was in March 2026. After having sent a request for prolongation of the deadline to the SRC for the station Abisko-Stordalen which depends on

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both weather and certified electrician to finalise the planned upgrade of the electricity at the Stordalen mire, the deadline was prolonged until March 2027.

Appendix A: The ICOS RI organization

ICOS is a European research infrastructure founded in 2008, which provides data on greenhouse gas concentrations. ICOS RI is part of the European Environmental Research Infrastructure landscape. ICOS RI organization consists of two pillars: research and measurement infrastructure and ICOS ERIC⁴, a legal entity for ICOS data release, coordination, and integration of the whole system.

ICOS RI (Fig. A1) is coordinated ICOS ERIC. ICOS is one of 32 ERICs. The legal entity of ICOS ERIC has held a Landmark status in the European Strategy Forum on Research Infrastructures (ESFRI) Roadmap⁵ since March 2016. The ESFRI Roadmap identifies new RIs of European interest corresponding to the long-term needs of the European research communities, covering all scientific areas, regardless of possible location. ICOS RI receives funding from member and observer countries through annual membership contributions, and through host contributions towards specific facilities in ICOS RI. The station networks being funded by different national agencies.

ICOS research infrastructure

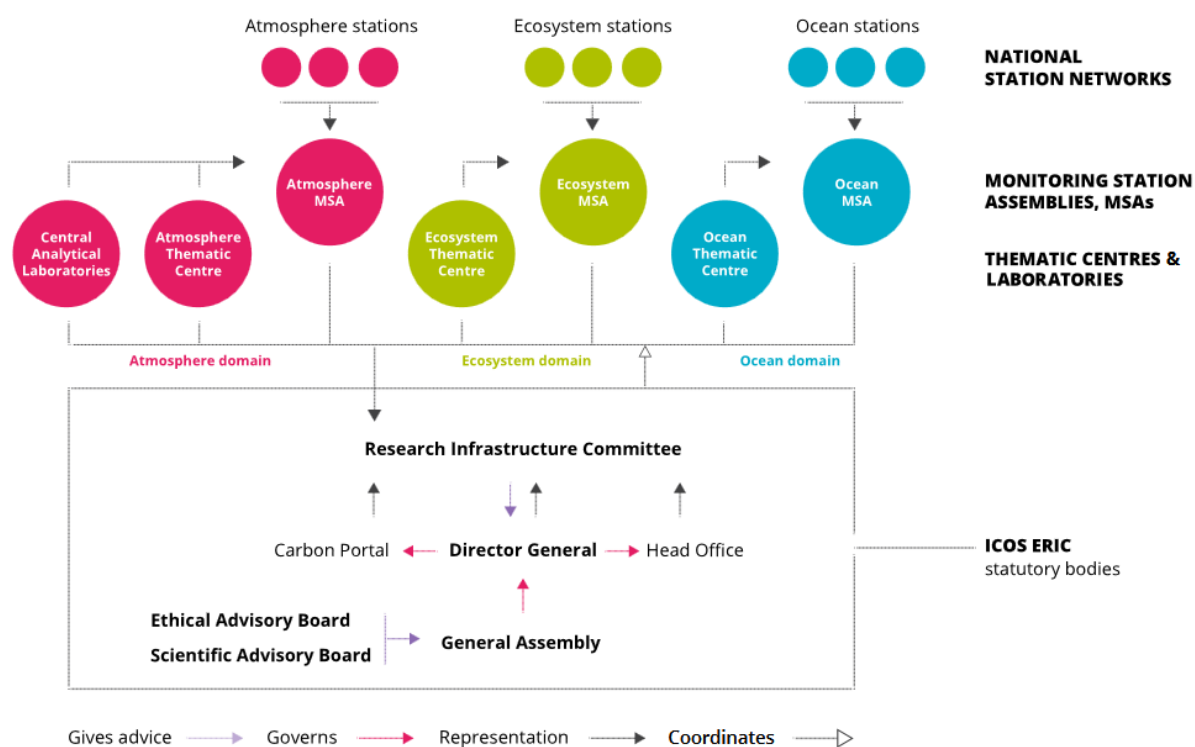


Figure A1. Outline of the ICOS RI organization (ICOS RI, 2023).

⁴ https://research-and-innovation.ec.europa.eu/strategy/strategy-research-and-innovation/our-digital-future/european-research-infrastructures/eric/eric-landscape_en

⁵ <https://roadmap2021.esfri.eu/projects-and-landmarks/>

ICOS National Station Networks

ICOS RI has more than 170 measurement stations in 19 mainly European countries. These stations measure greenhouse gas concentrations in the atmosphere and fluxes over the terrestrial and marine ecosystems. The ICOS stations are run and funded by national funding agencies, institutes, and universities, demonstrating an impressive joint effort to enable climate change research.

The current ICOS Atmosphere and Ecosystem Networks include 47 atmospheric and around 100 ecosystem stations located across Europe. The ICOS Ocean Network covers the North Atlantic and European marginal seas. The ICOS Ocean Observation System includes 28 facilities: voluntary observatory ships, fixed stations, and research vessels.

Monitoring Station Assemblies (MSA)

Monitoring Station Assemblies (MSAs) for the Atmosphere, Ecosystem and Ocean Station Networks consist of SPIs. The MSAs monitor, develop and improve the scientific and technical basis of the ICOS RI. The MSAs usually meet twice a year and they work closely with the ICOS Central Facilities (CF).

Central Facilities (CF)

All measurement raw data from each atmosphere, ecosystem, and ocean station within the ICOS Station Network is transferred to and processed in the ICOS CFs: The Atmosphere, Ecosystem and Ocean Thematic Centres (ATC, ETC and OTC). The CFs ensure that highly standardized and coordinated data is maintained and respected. The CFs ensure that all data are treated, and quality controlled with the same algorithms and properly archived for the long term.

ICOS ERIC

ICOS RI are coordinated by the legal entity of ICOS ERIC. ICOS ERIC was established by the decision of the European Commission on 23 November 2015, with the statutory seat in Finland. The principal task of ICOS ERIC is to coordinate the operations of ICOS RI, distribute information from ICOS RI to user communities and to provide integrated data and analysis from greenhouse gas observation systems.

ICOS ERIC Head Office

ICOS ERIC Head Office, located in Helsinki, Finland, manages the legal entity of ICOS ERIC. The Head Office promotes network extension to new countries in cooperation with the ICOS CFs and Focal Points of the ICOS National Networks. ICOS ERIC Head Office supports the scientific and technological developments in ICOS RI and facilitates the outreach, training, and mobility of participants.

ICOS ERIC General Assembly

The ICOS ERIC General Assembly is the governing and decision-making body of ICOS ERIC. It is composed of representatives of the member and observer countries of ICOS ERIC. It is led by the chair Christian Plass-Duelmer from the German Weather Service (DWD).

ICOS ERIC Director General

The Director General, appointed by the ICOS ERIC General Assembly, is the legal representative of ICOS ERIC. The Director General carries out the day-to-day management of ICOS ERIC and is responsible for the implementation of the decisions by the ICOS ERIC General Assembly, as well as overseeing and

coordinating the activities of ICOS RI (Director General of ICOS ERIC from 1 January 2026: Hannele Laine; deputy director: Alex Vermeulen, Director of the ICOS Carbon Portal).

ICOS ERIC Research Infrastructure Committee

The ICOS ERIC Research Infrastructure Committee is a key advisory body in ICOS RI that supports the Director General in all matters relevant to the coordination and management of ICOS RI. ICOS Research Infrastructure Committee consists of representatives from the Head Office, ICOS Carbon Portal, each ICOS CF and each MSA. The Director General chairs the committee.

ICOS Scientific Advisory Board

The ICOS Scientific Advisory Board is an external body and monitors the scientific quality of ICOS RI, gives feedback on and makes recommendations for the development of ICOS RI activities, and advises ICOS ERIC with the objective of achieving the scientific goals of ICOS RI. It also provides programmatic support by commenting on the overall science plans and directions and analyses the output of ICOS RI.

ICOS Ethical Advisory Board

The second external body, the ICOS Ethical Advisory Board giving advice to the ICOS ERIC based on periodical reports on ethical issues related to science, data, discrimination, or any kind of conflict of interest.

ICOS ERIC Carbon Portal

The ICOS Carbon Portal, an operative unit of ICOS ERIC, offers free access to ICOS RI data on greenhouse gases observations from the ICOS Station Networks, as well as easily accessible and understandable science and education products. The system design for the ICOS Carbon Portal management, databases, web services, and elaborated products is carried out by the system architect in dialogue with both internal and external scientists. Dedicated researchers from all over the world will contribute to the elaborated products catalogue.

Appendix B: The ICOS Sweden organization

Consortium partners

ICOS Sweden performs measurements at stations in a transect across Sweden, from Abisko-Stordalen in the north to Hyltemossa in the south (Fig. A2). There are three Atmosphere Stations for measurement of GHGs in the well-mixed boundary layer, six Ecosystem Stations for measurements of GHG exchange between ecosystems and the atmosphere, one fixed Ocean Station for observations of the coastal Baltic Sea, and one Ocean Station based on a SOOP, for measurements of the surface ocean traveling between The Netherlands and Finland.

The measurement stations are run by four universities and two institutes. The framing of the cooperation is set by formal agreement. The consortium partners of ICOS Sweden are the following:

- Lund University (LU) is the host organization with overall responsibility for the coordination of ICOS Sweden. LU also operates four ICOS stations: the Norunda forest Ecosystem and Atmosphere stations and the Hyltemossa forest Ecosystem and Atmosphere stations.
- Swedish University of Agricultural Sciences (SLU) operates three ICOS stations: Svartberget forest Ecosystem and Atmosphere stations, and the Degerö mire Ecosystem station.
- University of Gothenburg (GU) is responsible for the operations of the Mycklemossen mire Ecosystem station.
- Uppsala University (UU) operates the Östergarnsholm fixed Ocean station and Associated Ecosystem station which includes operation of a marine flux tower.
- Swedish Polar Research Secretariat (PFS) runs the Abisko-Stordalen palusa mire Ecosystem station.
- Swedish Meteorological and Hydrological Institute (SMHI) is responsible for the Ocean station aboard the SOOP M/S Tavastland.

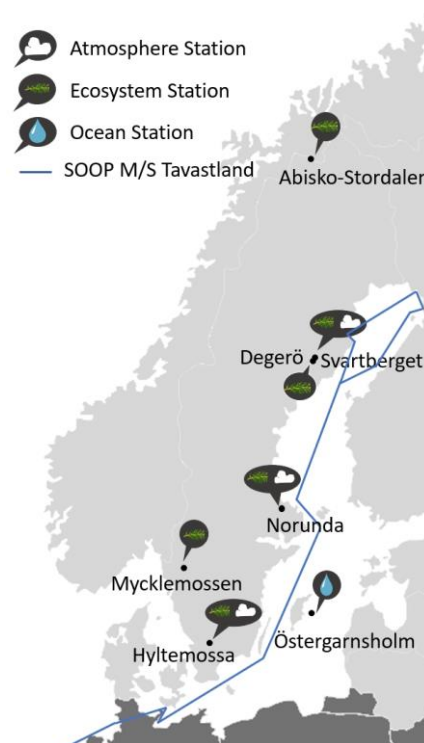


Fig A2. Map of the site locations of the observation network of ICOS Sweden.

The organization of ICOS Sweden (Fig. A3) are structured according to the directions given in the original agreement with the Swedish Research Council (SRC) for the funding period 2025-2028 (Dnr 2023-00172).

Lund University, as host for ICOS Sweden, is responsible for the financial resources and reporting to the donors. The host is the director's employer and formally appoints the director and the assistant director after consultation with the so-called partners' council (PC). The PC is a forum for consultation and agreement between all participating parties: all consortium partners are represented in the PC that decides on matters concerning the activities within the infrastructure but has no mandate in addition. The host also formally appoints the Steering Committee (SC) in consultation with the SRC.

Each partner has employer’s liability for the personnel at its station(s) and is represented in the ICOS Sweden Reference Group (RG) and in the ICOS RI Monitoring Station Assembly (MSA) by the Station Principal Investigator (SPI).

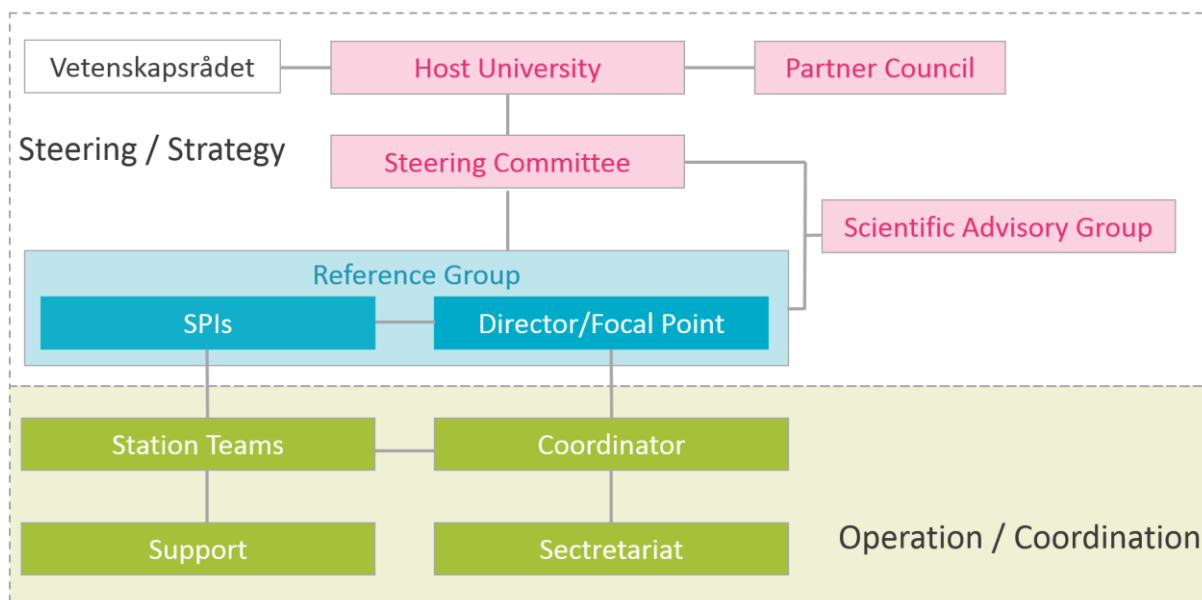


Fig. A3. The organization structure of ICOS Sweden.

ICOS Sweden Steering Committee (SC)

The SC has a broad composition with expertise that covers both the management of research infrastructure and qualified research in the area. The task of the SC is, independently of the parties and within the given frames by the PC, to work for optimal development, operation, and management of ICOS Sweden as a national research infrastructure. The SC is responsible for overall strategic and financial monitoring and shall promote development, operation, and management. The SC also decides on the focus and objectives for the collaboration between the different partner organizations that constitute ICOS Sweden.

The present SC members appointed on 19 juni 2025 until the end of 2028, are Marko Scholze (Chair; LU), Lars Arneborg (SMHI), Radovan Kreijci (SU), Hjalmar Laudon (SLU), Carin Nilsson (Swedish Forest Agency), Heather Reese (GU), and Ågot Watne (Swedish Environmental Research Institute), . In 2025, new members will be assigned to the Steering Committee.

Scientific Advisory Group (SAG)

The SAG consists of leading international scientists, appointed by the SC. The SAG is independent and contributes with scientific advice, establishes external contacts, and acts as ambassadors to the wider community. SAG advises the SC in strategic issues. ICOS Sweden, Actris Sweden and SITES are aiming to have a common SAG for all three infrastructures to enable the best possible coordinated strategy for high-level scientific output by the users of the RIs. For ICOS Sweden, Stephan Henne (EMPA, CH)

and Guy Schurgers (Copenhagen University, DK) have been appointed as Scientific Advisory Group members.

Reference Group (RG)

The RG consists of the director and scientifically merited and active representatives from each partner (SPIs). The RG shall provide the director with advice on strategic plans and budgets. Furthermore, the RG shall promote the use of research at ICOS Sweden at each partner institution and work on the outreach in Sweden in accordance with the strategic plan. The director is responsible for the management of the research infrastructure. The director's tasks include planning, leading, and prioritization of ICOS Sweden's operations within the framework of its business plan and budget with the support of the SPIs, while the operational management can be delegated to the assistant director according to the consortium agreement. As contact point between RG and the SC, the director prepares the reporting documents for the SC and the PC. The role as director of ICOS Sweden was given to Tim Arnold from 2025-01-01. Jutta Holst supports the director as coordinator of the RI.

Operational Management

The operational management oversees the daily business at the stations with the main goal of delivering high quality data to ICOS RI. This comprises the main task for the SRC funded national infrastructure. For this, the stations are to a large part directed by ICOS RI. The operational management group is led by the coordinator who is supported by a part time economist (Heléne Holmström). The SPIs are responsible for the daily management, data quality control, data reporting and coordination of scientific issues at the site level. The SPIs are also members of the respective ICOS MSAs (Atmosphere, Ecosystem, Ocean). The Scientific and Technical Support (1 FTE) assists the stations in terms of data file handling at the stations (e.g. preparation and transfer to Thematic Centers, data display on icos-sweden.se including eddy-covariance flux calculations), technical questions (e.g. installation of new instruments, management of common spare instrument pool, logger programs). The support also assists users in identifying and finding the correct data for their respective research questions, prepare special data requests or guide the users to the correct dataset on the ICOS Carbon Portal. The costs for the module have been shared between the ecosystem and atmosphere station hosts.

Appendix C: The ICOS Sweden measurement stations

ICOS Sweden operates twelve measurement stations in total: seven ecosystem stations, three atmospheric stations, and two ocean stations. The three atmospheric stations are co-located with three of the ecosystem stations and ACTRIS Sweden stations. The locations of the measurement stations were chosen with the aim to cover typical Swedish conditions, while at the same time considering a broader Nordic context as well as the European perspective.

Abisko-Stordalen Ecosystem Station (host: PFS, PI: Erik Lundin, total FTE: 1.6)

The Abisko-Stordalen subarctic mire, consisting of a palsa/bog/fen complex, is of great interest to many national and international researchers and there are a number of ongoing activities including flux measurements by different groups. The mire area is located very close to the 0°C isotherm and represents a very dynamic part of the sub-arctic region. Due to its vicinity to the Abisko Scientific Research Station, which is about 10 km west of the mire, the site is easily accessible despite its remote character. The station is included in the SITES station Abisko.

Svartberget combined Ecosystem and Atmosphere Station (host: SLU, ES PI: Matthias Peichl, AS PI: Eric Larmanou, total FTE: 2.4)

The SLU, Svartberget Experimental Forests (SEF), including the Krycklan Catchment Study (www.slu.se/Krycklan) is one of most well-equipped field research stations in the boreal biome with the most extensive scientific research in hydrology, ecology, biogeochemistry, biogeophysics and forest management practice etc. The SEF site (64°15'N, 19°46'E, 270 m asl) is located about 60 km west of Umeå, and dominated by mixed coniferous forests. SEF is also part of SITES, (Swedish Infrastructure for Ecosystem Science, funded by SRC) and provides key infrastructures for field-based research on productive pine and spruce forest stands, mire and lake ecosystems and catchments. The large study area gives researchers unique opportunities to perform studies on both local and landscape levels including large scale field manipulations. Visiting researchers will benefit from experienced field personnel, a workshop, labs, cold storage, an extensive vehicle park, drones equipped with multi-spectral cameras for aerial photography, and desk space. Another major asset is an extended, open access, database for long-term measurements of critical soil-, bedrock-, hydrological-ecological and land-atmosphere exchange variables of all dominating landscape elements. SEF currently hosts > 100 unique, externally funded, active research projects. The SEF station hosts both, the SITES station Svartberget, the ICOS Sweden Ecosystem and Atmosphere station Svartberget and the ACTRIS Sweden station Svartberget.

Degerö Ecosystem Station (host: SLU, PI: Matthias Peichl, total FTE: 1.35)

The Degerö station is situated on a minerogenic oligotrophic boreal mire covering 6.5 km² in the Kulbäcksliden research park at Vindeln Experimental Forests, located in a cold temperate humid climate, about 60 km west of Umeå. The station is included in the SITES station Svartberget.

Norunda combined Ecosystem and Atmosphere Station (host: LU, ES PI: Natascha Kljun, AS PI: Irene Lehner, total FTE: 2.35)

The mixed boreal pine/spruce forest at Norunda which is located about 30 km north of Uppsala was clear cut in 2022 and replanted with pine in early summer 2024. The research station is the oldest flux

site in Sweden, established in 1994. The station is co-located with the ACTRIS Sweden station Norunda and the ACTRIS Sweden cloud remote sensing exploratory platform.

Hyltemossa combined Ecosystem and Atmosphere Station (host: LU, ES PI: Michal Heliasz, ES Co-PI: Natascha Kljun, AS PI: Michal Heliasz, total FTE: 2.35)

The Hyltemossa site is located in southernmost Sweden, about 60 km north-east of Lund, in a young temperate spruce forest around 30 years old. The station is co-located with an ACTRIS Sweden station.

Mycklemossen Ecosystem Station (host: GU, PI: Per Weslien, total FTE: 1.35)

Mycklemossen mire station is located within the Skogaryd Research Catchment which is situated in a part of the country with high levels of nitrogen deposition, about 15km north-west of Trollhättan. The measurements enable determination of the net ecosystem carbon balance. The site is one of the subsites within the SITES station Skogaryd.

Östergarnsholm Fixed Ocean Station and Associated Ecosystem Station (host: UU, PI: Anna Rutgersson, total FTE: 1.1)

This site is located on the small island Östergarnsholm situated 4 km east of Gotland in the Baltic Sea. The island is very flat and for selected wind sectors representing well the open sea, i.e., marine conditions. The Östergarnsholm ACTRIS station is located in the vicinity (57°24'N, 18°54'E) across the strait, on the mainland of Gotland, a distance of a few kilometers.

M/S Tavastland: SOOP Ocean Station (host: SMHI, PI: Madeleine Nilsson, total FTE: 0.6)

SMHI runs a ferrybox on the SOOP M/S Tavastland, that mainly cruises the Baltic Sea between Kemi och Lübeck.

Appendix D: List of abbreviations and acronyms

ACTRIS Sweden – Aerosols, Clouds, and Trace gases Research Infrastructure network
ATC – ICOS Atmosphere Thematic Center
AS – Atmosphere station
CAL – Central Analytical Laboratory
CF – Central facilities (ETC, ATC, OTC, CRL and CAL)
CP – Carbon Portal
CRL – Central Radiocarbon Laboratory
ES – Ecosystem station
ETC – ICOS Ecosystem Thematic Center
ERIC – European Research Infrastructure Consortium
ESFRI - European Strategy Forum on Research Infrastructures
EUMETNET – Network of European Meteorological Services
FTE – full-time equivalent
GHG – greenhouse gas
GU – Gothenburg University
ICOS – Integrated Carbon Observation System
LU – Lund University
MSA – Monitoring Station Assembly
NordSpec – research network for spectral data collection
OS – Ocean station
OTC – ICOS Ocean Thematic Center
PFS – Swedish Polar Research Secretariat
RG – ICOS Sweden Reference Group
RI – Research Infrastructure
SAG – ICOS Sweden Scientific Advisory Group
SC – ICOS Sweden Steering Committee
SITES – Swedish Infrastructure for Ecosystem Research
SLU – Swedish University of Agricultural Sciences
SMHI – Swedish Meteorological and Hydrological Institute
SOOP – Ship of Opportunity
SRC – Swedish Research Council (in Swedish VR – Vetenskapsrådet)
UU – Uppsala University