ICOS SWEDEN
Annual Report 2024

ICOS National Network Sweden

Lunds Universitet · Göteborgs Universitet · Uppsala Universitet · SLU · Polarforskningssekretariatet · SMHI · Swedish Research Council

1. Summary 2024

The Annual Report 2024 was prepared by the ICOS Sweden Coordination Office (CO). The ICOS Sweden Steering Committee endorsed the document on 20 March 2025. The report is complemented by the ICOS Sweden key numbers for 2024, the ICOS Sweden Operational Plan for 2025 (DNo. LU STYR 2024/2862), the Strategic Plan 2025-2028 (DNo. LU STYR 2024/2859), and the Plan for Equal Opportunities (DNo. LU STYR 2024/2861). ICOS Sweden operations are going according to plan. The stations fulfill their obligations to ICOS RI. 2024 was the final year of the 4th funding period as RI of national interest (DNo. VR 2019-00205). The preparations for the 5th funding period (2025-28, DNo. VR 2023-00172) have been initialised and are expected to be finalised within the next weeks (signature of all partners on the consortium agreement). The last Class 2 Ecosystem station got certified by the ICOS General Assembly in November 2024. The marine stations Östergarnsholm and Tavastland are collaborationg with the Ocean Thematic Center towards finalizing their labelling processes. Also, the process of certifying the Associated Ecosystem station at Östergarnsholm, which was splitted from the previously combined ecosystem-marine station (marine flux tower) has been started. As in 2023, large emphasis was put on the elaboration of the best strategy for future collaboration with the other environmental research infrastructures ACTRIS Sweden and SITES and initiating first steps towards a closer collaboration.

2. Popular Science Description

ICOS RI (Integrated Carbon Observation System Research Infrastructure) is a European research infrastructure that provides high-precision data on greenhouse gas concentrations in the atmosphere and insights into the carbon cycle between the atmosphere, land, and oceans. Recognized as a landmark by ESFRI, ICOS RI operates standardized and open data from measuring stations across 16 European countries. This data enhances our understanding of the factors driving greenhouse gas concentrations, which significantly impact our climate. For more information, visit www.icos-ri.eu.ICOS Sweden is the Swedish national network within the Integrated Carbon Observation System, focusing on typical Swedish terrestrial and marine ecosystems and regions. It serves as a crucial resource for both national and international research on climate impacts, earth system modeling, and the factual basis for supporting and evaluating climate measures. ICOS Sweden operates two ocean stations, seven ecosystem stations, and three atmospheric stations. For more information, visit www.icos-sweden.se.

3. Description of operations

3.1 Timeplan

At the end of the funding period, ICOS Sweden is still running late with some of the planned work – labelling of the Ocean station Östergarnsholm - according to the time plan included in the proposal to the funding period 2021-24 (Table 1a). Regarding the work plan for the Upgrade and Renewal of the infrastructure (Table 1b), all outstanding deliveries of instrumentation, delayed due to long delivery times, were received in 2024. The instrumentation has been implemented in the measurement systems at the stations. However, data delivery to the Thematic Centres has not yet commenced due to ongoing final adjustments that need to be discussed between the ETC and the stations, or completed by the manufacturers (Picarro).

3.2 Construction, development and operations of the RI

The new ES mire station Mycklemossen finalized all mandatory tasks for the station labelling and got certified during the General Assembly meeting in November 2024. The station personnel at the marine station Östergarnsholm is in continued dialogue with the Ocean Thematic Centre on how to best solve the remaining issues with the station certification. The labelling process of the ICOS measurements on board SOOP Tavastland is ongoing. At the already labelled stations, operations according to the ICOS RI protocols and the ICOS Sweden operational plan were ongoing. Long term sick leave of technical staff required the use of external workers (later changed to temporary work contract /”vikariat”) and continued re-organization of tasks of the technical and scientific support.

3.3 Cooperation with other RIs

The common strategy of the three environmental RIs (ICOS, ACTRIS SITES) for closer collaboration which was handed in in spring 2024 lists short-term goals and defines the long-term vision to maximise the scientific gains that can be made possible. The RIs have started working on these: e.g. recruiting a common scientific advisory board, co-location of SITES and ICOS measurements at Abisko-Stordalen.

Table 1a: *Commented timetable for ICOS Sweden milestones during 2021-2024 according to grant No. 2019-00205. Legend: n/y - n times per year, cont – continuously; accomplished (green), partly accomplished (blue); not yet accomplished (pink)*

		2021	2022	2023	2024
Milestones	1. Management of the organization (module 1)				
	Management				
	Production and revision of steering documents	1 / y	1 / y	1 / y	1 / y
	Board meetings, revisions and endorsements	3 / y	3 / y	3 / y	3 / y
	Collaboration with other RIs	cont	cont	cont	cont
	Joint SAC and Board meetings	1 / y	1 / y	1 / y	1 / y
	Management team meetings	2-4 /y	2-4 /y	2-4 /y	2-4 /y
	Preparation of reports				
	Annual reporting, incl. financial status and key numbers	1 / y	1 / y	1 / y	1 / y
	Self-evaluation	1 / y		1 / y	1 / y
	Conduction of outreach activities and dissemination				
	Homepage, media activities, reports, info material, papers	cont	cont	cont	cont
	Courses and field visits	cont	cont	cont	cont
	Activities to stimulate scientific use of the RI	cont	cont	cont	cont
	2. Management of sites, systems and measurements (modules 2-6)				
	Operate measurement sites	cont	cont	cont	cont
	Station labelling: SE-Sto	x			
	Station labelling: SE-MFT-Östergarnsholm	x			
	Station labelling: SE-SOOP Tavastland				x
	Station labelling: SE-Myc				x
	Quality check data from thematic centres	cont	cont	cont	cont
	Service, system maintenance and update, work routines and protocols	cont	cont	cont	cont
	Staff training and station safety routines	1 / y	1 / y	1 / y	1 / y
	Service to ancillary project and data users	cont	cont	cont	cont
	Research engineer meetings (distant and face-2-face)	monthly	monthly	monthly	monthly
	3. Evaluation and renewal application (module 1)				
	Preparation of midterm evaluation	cont			
	Preparation for application for next period		cont	cont	
Deliverables	4. Reports (module 1)				
	Annual and financial reports incl. key numbers, operational plan, revision of strategic plan	1 / y	1 / y	1 / y	1 / y
	5. Dissemination (module 1-6)				
	ICOS conferences (ICOS RI, Nordic ICOS Symposium)	1 / y	1 / y	1 / y	1 / y
	6. Data (module 2-6)				

	Delivering data to ICOS RI	cont	cont	cont	cont
	Open data available in Carbon Portal	cont	cont	cont	cont

Table 1b: *Commented timetable for ICOS Sweden milestones during 2021-2024 according to grant No. 2021-00244. Legend: n/y - n times per year, cont – continuously; accomplished (green), partly accomplished (blue); not yet accomplished (pink)*

			2021	2022	2023	2024	2025
Milestones	**Procurement**						
	1	N_2O analysers atmosphere stations		06/22			
	2	CH_4 analysers wetland ecosystem stations		06/22			
	3	buoy fixed ocean station	12/21				
	4	CH_4 upgrade ferrybox	12/21				
	5	CO_2 flux system for northern flux systems	12/21				
	6	below canopy PAR sensors	12/21				
	7	Replacement sensors for old equipment	12/21				
	Purchase						
	8	N_2O analysers atmosphere stations		09/22			
	9	CH_4 analysers wetland ecosystem stations		09/22			
	10	buoy fixed ocean station		06/22			
	11	CH_4 upgrade ferrybox		06/22			
	12	CO_2 flux system for northern flux systems		02/22			
	13	below canopy PAR sensors		02/22			
	14	replacement sensors for old equipment		06/22			
	15	replacement for basic infrastructure (boardwalks, elevator)	12/21				
	Installation						
	16	N_2O analysers atmosphere stations		12/22			
	17	CH_4 analysers wetland ecosystem stations		12/22			
	18	buoy fixed ocean station					
	19	CH_4 upgrade ferrybox			03/23		
	20	CO_2 flux system for northern flux systems		10/22			
	21	below canopy PAR sensors		10/22			
	22	Replacement sensors for old equipment		09/22			
	23	replacement for basic infrastruture		08/22			
Deliverables	**Data flow established**						
	1	N_2O analysers atmosphere stations		10/22			
	2	CH_4 analysers wetland ecosystem stations		10/22			
	3	buoy fixed ocean station					
	4	CH_4 upgrade ferrybox			03/23		
	5	CO_2 flux system for northern flux systems		12/22			
	6	below canopy PAR sensors		12/22			
	7	reporting			03/23		

3.4 Datahandling and e-infrastructure use

The main data repository for ICOS Sweden data is the ICOS Carbon Portal. Data from the Ocean stations have been submitted to the Surface Ocean CO_2 Atlas (SOCAT) from where they will be available for FAIR use after thorough quality control. An overview over the available data on the data repositories is available on the RI's webpage.

4. Changes in organisation of the RI

Table 2: *Deviations from the special terms from ICOS Sweden granted in 2024.*

LU STYR 2024/1173	Hantering av avsteg från särskilda villkor för ICOS Sweden (Östergarnsholm)
LU STYR 2024/1176	Avsteg från särskilda villkor ICOS Sweden Upgrade and Renewal (förlängd inköp)
LU STYR 2024/1179	avsteg från särskilda villkor ICOS Sweden 2021-24, ICOS Sweden Upgrade and Renewal (förlängning, winter flux system)
LU STYR 2024/1180	avsteg från särskilda villkor ICOS Sweden 2021-24 (Göteborg Universitet)
LU STYR 2024/1181	avsteg från villkor ICOS Sweden 2021-24 (förlängd tid för inköp samt förlängd frist för slutredovisning av inköp)
LU STYR 2024/1184	Avsteg från särskilda villkor ICOS Sweden upgrade and renewal

LU STYR 2024/1186	Avsteg från särskilda villkor ICOS Sweden upgrade and renewal (SLU/Svartberget hiss)
LU STYR 2024/1689	Avsteg från särskilda villkor ICOS Sweden upgrade and renewal (SMHI/kostnadsslagsändringsbegär)
LU STYR 2024/3225	Avsteg från villkor (VR DNr 2019-00205): ansökan kostnadsslagsändring

5. Steering Committee (SC)

The ICOS SC (Eija Juurola (Chair; ACTRIS ERIC), Lars Arneborg, (SMHI), Hjalmar Laudon (SLU), Heather Reese (GU), Isaac Rodriges Dos Santos (GU), Linda Marie Kanders (IVL), Marko Scholze (LU), Lars Tranvik (UU)) met twice to approve the steering documents (annual report, key numbers, operational plan, budget and financial outcome, update of strategic plan, plan for equal opportunities) and was also involved in developing the strategy for the cooperation with SITES and ACTRIS and discussing strategies to attract users to the RI. The mandate period of the current SC members ended at the end of 2024 and the process for replacements has been initiated; the SC members agreed to meet for endorsement of the reporting documents in spring 2025.

6. Financial outcome 2024

The partner contributions in 2024 were significantly increased to meet the agreed co-funding level for the total funding period. At the end of 2024, the grant ICOS Sweden Operations 2021-24 (DNo. 2019-00205) ends with a positive balance. Main reasons are changes in staff with different salary level as budgeted; unused financial resources for other direct costs at the coordination office for physical meetings and printed outreach material; unused financial resources for other direct costs at the stations (reduced number of trips esp. in the beginning of the funding period); unused resources for instrument purchase (SLU used the same activity number for the grants Upgrade and Renewal (2021-00244) and Operations of ICOS Sweden (2019-00205) and moved costs between one and the other grant. A mistake in the prognosis of the economic result for 2019-00205 in autumn 2024, which showed that all funds for instrument purchase were spent hided a relatively large remaining sum at the end of the funding period; this remaining sum should have been used to cover costs which were reported to grant No 2019-00244, where SLU used more of the budget than originally attributed to SLU; these costs had to be covered by remaining funds from the other partners). As stated in the special terms, the final amount granted of DNo 2021-00244 was adjusted to the reported numbers in summer 2024 when the purchase period had ended; the total amount was reduced by 553.6 kSEK. The grant is now closed for any further accountings.

Table 2. *ICOS Sweden Operations 2021-24 grant (DNo. 2019-00205) financial outcomes per year until the end of the funding period (kSEK); including revisor costs.*

1		2	3	4	5	6	7	8
		total 2021-2024	**Outcome 2021**	**Outcome 2022**	**Outcome 2023**	**Outcome 2024**	**Total outcome 2021-2024**	***Remaining balance 2024***
in	partner	53 240.0	9 741.8	14 052.1	11 787.9	18 151.3	53 733.1	*-493.2*
	SRC	40 000.0	10 000.0	10 000.0	10 000.0	10 000.0	40 000.0	*0*
	total income	***93 240.0***	***19 741.8***	***24 052.1***	***21 787.9***	***28 151.3***	***93 733.1***	***-493.2***
costs	Staff/salaries	38 080.1	11 624 0	9 983.0	8 958.9	9 351.5	39 917.5	*-1 541.8*
	Premises	2 105.5	600.1	818.9	731.1	480.1	2 630.6	*-282.8*
	Operating other costs	28 707.3	2 688.4	6 774.8	5 149.3	7 429.4	22 119.6	*5 009.9*
	Overhead	17 123.3	4 788.5	4 358.0	4 160.5	5 103.5	17 885.7	*277.3*
	Investments	7 223.8	1 735.2	831.1	1 662.7	1 659.1	5 888.0	*1 335.8*
	total costs	***93 240.0***	***20.903.8***	***22 765.8***	***20 662.5***	***24 023.5***	***88 441.4***	***4 798.5***
	in-out		***-1 161.9***	***1 286.2***	***1 125.3***	***4 127.8***	***5 291.7***	***-5 291.7***

Table 3. *ICOS Sweden Upgrade and Renewal grant (DNo. 2021-00244) final financial outcome (kSEK).*

1		2	3	4	5	6	7	8	9
		Total Budget 2021-2025	**Outcome 2021**	**Outcome 2022**	**Outcome 2023**	**Outcome 2024**	**Total outcome 2021-2024**	***Remaining balance 2024 before adjustment***	***Budget 2025***
in	SRC	16 833.0	5 892.0	5 892.0	1 683.3	1 687.7	15 150.0	*1 682.8*	*1 129 4*
	total income	***16 833.0***	***5 892.0***	***5 892.0***	1 683.3	***1 683.0***	***15 150.0***	***1 682.8***	***1 129.4***

cost	Investments	16 833.0	485.9	3 528.5	3 397.2	8 867.8	16 279.4	*553.6*	*0*
	total costs	***16 833.0***	***485.9***	***3 528.5***	3 397.2	***8 867.8***	***16 279.4***	***553.6***	***0***
	in-out		*5 406.1*	*2 363.5*	*-1 713.9*	*-7 185.1*	*-1 129.4*	*-1 129.4*	*0*

7. Comment on key numbers

The number of research projects at the stations increased compared to earlier years. Note, that the number of research projects purely using data are not part of this statistic. Even if researchers are asked to inform the station PIs about the usage of data the number is highly unsure due to the open data policy following. Academic projects are evenly distributed between all sites with two exceptions: the commercial ship of opportunity Tavastland on the low end of users and well-known sub-arctic station Abisko-Stordalen on the other end which is of high interest for researchers from different parts of the world due to the easy access to the climate-sensitive permafrost region. Projects and visitors at the Swedish ICOS stations were mainly connected to the host of the respective stations. However, data products from the stations were downloaded from the ICOS Carbon Portal data repository from 45 countries outside Sweden. Downloads from users within Sweden increased compared to earlier years to >7.5% of the total downloads. As in previous years, data downloads from the Atmosphere Stations are higher than from the Ecosystem stations due to the structure of the data products (single variables in Atmosphere station data vs. collection of parameters in Ecosystem station data) and due to the user behaviour within the different communities: whereas the Atmosphere station community often accesses the data by demand during model runs which results in multiple downloads for multiple model runs, the typical Ecosystem station data user downloads a dataset and works offline with the data (single data download).

8. Comment on publication list

The number of peer-reviewed publications using ICOS Sweden data increased again compared to earlier years. More than 30% of the publications were based on more than one Swedish ICOS station, >6% were based on data from more than three stations.

9. Comment on work towards qqual opportunities in relation to the plan and our key numbers

Gender equality was balanced in 2024 for competence building projects. However, for research projects, females were underrepresented (30% of project PIs, 38% of all physical users).

10. Risk analysis

A risk analysis has been performed and included in the strategic plan.

11. Training efforts, outreach and user support

SPIs and station team members took actively part in the MSA meetings of all three domains, Atmosphere, Ecosystem and Ocean which were partly held online during 2024 to reduce travel needs and travel connected emissions. ICOS Sweden scientists and research engineers ICOS Sweden attended the ICOS Science Conference in Versailles, France (10-12 September 2024) and the Swedish Climate Symposium in Norrköping (15-17 May 2024). Data from the ICOS Sweden stations were subject of several presentations at these conferences, but also at other conferences (e.g. EGU, AGU, Baltic Earth Conference). User support is given at the stations and from the central support functions (technical and scientific support). ICOS Sweden was present at several occasions targeted to the general public and schools (e.g. Lund University NMT dagarna). A list of selected appearances of ICOS Sweden in media is listed on the RI's webpage. The RI is active on social media platforms (LinkedIN, (X – not active), Bluesky) and actively contributes to the ICOS RI communication team outreach activities with Sweden related inputs (e.g. for the ICOS RI newsletter). In summer 2024, the 3rd ICOS Bulletin "Fluxes" was published. The publication with the subtitle "Monitor, report and verify emissions to accelerate climate action" is targeted at stakeholders and researchers outside the core ICOS science area.

12. Other

N/A