ICOS RI
Management Plan

ICOS Integrated Carbon Observation System

Contents

1. Preface

This document provides an overview of the management structure of the ICOS research infrastructure (ICOS RI). It outlines different aspects of the management processes: the organisational structure with the different bodies and their roles and mandates, the decision-making processes, internal communication and some details of core operational and financial management. The ICOS RI Management Plan is comprised of two parts which describe the management structure at differing levels of detail to serve the needs of different readers. Part 1 (this part) is an introductory document and provides a compact overview of ICOS's management structure for internal and external readers. Part 2 contains detailed descriptions of each management process and their related tasks. The Management Plan will be a living document, serving as a tool for the ICOS community and will be available at the ICOS website. (For the current version of Part 2, please see ICOS RI Managment Plan Part 2). The two parts of the management plan are a transparent representation of ICOS's operations.

2. Introduction of ICOS research infrastructure

2.1 Definition of ICOS as a European Research Infrastructure (RI)

European research cooperation has resulted in the creation of Research Infrastructures (RIs), with the basic idea that they cover major equipment or sets of instruments, provide a data infrastructure and include the associated human resources. The RISCAPE project (2019), which was recently mapping the global research infrastructure landscape, provided a working definition for the concept of RIs:

- An RI has science or scientific research as the main driver of its activities.
- An RI provides research services to users outside of the organisation itself.
- An RI has an operational time horizon longer than the typical research projects in the field in question. This longevity is crucial for the use cases considered, as any short-term projects or initiatives would make the collected information quickly obsolete.
- An RI promotes excellence and is of significance for the science field in question.

In the context of ICOS, this definition can be applied as follows:

- Scientific Excellence drives ICOS's operations and forms the backbone for all ICOS activities.
- ICOS provides services (see annex 5) for both internal and external scientific users.
- Long-term sustainability is one of ICOS's strategic focus areas in order to achieve the scientifically-required series of long-term observational data.

ICOS engages in disseminating and promoting scientific achievements and supports assessment of climate change and political action to mitigate it.

2.2 ICOS RI and ICOS ERIC

As in many distributed RIs, the ERIC does not cover the entire RI but is a relatively small organisation. ICOS ERIC coordinates ICOS RI operations, distributes information from ICOS RI to user communities and establishes integrated data and analysis from GHG observation systems. Outside the ERIC, ICOS RI is a large distributed research infrastructure. It consists of observational station networks and Central Facilities hosted by organisations in different countries, connected to ICOS ERIC through agreements. The role of ICOS ERIC is to coordinate the overall ICOS RI operations, define the framework of activities, to monitor compliance and performance and to become active where action of individual bodies is insufficient (details agreed on in the agreements about the Central Facilities and National Networks). Furthermore, ICOS ERIC acts as a representative for ICOS RI, for example when communicating with scientific users, funding organisations, other research infrastructures in the ERA and in the global GHG research community, as well as with policy- and decision-makers.

ICOS ERIC is based on the ERIC Regulation, a specific legal framework that facilitates the establishment and operation of Research Infrastructures with European interest designated by the European Commission. The Legal Framework for a European Research Infrastructure Consortium - ERIC complements national and inter-governmental schemes based on Article 187 of the Treaty on the Functioning of the European Union (TFEU). ERIC regulation has been approved by the Council of EU (based on a proposal by the Commision) and allows the establishment and operation of new or existing research infrastructures on a non-economic basis. (What ERIC is, related documents, requirements and guidelines).

ICOS ERIC was established on 23 November 2015 on the request of Finland as statutory seat and eight additional European countries, implemented by a decision of the European Commission (Official Journal of the European Union 2015: L303/19). Following ERIC regulation Article 15 (Applicable law and jurisdiction), ICOS ERIC is a legal entity based on the ERIC regulation, underlying Finnish legislation regarding issues of financial and employment administration, the Statutes of ICOS ERIC and its implementing of rules. ICOS ERIC Statutes state: "The principal task of ICOS ERIC shall be to establish a distributed Integrated Carbon Observation System Research Infrastructure (ICOS RI) and to coordinate the operations of ICOS RI, distribute information from ICOS RI to user communities and to establish integrated data and analysis from GHG observation systems."

ICOS ERIC is governed by its General Assembly (GA). The ICOS Director General and the ICOS Head Office, located in Helsinki, Finland, are responsible implementing the GA decisions and coordinating the operations of ICOS RI. In addition, ICOS ERIC operates the ICOS Carbon Portal, located in Lund, Sweden, the central data portal through which all data and higher-level products produced by ICOS and related data products are available in an open and transparent way (according to the FAIR principles of the FORCE11 group). ICOS ERIC acts in cooperation with end-users of data and research results, industry, policy-makers, and the media in its capacity as a recognised legal entity. ICOS ERIC coordinates the main activities of ICOS RI which are defined in Art. 2 (2) of the statutes.

ICOS RI refers to the entire infrastructure which integrates highly standardised networks from multiple domains (atmosphere, terrestrial ecosystems, and oceans) connecting different carbon reservoirs. The measurement stations are run in National Networks (NNs). Central Facilities (CFs) provide services and data integration for the networks. ICOS NNs and CFs are related to ICOS ERIC by cooperation agreements with their host institutions. Within this framework, these ICOS RI components conduct their respective tasks according to their own work plans and are governed by personnel rules of the host organisation and national legislation of the host country.

All operative issues are primarily organised, discussed and solved autonomously by the respective communities, namely the domain-specific Monitoring Station Assemblies (MSAs). These consist of the Principal Investigators (PIs), who have scientific responsibility for each of the measuring stations and thus coordinate and represent the station networks in each domain, the Central Facilities and Carbon Portal. The details of this organisation are laid out in Chapter 3.

2.3 ICOS RI as an ESFRI Landmark

ICOS RI is a Landmark RI on the ESFRI Roadmap (European Strategy Forum for Research Infrastructures). The Landmark status is given to advanced research infrastructures in operational mode and evaluated periodically (see Monitoring of ESFRI projects). By being an ESFRI Landmark, ICOS RI is an important contribution to the European Research Area (ERA) and part of the European portfolio of long-term undertakings in excellent science and innovation. The ICOS strategy has been developed closely along the ESFRI principles for long-term sustainability as outlined in the 2018 ESFRI Roadmap. Excellent science is best encouraged by providing easily accessible and high-quality data in a timely manner. Thus, it is a key priority of ICOS to further develop its services based on ICOS data. ICOS provides tools for interactive analysis of data and model results, thereby securing reproducibility by using web-based technologies and direct access to ICOS data and elaborated products. As a result, ICOS RI enables transparent analyses, interactive collaboration between modelers and

data providers, and connections to computing resources in the European Open Science Cloud. ICOS thoroughly monitors and supports scientific developments and adapts to the demands of its scientific community. The ICOS science case has a primary focus on understanding carbon cycle feedbacks and possible tipping points. ICOS RI also has a strong technological innovation potential to support excellent science on quantifying fossil fuel emissions from systematic in-situ observations. It follows and supports this science, will co-design a system on the basis of said science during the upcoming years and will thereafter suggest implementation pathways.

2.4 ICOS RI mission and vision

The **mission** of ICOS RI has been formulated in the ICOS Strategy Document:

"ICOS RI is a distributed research infrastructure operating standardised, high-precision, and long-term observations and facilitating research to understand the carbon cycle and to provide necessary information on greenhouse gases. ICOS-based knowledge supports policy- and decision-making to combat climate change and its impacts. ICOS is the European pillar of a global GHG observation system. It promotes technological developments and demonstrations, related to GHGs, by the linking of research, education and innovation."

The key points of ICOS RI's **vision** define the strategic focus areas (SFAs):

Sustainability, Scientific excellence, Societal impact, Global cooperation and Innovation.

Please refer to the ICOS Strategy document for more details.

Documentation related to the establishment of ICOS RI:

- ERIC Regulation (EC/723/2009)
- Decision of the European Commission on setting up ICOS ERIC (Official Journal of the European Union 2015: L303/19)
- Final ICOS ERIC Act (based on Article 18 of ERIC Regulation)
- ICOS ERIC Statutes
- ICOS Strategy

3. Organisational structure

ICOS RI member and observer countries have committed to fund ICOS RI and have their representatives in the ICOS General Assembly. In addition, JRC (Joint Research Centre, the EC's science and knowledge service) operates two stations in ICOS's network.

ICOS Belgium	ICOS France	ICOS Sweden	ICOS Hungary
ICOS Czech Republic	ICOS Germany	ICOS Switzerland	JRC
ICOS Denmark	ICOS Italy	ICOS United Kingdom	
ICOS Finland	ICOS Norway	ICOS Netherlands	
	ICOS Spain		

The organisational structure of ICOS RI is two-fold, as depicted in Figure 1.

On the left side, the operational viewpoint shows the ICOS observation stations which are led by a station principal investigator (PI). They are the core of ICOS's operations and organised country-wise in National Networks (NNs) and domain-wise (atmosphere, ecosystems, oceans) in Monitoring Station Assemblies (MSAs). Speakers of the NNs are the National Focal Points, while speakers of the MSAs are their chairs. MSAs and Central Facilities are together responsible for the definition of station specifications, compliance to these specifications (station labelling), data processing, and data quality assurance and quality control (QA/QC). The MSA chairs, together with the coordinators of the Central Facilities, Head Office and Carbon Portal, constitute the Research Infrastructure Committee (RICOM)

where general operational and strategic topics are planned and coordinated (see table 1 for a more detailed description). It is convened by the Director General (DG). DG and RICOM are in the centre of the ICOS management and form the intersection of ICOS RI and ICOS ERIC.

On the right side, the administrative governance viewpoint shows that ICOS ERIC is governed by the General Assembly (GA) that includes representatives from each member country. The GA is supported by two advisory bodies, the Scientific Advisory Board (SAB) and Ethical Advisory Board (EAB). The GA connects to the RI through the DG and the RICOM.

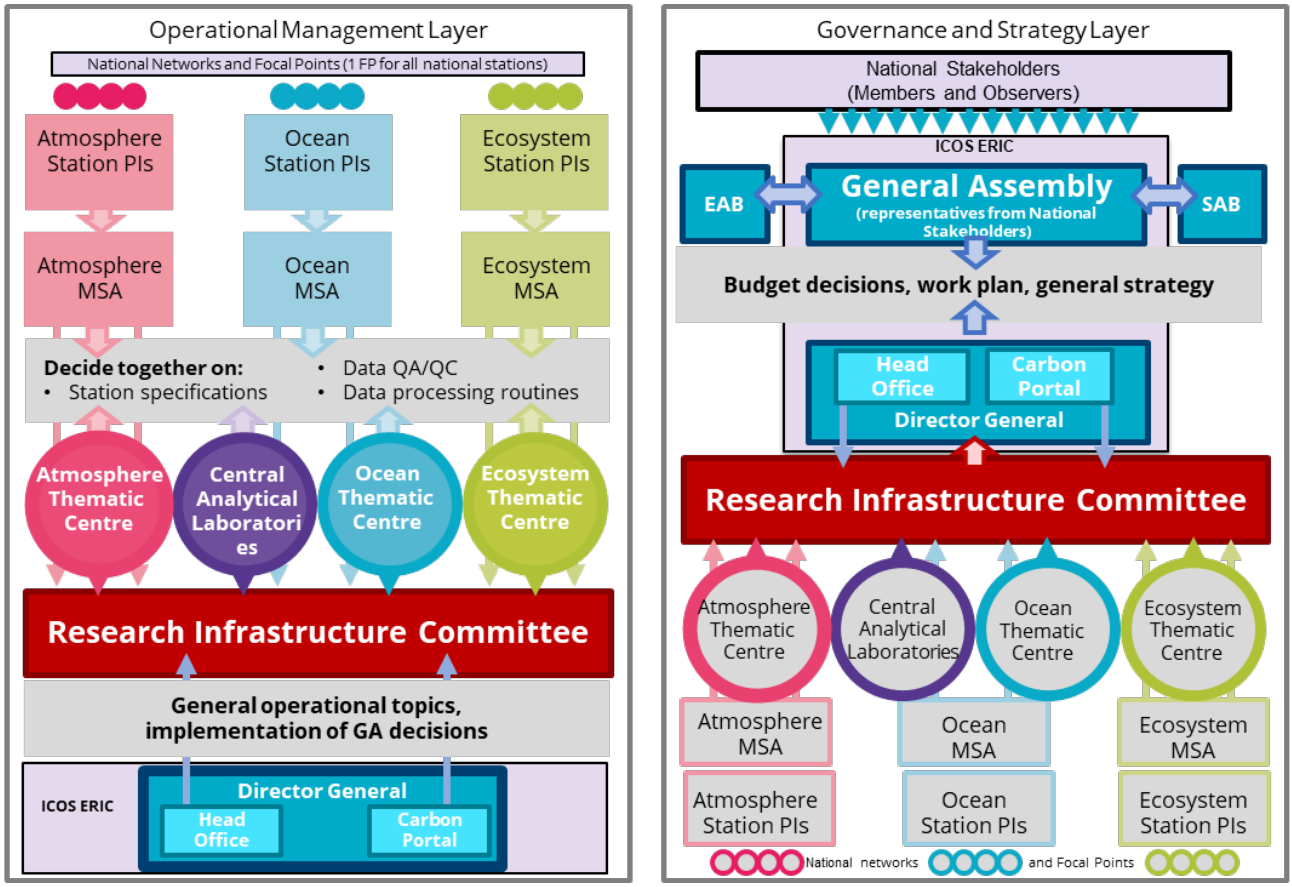


Figure 1. Operational Management and Governance and Strategy layers in ICOS RI management.

3.1 Governing, - advisory-, and management bodies

The different management bodies of ICOS RI are described in table 1.

Table 1. Governing and management bodies of ICOS RI.

Governing and advisory bodies	
General Assembly • The decision-making body of ICOS ERIC • Consists of delegates from each Member and Observer countries • Acts as a high-level council for Member and Observer representatives • Discusses and approves strategic, legal, governance and financial issues, site selection, and facilities locations	
Scientific Advisory Board • Monitors the scientific quality of ICOS RI. • Gives feedback and makes recommendations to develop the RI • SAB reports directly to the GA at least annually, members are selected by the GA	**Ethical Advisory Board** • Gives feedback and provides advice and support in cases of conflict of interest • Supports and advises on implementation of ethical policies and guidelines • Advises and supports in solving ethics conflicts involving any ICOS RI body • EAB is responsible to the General Assembly and reports directly to the GA at least annually and when seen as necessary, members are selected by the GA

Director General
- The DG is the legal representative of ICOS ERIC
- Carries out the day-to-day management of the ICOS ERIC
- DG convenes the RICOM
- DG is responsible for the implementation of the decisions by the General Assembly
- DG is in charge of the HO personnel and activities and supervises the Director of the Carbon Portal
- The DG is responsible for ICOS RI's strategic developments

Research Infrastructure Committee
- The RICOM plans, coordinates and monitors general operational and strategic topics, implements the GA decisions and provides the DG, SAB, EAB and GA an expert insight into the day-to-day operative, scientific and strategic issues in ICOS RI

Monitoring Station Assemblies
- The MSAs assess and define all aspects of ICOS measurement protocols (definition, criteria of application, revision, etc.)
- provide advice to the ICOS Central Facilities (CF) and ICOS National Networks for considering new approaches, new sensors and measurement systems
- MSA chairs are RICOM members
- Discuss, and bring up at the RICOMmittee, technical and scientific matters
- Constitute a space for exchange of experience between scientists and technicians of the different sites.

Management bodies

ICOS ERIC

Head Office
- The organisational hub of the ICOS Research Infrastructure
- Supports and connects all bodies of ICOS RI
- Prepares the meetings of the GA, and implements its decisions
- Prepares, implements and monitors the annual work plans and annual budget and oversees and coordinates the operations of ICOS RI in close cooperation with the RICOM

Carbon Portal
- Offers access to research data and science and education products. The Carbon Portal director is part of the RICOM
- Integrative access point for all ICOS users and stakeholders
- Supports standardised data-exchange protocols and techniques
- Organising the long-term archiving of ICOS data products

ICOS RI

Central Facilities

Atmospheric Thematic Centre | Ecosystem Thematic Centre | Ocean Thematic Centre | Central Analytical Laboratories (CAL)

- Coordinate and lead operations within their fields and process the data coming from the stations with close collaboration with the MSAs
- The Central Facility directors are RICOM members
- Play key roles in specialised analyses, metrology and QA/QC and the technology watch
- Support the measurement stations by offering spare instruments, training and technical assistance.

National Focal Points
- The National Focal Point acts as a point of communication between all stations in their country and ICOS ERIC. They represent the whole (multi-domain) National Network of their country.
- Responsible for informing the Head Office of any new stations that are planned for completing the ICOS station labelling process
- Focal Points belong to National Networks and MSAs and are often Station PIs, occasionally participate in the RICOM meetings (but are not officially part of the RICOM)

Station Principal Investigators
- Station Principal Investigator (PI) is the leader of ICOS-related scientific and technical operations and technical matters at their station
- Represent their station in the Monitoring Station Assembly (MSA) and are there to discuss, develop and improve the scientific and technical basis of the observations.
- Responsible for Quality Assurance at the station and for the first-order Quality Control of the data
- Station PIs belong to National Networks and MSAs, some are also Focal Points.

Documentation related to the governing, advisory, and management bodies:

- Statutes
- MSA Terms of Reference
- MSA Chair role description
- GA RoP
- SAB ToR
- EAB ToR
- Director General Agreement
- RICOM RoP
- Head Office Concept
- ICOS ERIC Employment Policy
- ICOS ERIC Staff Rules
- Carbon Portal concept
- FP role description
- FP / PI Onboarding document
- PI role description

3.2 Funding structure and governing cycle

The revenues of ICOS ERIC consist of:

a) Host premium contributions from the HO and CP hosting countries (Finland and Sweden, respectively)
b) Annual ICOS ERIC membership contributions from ICOS ERIC Member and Observer countries (common contributions)
c) Third party contributions and grants
d) Any other income (e.g. interest, sales, donations)

The revenues of ICOS RI Central Facilities consist of:

a) Substantial direct host funding provided by the country(ies) where the ICOS Central Facilities are located
b) Contributions from ICOS ERIC based on the number and type of stations related to the Central Facility (station-based contributions)

The revenues of ICOS RI National Networks consist of:

a) National Networks are solely funded from national sources

3.3 The governing cycle

The annual governing cycle of ICOS RI is defined by a set of regularly-occurring annual meetings (Figure 2) to maintain a clear information flow, and to ensure the efficient implementation of well-prepared decisions. Internal and process-specific meetings are not shown in this figure but can be found in individual process- and task descriptions in Part 2 (where applicable).

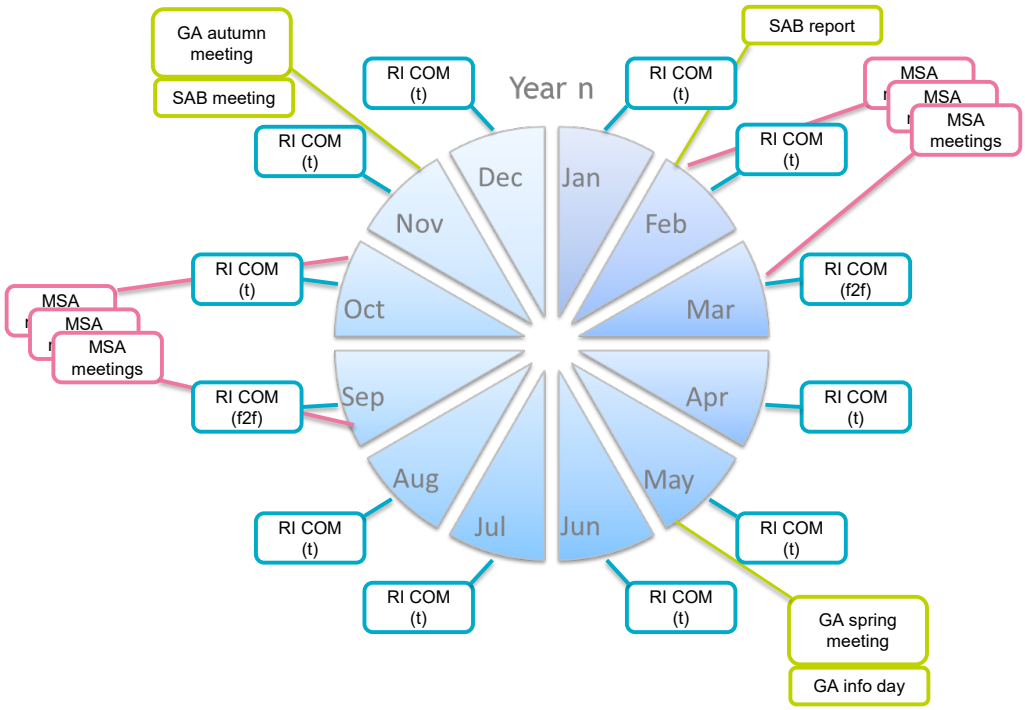


Figure 2. Annual governing cycle of ICOS RI (t: via teleconference, f2f: face to face meetings).

3.4 Users and stakeholders

To understand the vision and mission of ICOS RI, it is useful to establish the groups that are involved and / or interested in the activities carried out by ICOS RI. The ICOS strategy defines three categories of groups:

- Operators: ICOS personnel employed at the host institutions of the National Networks and Central Facilities and at ICOS ERIC who are involved in ICOS activities and in producing ICOS outputs
- Users: Scientists or organisations who use ICOS data, publish papers, and communicate their findings
- Stakeholders: People, organisations or groups who benefit from the knowledge created by ICOS (impact of ICOS).

In addition, the following interest groups have been identified for ICOS RI:

- Practitioners: organisations taking up the knowledge produced by the users into their own activity to produce an action, a policy, a product.
- Enablers: Organisations making the activities of ICOS possible (or not).
- Frame-makers: Organisations setting the frames in which ICOS develops its activities
- General Public: This category includes citizens and opinion-makers or influencers.

4. Management principles

ICOS RI follows management principles that ensure proper planning, organisation, and monitoring of the operations and the basic elements included in them (processes, resources, methods). The management principles enable the leadership of human efforts.

4.1 Network-centric organisation and subsidiarity

ICOS ERIC statutes (Art. 1.3) state: "*ICOS ERIC shall coordinate the operations of the distributed European Research Infrastructure called 'Integrated Carbon Observation System Research Infrastructure' …*". This means that ICOS RI operations follow the subsidiary principle: ICOS ERIC - being the legal entity of the RI – defines the framework of the RI's activities (e.g. financial aspects and activities needed from each of the RI components for executing the RI's mission and strategy).

Article 7 in the ICOS ERIC Statutes state that *'Specific agreements describing the roles and responsibilities, including financial obligations shall be concluded between ICOS ERIC and the entities responsible for managing the ICOS Central Facilities and ICOS National Networks'.* The activities required from each party, as well as the protocol for committing to the delivery of them, is broadly defined in these agreements. The CF contracts also describe the frameworks of the management of each CF. Performing the activities and organising the day-to-day management of each CF and National Network is, however, organised independently by the parties themselves.

While each of the RI components is responsible for managing its own activities, they are committed, by the relevant agreements with ICOS ERIC, to contribute to the annual activity report that is required by the ICOS ERIC statutes (art. 17): "*ICOS ERIC shall produce an annual activity report, containing in particular the scientific, operational and financial aspects of its activities. The report shall be approved by the General Assembly…* ". The annual report compilation is coordinated by ICOS ERIC. The ERIC, through the Director General, is directly responsible for '*the implementation of the decisions by the General Assembly, including the annual work plan and annual budget as well as overseeing and coordinating the ICOS RI activities*' (ICOS ERIC Statutes, Art. 11). This means that ICOS ERIC has an up-to-date understanding of how the RI is executing its activities as stated in the specific agreements. In the instance of issues related to the RI's ability to carry out its activities, ICOS ERIC can intervene either through the RICOM or MSA, or by direct contact with a specific RI component. The ERIC also maintains a dialogue between the GA and the RI through RICOM (which subsequently conveys information to the MSAs and via the national Focal Points to the National Networks) and SAB and EAB.

4.2 Transparency and communication

The complexity and distributed character of ICOS RI requires a high level of transparency and communication within and between all components of the RI. To manage internal and external communication, ICOS RI has several communications networks and channels, as well as a communication strategy to support the realisation of the ICOS strategy. The success of communications and the performance of the channels is continuously monitored, and improved accordingly.

4.3 Strategy-orientation

The management of the ICOS RI is designed to support the ICOS mission and vision defined in the strategy (see above, 2.4). In order to provide a logical and strategy-oriented management of ICOS RI, the five Strategic Focus Areas

(SFA) defined in the strategy are: (i) sustainability, (ii) scientific excellence, (iii) societal impact, (iv) global cooperation, and (v) innovation. These are connected to five identified Core Activities (CA), based on the structure of the RI: a) governance and management, b) operation of measurements in the station networks, c) data management and provision to users, d) provision of services to scientific and societal users, and e) communication, including dissemination of results and community support. Table 2 demonstrates the inter-linkages between ICOS's strategy and management processes by forming a matrix connecting the Strategic Focus Areas (SFA) and the Core activities (CA). This matrix is used as the management blueprint of ICOS RI. Each field in the matrix reflects an aspect of the complex structure of a distributed RI, including a large number of management processes, tasks, and their outcomes. The matrix approach provides the strategic location of any activity and opens a way to describe them throughout all levels of ICOS RI. This is achieved in Part 2 by in-depth descriptions of the activities in each of the 25 matrix fields and describing the respective responsibility of each ICOS body.

Table 2. The management blueprint of ICOS RI.

	Strategic focus areas				
	Sustainability	Scientific excellence	Societal impact	Cooperation	Innovation
Core activities	**Processes**	**Processes**	**Processes**	**Processes**	**Processes**
Governance and management	**Administrative management:** • Support and coordination of the GA and SAB: Implementation and dissemination of governing decisions • Financial management and administration of ERIC and RI • Monitoring and evaluating the RI's performance	**General Operational management:** • General network management Research facilitation • Monitoring and evaluating the RI's performance	**Knowledge management** • Dissemination of ICOS data as elaborated products • Dissemination of ICOS-related knowledge: contribution to informed policy-making	**External cooperation management** • Including new member countries into the network • Dialogue with high-level platforms	**Innovation management:** • Network development Industry liaison management
Communication, dissemination and community support	**Fostering a motivated and engaged ICOS Community:** • Facilitating collaboration, showcasing community impact, maintaining a strong ICOS identity, maintain stakeholder relations	**Communication and dissemination of data scientific results:** • Dissemination of scientific results Training and user support • ICOS Science Conferences	**Communication of ICOS-provided knowledge** • Participation in UNFCCC, SBSTA, ICOS Science Conferences	**International visibility** • Cooperation within UN Climate system • ICOS Science Conferences	**Support for visibility for research activities and projects** • Science Conference Vendor expos • Business Forums
Conducting measurements	**Network sustainability:** • Definition and standardisation of measurements • Risk management for operations • Ensuring high geographical coverage	**Network operations:** • Data generation and transfer QA of measurements	**Ensuring societal relevance of observations:** • Quantification of GHG atmospheric concentrations and terrestrial and oceanic fluxes over Europe and key regions of European interest, including the North Atlantic Ocean	**Network-related cooperation:** • Network expansion activities: Promoting the advantages of ICOS RI membership on national and global levels • Developing collaboration opportunities by co-location and common access • Adoption of ICOS standards at European and global level	**Innovation-related network activities**: • Industry application of ICOS standards Promoting new technical developments • Providing demonstrators of innovative technologies
Providing data	**Data Management: Data sustainability** • Ensuring data life cycle including provenance, rich meta data, and digital object identifiers for data citation	**Data Management: Data operations** • Data processing and data QC • Providing access to data and ensuring data FAIRness	**Data Management: Data accessibility for societies:** • Elaborated data products	**Data Management: vuropean and global data cooperation:** • ENVRICOMmon data FAIRness policy Support of global data integration	**Data Management: Innovation-related data activities:** • Industry application of ICOS data standards Promoting big data approaches
Providing services	**Infrastructure-internal services:** • Ensuring data life cycle including provenance, rich meta data, and digital object identifiers for data citation • Scientific and management evaluation Strategic orientation	**Services to scientists:** • Science facilitation (Jupyter notebooks) • ICOS Science conference and contribution to other conferences • Facilitation of European research programmes and projects	**Services to societies:** • Contribution of timely information relevant to the GHG policy and decision-making • Analysis of carbon sequestration and/or GHG emission reduction activities on atmospheric composition levels, • Attribution of sources and sinks by geographical regions and activity sectors • Transcribing between science communities and policy makers	**Cooperative services:** • Contribution to the mobility of knowledge and/or researchers within the European Research Area (ERA) • Actively looking for new opportunities and developments within the ENVRI and EU/global RI landscapes	**Innovation-related services:** • Industry liaison services • Coordination and support of development of technology and protocols for high-quality and cost-efficient GHG measurements

4.4 Documentation and document hierarchy

ICOS RI's operations and strategy are guided by a set of documents that serve differing purposes. They facilitate the flow of activities and ensure compliance between the different parts of the distributed infrastructure. It is important to note that they are in a hierarchical order, with statutes being the constitutional document. For a list of management documents, please see Annex 2.

Table 3. Document hierarchy.

Document category / rank	Document name/ Status (public, (p) / non-public (np)	Legislation / binding basis	Formulated by	Validity / renewal	Changing procedures
Constitutional documents (legally binding)	ICOS ERIC statutes (p)	Applicable law: ERIC Regulation: The setting-up and internal functioning of ICOS ERIC shall be governed by: (a) Union law, in particular Regulation (EC) No 723/2009; (b) by the law of the hosting state in case of a matter not covered (or only partly covered) by Union law; (c) by these Statutes and their implementing rules	The ICOS GA and EC, based on ERIC regulation and applicable law	Entry into force: 23.11.2015 (establishment of ICOS ERIC)	Defined in Article 5 in the ICOS ERIC Statutes
Bilateral contracts	CF-ERIC Cooperation contracts (np)	In accordance with and governed by the laws of Finland	Approved by the GA, formulated by ERIC and RICOM	The agreement, including its annexes is amended from time to time	Defined in Article 11 in the CF-ERIC Cooperation Agreement
	Station – ERIC contracts (np)	In accordance with and governed by the laws of Finland	approved by the GA, formulated by ERIC and RICOM	Contracts are signed after station is labelled and labelling report is adopted by the GA	Defined in the contract
	JRC contract (np)	In accordance with and governed by the laws of Finland and EU regulation	approved by the GA, formulated by ERIC and RICOM	Contract is renewed every 12 months	Defined in the contract, chapter II.18.3.
Internal rules, agreements, policies and procedures	Financial rules (p)	ICOS ERIC is run according to the Finnish legislation on accounting standards and principles. ICOS Central Facilities shall respect the legislation and accounting procedures of their hosting countries.	Approved by the GA, formulated by ERIC, Financial Committee and RICOM	Updates are approved by the GA	Updates are approved by the GA
	Data policy (p)	Regulates data right and licenses based on EU directives.	Approved by the GA, formulated by HO, CP, and RICOM	Updates are approved by the GA	Updates are approved by the GA
	Procurement rules for ICOS ERIC (p)	In accordance with Finnish legislation and ERIC legislation	Approved by the GA, formulated by HO	Updates are approved by the GA	Updates are approved by the GA
	Conflict of interest rules (p)	Basic rules based on ICOS statutes	Approved by the GA, formulated by HO	Updates are approved by the GA	Updates are approved by the GA
Reporting documents	Work Plans (np) Annual Reports (p) ERIC reporting to national funders (p)	Based on CF-ERIC cooperation contracts Based on regulations by Funding bodies (Finnish Academy and FMI, Swedish VR)	Approved by the GA, formulated by ERIC and RICOM	Changes to the reporting are approved by the GA (cycle, contents, changes in tasks /obligations)	Changes to the reporting are approved by the GA (cycle, contents, changes in tasks /obligations)

Internal management documents	Process- and task descriptions (np)		Discussed in HO and RICOM	Discussed in HO and RICOM	Discussed in HO and RICOM
Other supporting documents	Other supporting documents (publicity depending on the type of the document)		Discussed in HO and RICOM, the GA informed if necessary / approved by the GA if deemed appropriate	Discussed in HO and RICOM, the GA informed if necessary / approved by the GA if deemed appropriate	Discussed in HO and RICOM, the GA informed if necessary / approved by the GA if deemed appropriate

5. Decision-making and information flows

5.1 Financial decisions

Decisions regarding ICOS ERIC finances depend on national funding bodies and are taken in the GA meetings. The GA has the full authority to decide on common contributions and station-based contributions. Decision-making in the most important financial processes of ICOS RI are shown in table 4.

The structure of ICOS RI does not provide the GA with full authority on the finances of the NNs and the CFs. ICOS NNs are solely funded from national sources and are decided by national governments, funding organisations and host institutions of the stations based on Article 6(d) of the ICOS ERIC Statutes ('Each Member shall provide the necessary infrastructure and resources for ICOS National Network operations and ICOS Central Facilities that it hosts.'). The GA takes note of the financial reports of the National Networks and might remind a member of its obligation to provide the necessary resources.

The direct host funding (a) is not to be decided by the GA but again underlies Article 6(d) of the ICOS ERIC Statutes while station-based contributions (b) are within the purview of the GA. As a consequence, the financial management of the Central Facilities and related decisions are hybrid. The General Assembly takes note of the budgeting and reporting related to (a) and approves the budget and report related to (b). The budgeting and reporting system was established between 2016 and 2017. Chapter 5.1 of Part 1 gives an overview, while detailed descriptions are given in Part 2.

Table 4. Decision making in the most important financial processes of ICOS RI.

Process	Responsibility for decision	Information channels used
ICOS ERIC financial plan	The GA based on decisions of host countries of HO and CP and on decisions in member countries	Direct communication with funding organisations in Host Countries, GA and RICOM meetings
ICOS ERIC budget	The GA based on decisions of host countries of HO and CP for their host premium contributions	Direct communication with funding organisations in Host Countries, GA meetings
ICOS CFs' budgets	CF Host Institutions based on decisions by national funders (for host contributions) and the GA (for station-based contributions)	Direct communication with funding organisations in Host Countries, GA and RICOM meetings
ICOS station budget	Station Host Institutions based on decisions by national funders	Internal discussions in NNs and direct communication with national funding organisations

5.2 Operational decisions

The internal operational decisions in the RI are distributed among the different management bodies described in Chapter 3.1 and follow the subsidiary principle explained in chapter 4.1. The responsibilities lie with individual stations Principal Investigators (PIs) on issues related to station operation and maintenance work, the Monitoring Station Assemblies (MSAs) and the Central Facilities (CFs) (for matters related to stations specifications and the station labelling process, for example). Operations are monitored by ICOS ERIC through the HO and discussed in the

RICOM. The GA provides a general framework and is informed via work plans and reports. Table 5 below indicates the ongoing processes where decisions are needed with the bodies responsible for those decisions, and indicates the communication channels used related to these decisions.

Table 5. Decision making in the most important operational processes of ICOS RI.

Process	Responsibility for process	Discussion forums and information channels	Remark
Station specification	CFs and MSAs	MSA meetings, station specification documents	
Station labelling process	CFs and MSAs	MSA meetings, documents describing station labelling process	
Station labelling	CFs, approval by DG (Step 1) and the GA (Step 2)	Direct communication between TCs and stations, labelling reports, RICOM meetings	
HO work plan	DG based on provided budget and HO task descriptions	Internal discussions between DG and Heads of Units, work plan and report to the GA, information to RICOM via documents and meetings	
CP work plan	Carbon Portal Director based on provided budget and CP task descriptions	Internal discussions at CP, GA and RICOM meetings	
ICOS CFs work plan	CF coordinators based on agreements with ICOS ERIC and provided budget	Internal discussions in CFs, GA and RICOM meetings	
Strategic issues	The GA, after briefing from DG (who has discussed with SAB and RICOM as necessary)	Broad discussions throughout the entire RI, GA, FP and RICOM meetings	
Legal, governance and financial issues	The GA, after briefing from DG (who has discussed with SAB and RICOM as necessary)	Discussions in the GA, FinComm and RICOM as required	
Site selection	National Networks with recommendations by the Thematic Centres	Direct communication between TCs and national network coordinators	
Facilities location	The GA, after briefing from DG (who has discussed with SAB and RICOM as necessary)	Application process between GA and Host Organisations	Depending on location and the type of facility

5.3 Decision on principle changes or upgrades of ICOS RI

Minor changes to the station specification documents of stations are discussed and decided between MSAs and CFs. Decisions of principle changes or upgrades of ICOS RI can only be made by the General Assembly and should be based on funding decisions made by the affected countries. The initial process to prepare and design a principle change or major upgrade may last several years. Figure 3 depicts the process towards a decision on principle changes or major upgrades of ICOS RI.

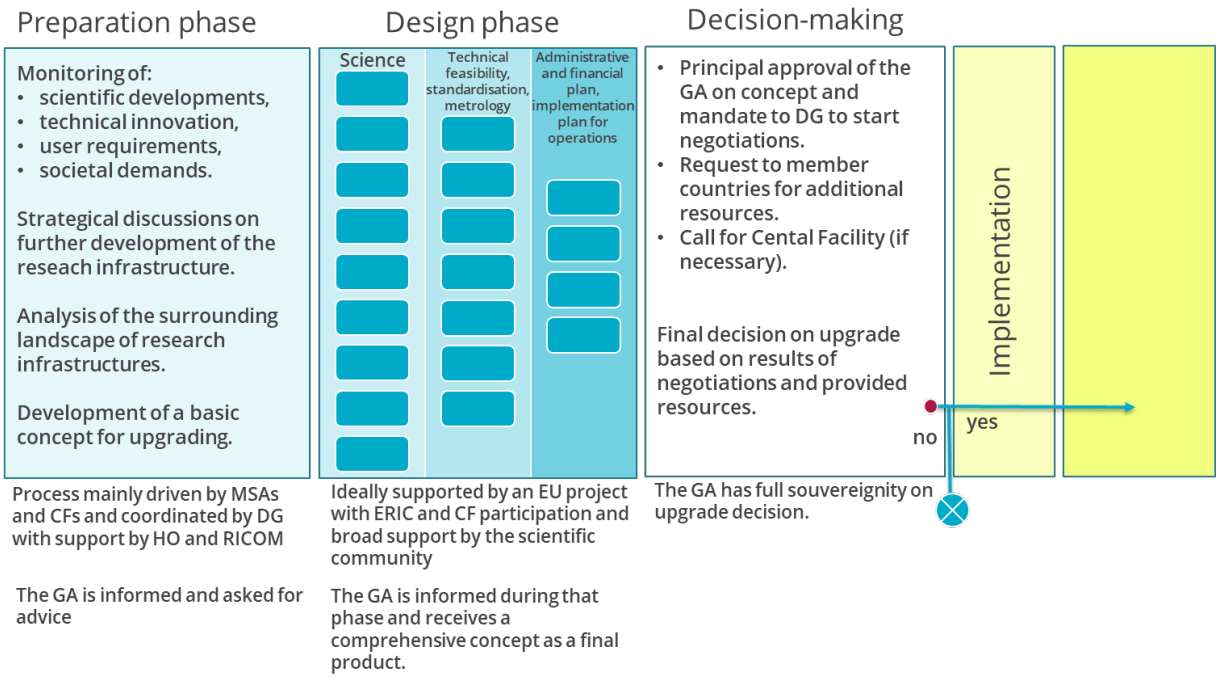


Figure 3. Process towards a decision on principle changes or major upgrades of ICOS RI.

Often, entirely new innovations are first nurtured in externally-funded scientific projects before potential implementation is brought to the consideration of the GA. Connections to the private sector are important for ICOS to increase the value of ICOS data and support the development of new services and solutions on climate change mitigation and adaptation. Innovation management is an area currently being developed.

5.4 Decision on international cooperation

The cooperation rules for making agreements between ICOS RI and external entities have been confirmed by the GA in 2017. For activities concerning the entire RI as well as for policy-relevant or long-term cooperation with other infrastructures or international organisations, the possible agreements are negotiated and signed by ICOS ERIC, after consultation with he RICOM.

The Central Facilities or their host organisations can sign agreements which do not involve other parts of ICOS, however RICOM should be informed of such decisions. The Head Office provides support if needed.

Documentation related to international cooperation

- International cooperation rules

6. An overview of the key management processes

6.1 Financial management

ICOS RI financial management mirrors the structure and decision-making within ICOS RI and is adjusted to the annual governing cycle. The financial management of ICOS RI in a certain year (n) comprises the day-to-day management during the year itself but also the reporting of the previous year (n-1) and the budgeting of the upcoming year (n+1) (figure 4).

Figure 4. The annual cycle of ICOS RI financial planning.

The financial planning for the next year begins in June with an overview of the following year's station network based on information given by the Focal Points to the HO. Based on this information, the CFs are informed by the HO about the expected station-based contributions and collect information on next year's host contributions. In the September face-to-face RICOM meeting the budgets are discussed and related to the work plan. The compiled budget is analysed by the Financial Committee which relates it to the financial five-year plan and checks for inconsistencies and risks. After that the budget is presented to the autumn GA meeting. The GA approves the budget and decides about the annual membership contributions and the payments towards the CFs.

For the reporting of the previous year the financial report of ICOS ERIC is compiled in January and February and audited in March. The CFs and NNs send their financial reports by March to the HO which compiles a comprehensive report on the entire ICOS RI. The reported revenues and expenses are then analysed by the Financial Committee which relates them to the budgets of the respective years and checks for inconsistencies and major deviations. After that, the report is brought to the spring GA meeting. The GA approves the report of ICOS ERIC and takes note of the reports of the CFs and the NNs.

Five-year financial planning

The five-year financial planning establishes a process that ensures a permanent relation between future developments ("re-planning"), their implementation and related monitoring/evaluation ("assessment"), as outlined in Figure 5. These three activities should be running through logical cycles from the third five-year period on. It will begin with two to three years of standard operations and implementation of novel activities in case these were brought in by the GA (see decision process described in 5.1), followed by a period of evaluation and a period of future planning. This cycle is the outline for the third five-year period (2025 – 2029) in Figure 5. Evaluation and monitoring by ESFRI should be combined in a way that the General Assembly submits the results of the evaluation to the ESFRI with the suggestion to renew the Landmark status. This in return would be a strong signal towards the national funders to support another five-year period.

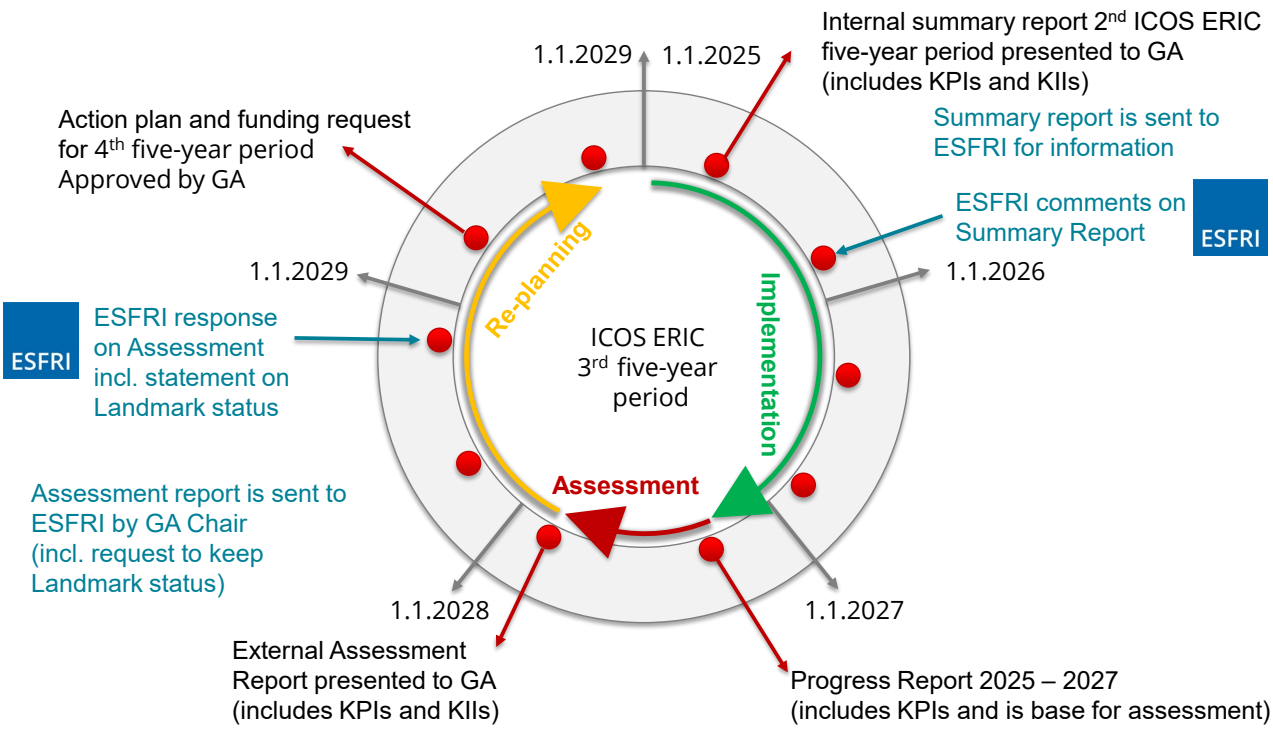


Figure 5. Five-year cycle of implementation, assessment and re-planning as envisaged for the 2025-2029 period and further on.

The financial planning for the next period should be conducted mainly throughout year 4 and be concluded by the spring GA of year 5 at the latest. The underlying complexity arises from the hybrid decision-making process on finances described in Chapter 5.1. Since the direct funding of the stations, the host contributions towards the CFs and the host premium contributions to HO and CP are dependent on national sources of the hosting countries and are decided by national governments, funding organisations and host institutions, the GA decides on the common contributions towards ICOS ERIC and the station-based contributions to the Central Facilities. The national decisions may be the subject of national funding calls which should ideally be conducted during year 4.

The requested resources should be related to a five-year action plan that describes the tasks of the different bodies of the RI in detail and which may also suggest additional activities. Furthermore, it should be based on the recommendations of the most recent evaluation. The five-year action plan and the five-year financial plan are coordinated by the HO that compiles the information on host contributions. The work plan may be adapted to the provided resources based on the final financial decision.

KPIS related to financial management:
- 11–15

Documentation related to financial management:

- Financial Committee ToR
- ICOS ERIC Financial Plans
- ICOS ERIC and CF budgets
- ICOS ERIC Internal Financial Rules
- ICOS ERIC Statutes: Article 15: Contributions and principles of finance
- Procurement Rules

6.2 General operational management

Planning and monitoring the operational management follow the annual cycle described for financial management. The Central facilities have their tasks listed in their contracts, the annual work plan for following year is brought to the GA in November together with the budget, and the work report of the previous year is brought to the May GA.

KPIS related to general operational management:
- 1

Documentation related to general operational management:

- Annual Work Plans and Budget Plans
- Annual Reports

6.3 Engagement, integration and community support

ICOS RI has tasks aimed at providing harmonised and high-precision scientific data on carbon cycle and greenhouse gas budget and perturbations. ICOS RI could, hence, be understood as a collective, shared space, but ICOS RI is essentially a mosaic or collection of communities that take different geographical and focus-driven forms and operate on several scientifically-differing domains. ICOS RI is also spread around differing political, societal, linguistic, organisational, institutional and historical contexts. Hence, it needs to be remembered that ICOS is understood from different viewpoints by multiple different observers. Therefore, fostering an engaged community is vital for the RI's operational capacity. One of ICOS's core activities across the domains (explained in more detail in table 2) is communication, dissemination and community engagement and support.

The ways ICOS RI fosters community engagement are described in the ICOS RI community Engagement Plan. It defines the following areas where activities take place and are being developed to enable community engagement:

- Inclusivity: access to communication and activities, gender equality, acknowledging diversity
- Membership, belonging and a sense of community
- Services to scientists: internal science facilitation providing services to scientists is at the core of ICOS' community engagement activities. ICOS is supporting scientists in three dimensions: helping them in finding, selecting and assessing their input data, facilitating events and platforms where they can find new partners to co-operate with, and boosting the publicity of results of their research.

ICOS RI facilitates joint research initiatives demonstrating the use of ICOS Data, coordinates and participates in externally funded project proposals and organising the ICOS Science Conference and sessions and side events in other conferences.

KPIs related to measuring community engagement and integration:
- 16–19

Documentation related to intergration, engagement and community support:
- ICOS Identity Study
- ICOS Communication strategy
- ICOS Handbook
- ICOS RI Community Engagement Plan
- ICOS RI Science Facilitation Plan
- New Project Proposal Process

6.4 Monitoring and evaluation performance and impact

The performance of ICOS RI is monitored through its annual reports and evaluated according to Article 20 in ICOS ERIC's Statutes:

1. Every five years an independent panel of international external evaluators of the highest quality, appointed by the General Assembly, shall carry out:

(a) scientific and management evaluations of the activities of ICOS ERIC;

(b) evaluation of ICOS RI activities, scientific and strategic orientation and operation of all components of ICOS RI.

The panel shall give special attention to the fulfilment of user requirements.

2. The results of the evaluations shall be reported to the General Assembly

In the five-year evaluation of science and management, the performance of ICOS RI is evaluated based on an evaluation concept developed through the first evaluation in 2020 and approved by the GA. It determines key performance areas to be evaluated:

- General management
- Operational management
- Data management
- Financial management
- Internal engagement and integration
- ICOS data and user expectations
- Integration of ICOS in European and Global GHG information system

Systematic monitoring and evaluation ensure high performance of ICOS RI and forms the basis for achieving significant impact. To ensure that the process is both agile (in terms of reflecting the maturity phase in the RI's life cycle) and standardised (in terms of following defined processes), ICOS RI employs an integrated system where 'Key Performance Indicators' (KPIs) and 'Key Impact Indicators' (KIIs) are distinguished and linked together. KPIs (table 6) are concrete, measured outputs that demonstrate ICOS RI's performance (e.g. operability and alignment with the goals formulated in the ICOS ERIC statutes). The outcome of the RI's performance can be seen as effect – either a direct 'outcome' (1st order effect) or indirect 'impact' (2nd order effect). The effects can be measured by Key Impact Indicators (table 7).

Using both KPIs and KIIs enables the development of a monitoring and evaluation system that showcases the development of the RI's socio-economic impact from the RI's combined activities and output to the effects. Furthermore, monitoring and evaluation are connected to the strategic focus areas (SFAs), introduced as the basis of the management plan. An example of the accumulating impact through combined activities is depicted in

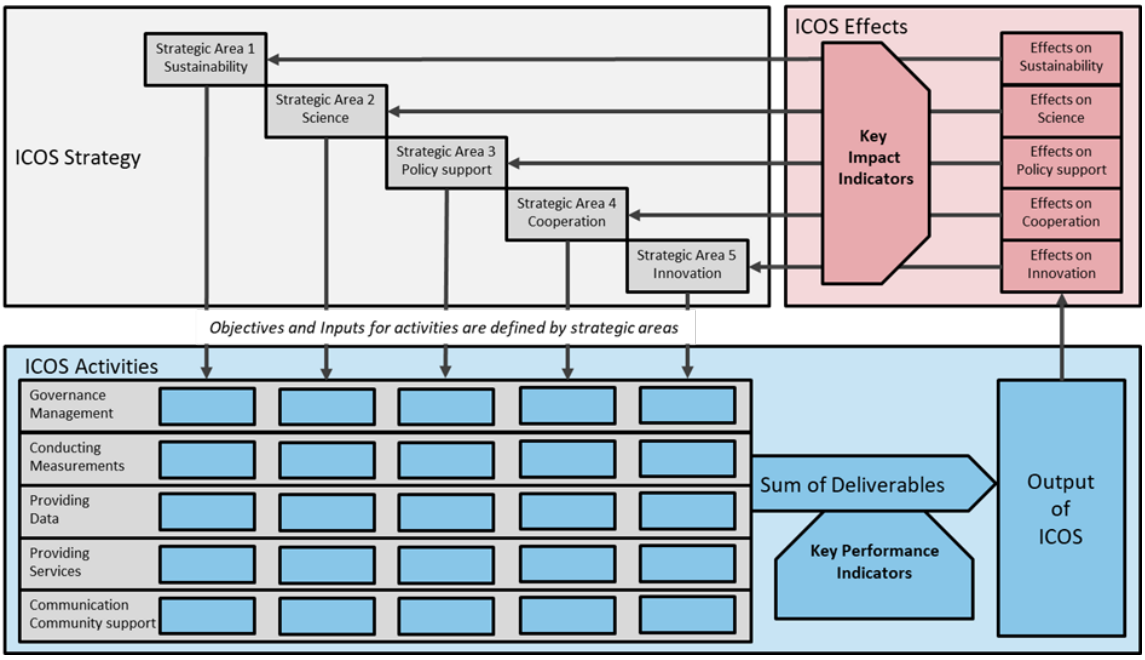


Figure 6. Two-level conceptual framework distinguishing between Key Performance Indicators and Key Impact Indicators. The five strategic areas and five key activities of ICOS form a matrix of 25 potential processes (as demonstrated in table 2), each with deliverables that together define the output of ICOS (more detailed description in Part 2 of the Management Plan).

6.4.1 Key Performance Indicators

ICOS RI's KPIs (table 6) are aligned with the objectives of RIs and fulfil RACER criteria: Relevant, Accepted, Credible, Easy to monitor, and Robust. The development of ICOS RI's KPIs is streamlined with the evaluation process. As the maturity and operability of the RI evolves during each five-year evaluation period, it is important to keep the KPIs agile, enhanging their relevancy related to each evaluation period. During the first five-year period, necessary KPIs to measure standard operability (KPIs highlighted in violet in table 6) are specific to the transition from implementation to operations and will not be repeated in future evaluations. KPIs highlighted in pink in table 6 are implemented in the annual reporting system and summarised based on the annual reports every five years. KPIs highlighted in yellow in table 6 are being developed further and repeated in the next evaluation.

Table 6. KPIs. Current KPIs. These KPIs result from the first scientific evaluation (covering the first 5-year operational phase of ICOS RI) and will be assessed in the evaluation of the next 5-year period and in future evaluations, to keep the KPIs relevant. Hence, the process of developing KPIs for ICOS RI is an ongoing one. The details of the exact ways of organising and measuring the KPIs will be added to Part 2 of the Management Plan.

KPI no	Area of monitoring	Frequency of monitoring
General management		
1	Implementation of basic processes and availability of the basic documents describing them.	KPI was utilised in the first 5-year evaluation to measure standard operability. Not repeated in future evaluations unless deemed necessary.
Operational management		
2	Availability of technical requirements for ICOS instrumentation	KPI was utilised in the first 5-year evaluation to measure standard operability. Not repeated in future evaluations unless deemed necessary.
3	Availability of ICOS approved operation practices for variables	KPI was utilised in the first 5-year evaluation to measure standard operability. Not repeated in future evaluations unless deemed necessary.
Data management		
8	Definitions of data workflows	KPI was utilised in the first 5-year evaluation to measure standard operability. Not repeated in future evaluations unless deemed necessary.
Internal integration and structure		
20	The suitability of ICOS RI's organisational structure to manage the RI	KPI was utilised in the first 5-year evaluation to measure standard operability. Not repeated in future evaluations unless deemed necessary.
	ICOS data and user expectations: A priori design	
KPI no	**Area of monitoring**	**Frequency of monitoring**
Operational management		
4	Effective station labelling	Annually
5	Comprehensive temporal data coverage	Annually
Data management		
9	Timeliness of data provision	Annually
Financial management; core funding		
12	Amount, trend and volatility of core funding	Annually
13	Equity ratio	Annually
Financial management, project funding		
15	Amount, trend and volatility of external funding	Annually
ICOS data and user expectations: Data download		
22	Total amount of ICOS data downloads	Annually
ICOS data and user expectations: Data usage		
24	Usage of ICOS data in publications and number of citations of publications using ICOS data	Annually
27	Usage of ICOS data in educational tools and activities	Annually
ICOS data and user expectations: Active data promotion and meeting user/stakeholder expectations		
28	Facilitation of scientific initiatives	Annually
International cooperation		
34	Participation in events of regional or global relevance	Annually
35	Synergies and co-locations with other RIs	Annually
KPI no	**Area of monitoring**	**Frequency of monitoring**
Operational management		
6	Comprehensive spatial coverage of observations	being developed further and repeated in the next evaluation
7	Implementation of new technologies	being developed further and repeated in the next evaluation
Data Management		
10	Data compliance with FAIR principles	being developed further and repeated in the next evaluation
11	Availability of all data and data-related support and services via CP	being developed further and repeated in the next evaluation
14	Mid-term financial sustainability	being developed further and repeated in the next evaluation
Internal engagement		
16	RI members identifying with ICOS	being developed further and repeated in the next evaluation
17	Motivation of people involved in the ICOS RI operations	being developed further and repeated in the next evaluation
Internal integration and structure		
18	The inclusiveness of the organisational structure of RI	being developed further and repeated in the next evaluation
19	The ability of the organisational structure of ICOS RI to improve activities	being developed further and repeated in the next evaluation
21	ICOS-related participation in international efforts to co-design standards for ICOS measurements	being developed further and repeated in the next evaluation
ICOS data and user expectations: Data Usage		
23	Research areas where ICOS data are used	being developed further and repeated in the next evaluation
25	Application of ICOS data in (globally leading) models	being developed further and repeated in the next evaluation
26	Use of ICOS data towards support of satellite observations	being developed further and repeated in the next evaluation
ICOS data and user expectations: Active data promotion and meeting user/ stakeholder expectations		
29	Enabling scientific exchange through ICOS Science Conferences	being developed further and repeated in the next evaluation
30	Engagement with social- and general media	being developed further and repeated in the next evaluation
31	Engagement in downstream projects with private sector	being developed further and repeated in the next evaluation
International cooperation		
32	Cooperation with the main actors of the European & global GHG information systems	being developed further and repeated in the next evaluation
33	ICOS's relevance in the global response to climate change	being developed further and repeated in the next evaluation
36	Formal agreements (MoUs) with other RIs or organisations	being developed further and repeated in the next evaluation

6.4.2 Key Impact Indicators

Linking KPIs to Key Impact Indicators (KIIs, table 7) closes the feedback cycle introduced in Figure 6. A pilot ICOS Impact Assessment Study (2018) used already the five Strategic Focus Areas. The Impact Analysis and further experience accumulated through the RI's operations on identifying the types of potential socio-economic impacts of ICOS RI have made it evident that it is often not entirely straightforward to differentiate between performance and impact. Particularly, the top four KIIs are very closely related to the outcome of ICOS RI and, thus, display an overlap with the KPIs. In addition, the longer-term impacts as particularly formulated in KII 10 are almost impossible to measure.

Aligning the relevancy of both the KPIs and KIIs of ICOS will be developed further as the RI's operational time span extends and more evaluations are conducted.

Table 7. Key Impact Indicators. These KIIs result from the first SEI assessment of ICOS RI in 2018. They are based on an analysis of the then available quantitative and qualitative data and represent the RI's operational phase at the time of data collection and analysis. The KIIs are, together with KPIs, subject to further development. As many instances (e.g. policy makers, stake holders and the instances popularising science) call for 'impact landscapes' that depict the development of the RI's impact, both quantitative and qualitative indicators are important.

No.	Description / operationalisation	Measurement	Strategic objective
1.	Longer time series of data.	Quantitative description of the length (average, median, max, min) of timeseries across ICOS measurement stations.	Observations: producing standardised high-precision long-term observational data.
2.	Global harmonisation of data sets, methods, algorithms or instruments.	Narrative based on information obtained through interviews.	Science: stimulating scientific studies and modelling efforts and providing a platform for data analysis and synthesis.
3.	Number of ICOS related articles published.	Bibliometric analysis of the 465 publications provided by ICOS. From 2018 onwards based on DOI minted ICOS publications available through the CP.	Science: stimulating scientific studies and modelling efforts and providing a platform for data analysis and synthesis.
4.	Number of (global) services provided. This is an overview and count of the different types of services linked to the ICOS infrastructure.	Analysis of data-related services such as calibration, Obspack products and instrument testing.	Science: stimulating scientific studies and modelling efforts and providing a platform for data analysis and synthesis.
5.	Popularity of ICOS data.	The number of downloads from the Carbon Portal, based on data provided by the CP.	Science: stimulating scientific studies and modelling efforts and providing a platform for data analysis and synthesis
6.	Media appearances.	Measured as the number of ICOS general media appearances, audience size and presence in social media. Both new analyses using Meltwater and existing ICOS data on social media appearances.	Climate action support: communicating science-based knowledge towards society and contributing timely information relevant to the GHG policy and decision making.
7.	The ability to provide policy-relevant data.	Narrative on the basis of interviews what type of data is relevant to policy makers, and where, at what level, ICOS currently contributes to policy relevant data.	Climate action support: communicating science-based knowledge towards society and contributing timely information relevant to the GHG policy and decision making.
8.	ICOS related publications are used outside the scientific domain.	Altmetric analysis of the same articles used in the bibliometric analysis. Altmetric search is conducted on the web using the articles in question as search terms. It combines quantitative and qualitative data.	Climate action support: communicating science-based knowledge towards society and contributing timely information relevant to the GHG policy and decision making.
9.	Insight on carbon source and sinks on national and regional level.	Narrative that describes ICOS contribution to the data required by the IPCC guidelines on national reporting.	Climate action support: communicating science-based knowledge towards society and contributing timely information

			relevant to the GHG policy and decision making.
10.	A reduction of damage by extreme weather events through more effective climate mitigation policy	Narrative of how science supported by ICOS leads to improved targeting of climate mitigation efforts.	Climate action support: communicating science-based knowledge towards society and contributing timely information relevant to the GHG policy and decision making.

Documentation related to impact monitoring:
- ICOS RI Impact Assessment
- Impact monitoring and measuring process description
- Impact dissemination strategy

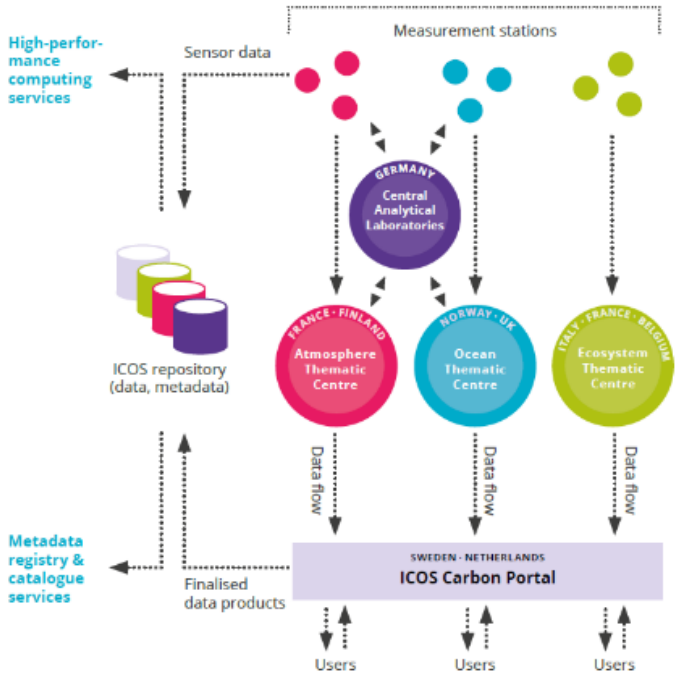
6.5 Data management

The ICOS data life cycle is the whole chain of action beginning with long-term observations from across its stations all the way through the Carbon Portal and outwards to a range of users. A reliable, robust, fast and efficient data life cycle is an essential prerequisite to assure the service provision of ICOS, in particular the timely release of comprehensive, quality-assured data for users following the FAIR principles. The ICOS RI data flow is shown in figure 8.

ICOS defines 4 Levels of data products:

- Level 0 or raw data: information or objects obtained directly from human measurement or automated sensors without any further transformation
- Level 1 or intermediate observational data: generated in intermediate steps of Level 1 Near Real Time (NRT) or Level 2 data for example for internal quality checks and not used as persistent data or outside ICOS. NRT data is a special form of Level 1 data developed for fast distribution with only automated quality control, typically within 24 hrs
- Level 2 data: final quality-controlled data, the main product of ICOS
- Level 3 data: elaborated products, based partly or completely on Level 2 data

The ICOS RI component that generates the data owns it (please see ICOS Data Policy). Data quality is the responsibility of the component that generates it. Stations generate Level 0 (raw) data, and Thematic centres generate Level 1 (NRT automatically quality controlled) and Level 2 (final quality controlled) data. According to the ICOS Data Policy, Stations and ICOS Facilities license ICOS ERIC to distribute all ICOS data and metadata and to sub-license it to its users according to the agreed ICOS data licence (CC4BY (data) and CC0 (metadata)).



- Data are collected at ICOS measurement stations.
- The 'raw' data are stored in a safe repository as soon as possible.
- The observation data are then passed on to the Thematic Centres for expert processing.
- The Central Analytical Laboratories (CAL) provide gas analyses and calibration gases.
- The ICOS Thematic Centres take care of and process the observations following standardised procedures.
- Quality-controlled data are delivered by the Thematic Centres.
- The Carbon Portal is responsible for organising and taking care of all ICOS datasets.
- Users can freely and openly access the ICOS data and may also contribute.
- All ICOS data products are safely stored in the ICOS repository.
- Descriptions of the ICOS data products and their contents must be easily found.
- ICOS data can be effectively and quickly sent to other computing centres.

Figure 8. Data flow.

KPIS related to data management:
- 2–11

Documentation related to data management:
- ICOS Data Policy
- Station Labelling process description
- How to cite ICOS Data description

6.6 Knowledge management

6.6.1 Dissemination of ICOS data as elaborated products

Through a set of elaborated data products, the Carbon Portal gives easy access to the data and assists the ICOS community of data providers, data managers and scientists (sometimes the same people in different roles) in their collaboration and development of carbon cycle science. Elaborated data products are co-designed with scientists and stakeholders in joint projects in the framework of Horizon 2020 and Horizon Europe. ICOS community members and users are encouraged to publish their results that are (partly or totally) based on ICOS data through the Carbon Portal as elaborated products. The development of the products is an on-going process and aligned with annual reporting. Details of the current products and their development can be found here: Elaborated products

6.6.2 Dissemination of ICOS-related knowledge: contribution to informed policy-making

ICOS RI cooperates with other environmental research infrastructures to contribute to the European Union's climate policy and to awareness of the global challenges related to climate science. Through translating scientific data into actionable knowledge, ICOS RI reaches out to relevant stakeholders in different cooperation frameworks. On the global level, the status of ICOS as an observer to UNFCCC, IPCC and GEO provides a fruitful contact point to decision-makers interested in climate services using ICOS-type data. In practice, the dissemination of ICOS-related knowledge is done through events, such as dedicated stakeholder engagement activities or side-events gathering scientists and policy-makers in global settings. The projects where ICOS RI is involved are another place where ICOS reaches out

beyond the circle of the project partners in order to ensure maximal dissemination and exploitation of the project results. Projects also allow concrete collaboration with other RIs from the environmental domain and beyond (for example in the PAUL project where the European Social Survey is a partner).

6.6.3 Services to societies

According to ICOS ERIC statutes, ICOS RI shall also provide data and knowledge-related services to societies and decision makers. Basic examples of these services are currently (as of fall 2021) developed in projects and mainly related to the European Monitoring and Verification Support System (MVS) of anthropogenic emissions. Since ICOS RI has focused on implementation of the observational networks during the past years, these activities have not been developed as a first priority. However, they will become more relevant in the upcoming years and management procedures will be developed soon.

The foreseen processes will be:

- Contribution of timely information relevant to the GHG policy and decision-making
- Provide data and tools to enable analysis of the impact of carbon sequestration and/or GHG emission reduction activities on atmospheric composition levels
- Provide access to results attributed by sources and sinks by geographical regions and activity sectors

6.7 External cooperation management

External cooperation is a cross-cutting activity within ICOS RI. It entails, on one hand, the processes of including new member countries into the network, participating in externally funded projects, organising the biannual ICOS Science Conference, and on the other hand, dialogue with high-level platforms (table 8). The related management processes are described in Part 2.

Table 8. High-level platforms ICOS RI interacts with.

Global observations	GEOS
	Fluxnet
	GAW / IG3IS
	GCOS
	GOOS / IOCCP
	ObsPack
	SOCAT
	WMO
Global research	WCRP
Global assessment	IPCC
Global policy-making	GEO
Climate services	Copernicus
	GFCS
Other European and international RIs	ENVRICOMmunity
	GERI

KPIs related to external cooperation:
- 32–36

Documentation related to external cooperation management:
- MoUs and acceptance letters
- International strategy (in progress)
- ICOS Handbook

Annexes

Annex 1 Terms and definitions & abbreviations

Annex 2 List of documentation

Annex 3 FAQs and contact information

Annex 4 Responsibilities and process owners

Annex 5 Services

ANNEX 1. Terms, definitions and abbreviations

Terms and definitions

TERMS	DEFINITIONS
Carbon Portal	The combined real and virtual data centre in which ICOS observational and elaborated data products and associated metadata are stored, archived, accessed and curated.
FLUXNET	FLUXNET is a global network of micrometeorological tower sites that use eddy covariance methods to measure the exchanges of carbon dioxide, water vapor and energy between terrestrial ecosystems and the atmosphere.
Head Office	(REWRITE)The Operational Unit in which work the administrative staff in charge of supporting the Director General in ICOS ERIC's day-to-day management and that is mainly located on the premises of the statutory seat but may also have components in other countries.
Host Premium Contribution	The financial support of Members or Observers hosting an ICOS Head Office and Carbon Portal.
ICOS Research Infrastructure (ICOS RI)	The distributed research infrastructure that is coordinated by ICOS ERIC and involves Central Facilities and ICOS NNs.
ICOS Central Facilities (CFs)	The centres analysing samples and/or processing data obtained from ICOS NNs, supporting and supervising them and performing technological surveillance on sensors and methods.
ICOS DATA	To be added
ICOS National Networks	ICOS ERIC Member countries' Atmosphere, Ecosystem and Ocean networks of stations.
ICOS Research Infrastructure Committee (ICOS RICOM)	The advisory body for the Director General of ICOS ERIC in all general matters to ensure the consistency, coherence and stability of the Research Infrastructure; it includes one representative from the Head Office, Carbon Portal, each ICOS Central Facility and each Monitoring Station Assembly.
ICOS Station	An observatory in an ICOS NN that has been labelled by ICOS ERIC and follows the standardised measurement protocols and quality-assurance and data- management plans defined in ICOS's internal technical and scientific documents. An ICOS station may be labelled for atmospheric, ecosystem or oceanic research purposes. There are both Class 1 and Class 2 stations, which are defined in the Scientific and Technical Description.
ICOS Class 1 Station	(For all domains) Has complete equipment for measuring the full set of ICOS core parameters.
ICOS Class 2 Station	(For all domains) Has the same analytical precision as a Class 1 station but measures fewer physical parameters than a Class 1 station.
ICOS Associated Station	(For Ecosystem stations only). Measures a selection of parameters and has fewer obligations towards data submission and standards than Class 1 and Class 2 stations.
Internal Financial Rules	The document setting out the general financial principles of ICOS ERIC and the ICOS RI, in particular rules regarding the day-to-day management of financial matters, financial contributions to ICOS ERIC and financial reporting.
Monitoring Station Assembly (MSA)	An assembly of scientific and technical experts from the ICOS NNs; there is one MSA for each thematic area (Atmosphere, Ecosystem and Ocean).
Spatial Coverage	To be added (differentiate between geographical coverage, network coverage, spatial coverage, data coverage…)

Abbreviations

Abbreviation	Explanation	Abbreviation	Explanation
(FA)PAR	(Fraction of Absorbed) Photosynthetically Active Radiation	KII	Key Impact Indicators
ACTRIS	The Aerosols, Clouds and Trace gases Research Infrastructure	KPI	Key Performance Indicator
AfriGEO	The African Group on Earth Observations	LAI	Leaf Area Index
AnAEE	(Analysis and Experimentation on Ecosystems	LC	Land Cover
AOSP	African Open Science Platform	LCCS	Land Cover Classification Scheme
APAR	Absorbed photosynthetically-active radiation	LTER	Long-Term Ecosystem Research in Europe
API	Application Programming Interface	LULUCF	Land Use, Land Use Change and Forestry
ATC	Atmosphere Thematic Center	LW	Longwave
AU	African Union	MISR	Multi-angular Imaging Spectral Raiometer
BADM	The Biological, Ancillary, Disturbance and Metadata (BADM) protocol is standardised across the FLUXNET networks, in particular between AmeriFlux and the European Network	MSA	Monitoring Stations Assemblage
BNF	Biological Nitrogen Fixation	MVS	Monitoring and Verification Support
CAL	Central Analytical Laboratory	NEE	Net Ecosystem Exchange
CCAM	Conformal-Cubic Atmospheric Model	NEON	National Ecological Observatory Network
CF	Central Facility	NIR	Near Infrared
CLIVAR	Climate and Ocean - Variability, Predictability and Change	NMVOC	Non-Methane Volatile Organic Carbons
CMIP	Coupled Model Intercomparison Project	NPP	Net Primary Production
CP	Carbon Portal	OADC	Open Access Data Centre
CSIR	Council for Scientific and Industrial Research	OPD	Open Data Platform
DEM	Digital Elevation Model	OpenID	OpenID allows you to use an existing account to sign in to multiple websites, without needing to create new passwords
DMS	Dimethyl Sulfide	OTC	Ocean Thematic Center
EAB	Ethical Advisory Board	PAUL	Pilot Application in Urban Landscapes - Towards integrated city observatories for greenhouse gases
EBV	Essential Biodiversity Variable	PET	Potential Evapo-Transpiration
EC	Eddy Covariance	PI	Principal Investigator.
ECMWF	The European Center for Medium-Range Weather Forecasts	PID	Persistent Identifiers
ECV	Essential Climate Variable	QA	Quality assurance
eLTER	Long-Term Ecosystem Research in Europe	QC	Quality control
ENVRI RM	Environmental Research Infrastructure Reference Model	RDA	Research Data Alliance
ENVRIPLUS		Re	Ecosystem respiration
EOSC	European Open Science Cloud	RH	Relative Humidity
EOV	Essential Ocean Variable	RI	Research Infrastructure
ERIC	European Reserearch Infrastructure Consortium	RICOM	Research Infrastructure committee
ESFRI	The European Strategy Forum on Research Infrastructures	RINGO	Research Infrastructures, Needs, Gaps and Overlaps
ETC	Ecosystem Thematic Center	RINGO	Readiness of ICOS for Necessities of Integrated Global Observations
EU	European Union	RMSE	Root mean square error
EUROCOM	EUROpean Atmospheric Transport Inversion COMparison	ROI	Research Output Infrastructure

FAIR	FAIR principles, Findable, Accessible, Interoperable, Reusable	SAB	Scientific Advisory Board
FLUXCOM	An Iniative to upscale bioshpere-atmosphere fluxes from FLUXNET sites to continental and global scales	SADC	South African Development Community
FRE	Fire Radiative Energy	SAEON	South African Environmental Observation Network
FTIR	Fourier-Transform Infrared Spectroscopy	SAEOSS	South African Earth Observation System of Systems
GA	General Assembly	SASDI	Sout African Spatial Data Infrastructure
GAW	Global Atmosphere Watch	SASSCAL	Southern African Science Service Centre for Climate Change and Adaptive Land Management
GCM	General Circulation Model	SEACRIFOG	Supporting EU-African Cooperation on Research Infrastructures for Food Security and GHG Observations
GCOS	Global Climate Observing System	SLA	Specific Leaf Area
GEO	Group on Earth Observations	SOC	Soil Organic Carbon
GEOBON	Group On Earth Observations Biodiversity Observation Network	SST	Sea Surface Temperature
GEOSS	Global Earth Observation System of Systems	SW	Shortwave
GHG	Green House Gases (CO2, NH4, N3, water vapor)	TAHMO	Trans-African Hydrometeorological Observatory
GIS	Geographical Information Systems	TC	Thematic Center
GPP	Gross Primary Production	TCCON	Total Carbon Column Observing Network
ICOS	Integrated Carbon Observation System	ToA	Top of Atmosphere
ICOS CP	Integrated Carbon Observation System Carbon Portal	ToC	Top of Canopy
ICOS ERIC	Integrated Carbon Observation System European Research Infrastructure Consortium	UN	United Nations
ICOS ETC	Integrated Carbon Observation System Ecosystem Thematic Center	UNCBD	United Nations Convention on Biological Diversity
ICOS RI	Integrated Carbon Observation System Research Infrastructure	UNFCCC	United Nations Framework Convention on Climate Change
ICOS TC	Integrated Carbon Observation System Thematic Center	UVGZ	Ústavu Výzkumu Globální Změny
ICSU-WDS	International Council for Science - World Data System	VERIFY	Verifying Greenhouse Gas Emissions
IG3S	An Integrated Global Greenhouse Gas Information System	WHC	Water Holding Capacity
IOC	Intergovernmental Oceanographic Commission	WMO	World Meteorological Organisation
IPCC	Intergovernmental Panel on Climate Change	WP	Work Package
IRGA	Infrared Gas Analyser		

ANNEX 2: List of documents

Documentation	Public / Non-public	Link to document
Annual Reports	P	Annual Report 2020
Annual Work Plans and Budget Plans	NP	Non-public documents
CF-ERIC contracts	NP	Non-public documents
Decision of the European Commission on setting up ICOS ERIC (Official Journal of the European Union 2015: L303/19)	P	https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32015D2097
EAB ToR	P	EAB ToR
Evaluation Evidence Report 2020 and Evaluation Report 2020		ICOS RI Evaluation Evidence Report 2020 ICOS RI Evaluation Report 2020
ERIC Regulation (EC/723/2009)	P	ERIC Regulation
Final ICOS ERIC Act (based on Article 18 of ERIC Regulation)	P	ICOS ERIC Act
Financial Committee ToR	P	ICOS Financial Committee ToR
FP / PI Onboarding document	P	ICOS in a Nutshell
FP role description	P	See above
GA RoP	P	GA RoP
Head Office Concept	P	HO Concept
ICOS Communication strategy	P	Under development
ICOS Data How to cite	P	How to cite ICOS Data
ICOS Data Policy	P	ICOS Data Policy
ICOS ERIC and CF budgets and reports	P	Financial reports
ICOS ERIC Employment Policy	P	Update under development
ICOS ERIC Financial Plans	NP	Non-public
ICOS ERIC Internal Financial Rules	P	IOCS ERIC Internal Financial Rules
ICOS ERIC Staff Rules	P	Update under development
ICOS ERIC Statutes	P	ICOS ERIC Statutes
ICOS ERIC Statutes: Article 15: Contributions and principles of finance	P	See statutes
ICOS Handbook	P	ICOS Handbook 2020
ICOS Identity Study	P	ICOS Identity Study
ICOS PI role description	P	See onboarding materials
ICOS RI Community Engagement Plan	P	Under development

ICOS RI Impact Assessment report	P	ICOS Impact Assessment Report 2018
ICOS RI Science Facilitation Plan	P	Under development
ICOS Strategy	P	ICOS Strategy
Internal cooperation rules	P	Cooperation Rules
International strategy	P	Under development
Management process descriptions	P	ICOS RI Management Plan Part 2
MoUs and acceptance letters	P	Internal organisation underway
MSA Chair role description and MSA ToR	P	Update under development
New Project Proposal Process	P	ICOS RI Management Plan Part 2
PI role description	P	See onboarding materials
Procurement Rules	P	ICOS ERIC Procurement Rules
RICOM RoP	P	Update under development
SAB ToR	P	ICOS SAB ToR
Station Labelling process description, labelling reports and station specifications	P	ICOS RI Management Plan Part 2 Atmosphere station specifications Labelling process for atmosphere stations Labelling reports for atmosphere stations Ecosystem station protocols Labelling process for Ecosystem stations Labelling reports for Ecosystem stations Ocean station specifications Labellling process for Ocean stations Labelling reports for Ocean stations
Station-ERIC contracts	NP	Non-public documents
Task descriptions	P	ICOS RI Management Plan Part 2

ANNEX 3: Frequently Asked Questions and Contact information

Governance, strategy, organisation and management

- What is the governing structure of ICOS RI?
    - The governing body responsible for legally binding decisions is the ICOS General Assembly that consists of representatives from all ICOS RI member countries. The legal entity of the ICOS RI is ICOS ERIC, consisting of the Head Office and Carbon Portal. For detailed descriptions, please refer to the ICOS RI Management Plan Part 1
- What is the difference between ICOS RI and ICOS ERIC?
    - ICOS ERIC is a legal entity based on the ERIC regulation, the underlying Finnish legislation and the Statutes of ICOS ERIC and its implementing rules.
    - ICOS RI refers to the infrastructure as a whole: the measuring stations and their host institutions, the Central Facilities and their host institutions, the Carbon Portal and its host institutions and the Head Office. ICOS stations and Central Facilities are related to ICOS ERIC by cooperation agreements with their host institutions.
    - For detailed descriptions, please refer to the ICOS RI Management Plan Part 1
- Where do I find the ICOS ERIC Statutes?
    - The ICOS ERIC Statutes can be found here:

      ICOS ERIC Statutes
- Can I find materials and reports related to governance and management? Are they publicly available?
    - All public documents can be found on the ICOS RI website here:

      Reports and documents
- How to contact the Director General of ICOS RI?

  Please contact the Head Office, DG Executive Assistant:

  Head Office contacts
- Who are the members of different decision-making (and other) bodies and committees?
    - The composition of each committee and body is listed in the ICOS RI Management Plan Part 1.
- What are the tasks of different committee members? (GA, RICOM, FINCOM, SAB, EAB)
    - The purpose of each committee and body is listed in the ICOS RI Management Plan Part 1, with links to the relevant Rules of Procedure and Terms of Reference
- How to contact the members of the decision-making bodies? (GA, RICOM, FINCOM, SAB, EAB)
    - Please contact the Head Office, Executive Assistant:

      Head Office contacts
- How to contact the different components (Central Facilities, Carbon Portal and the Head Office)?
    - To contact the different components of ICOS RI, please refer to our website:

      ICOS RI Contacts
- How is ICOS RI funded?
- The revenues of ICOS ERIC consist of:
    - Host premium contributions from the HO and CP hosting countries (Finland and Sweden, respectively)

  - Annual ICOS ERIC membership contributions from ICOS ERIC Member and Observer countries (common contributions)
  - Third party contributions and grants
  - Any other income (e.g. interest, sales, donations)
- The revenues of ICOS RI Central Facilities consist of:
  - Substantial direct host funding provided by the country(ies) where the ICOS Central Facilities are located
  - Contributions from ICOS ERIC based on the number and type of stations related to the Central Facility (station-based contributions)
- The revenues of ICOS RI National Networks consist of:
  - National Networks are solely funded from national sources
- For a detailed description about the funding structure and financial management of ICOS RI, please refer to the ICOS RI Management Plan Part 1
  - More info can also be found in the ICOS Handbook, available here:

    ICOS Handbook
  - For more information about financial matters related to ICOS RI, including financial matters related to ICOS RI membership, please contact the Head Office, Administration:

    Head Office contacts
- Does ICOS RI have KPIs? What are they?
  - The KPIs are listed in the ICOS RI Management Plan Part 1
- How often is ICOS RI evaluated, and what is being evaluated?
  - The evaluation takes place every five years, according to the ICOS ERIC statutes. The evaluation procedure is described in the ICOS RI Management Plan Part 1
- Are the evaluation reports publicly available?
  - The latest evaluation report and evidence report can be found here:

    ICOS RI Evaluation Report 2021

    ICOS RI Evaluation Evidence Report 2021
- Who to contact about the evaluation?
  - For more information about ICOS RI evaluation, please contact the Head Office, Operations:

    Head Office contacts

ICOS RI Membership

- How can a country become an ICOS member country?
  - For a detailed description of the membership process, please refer to the ICOS Handbook:

    ICOS Handbook
- Who to contact about becoming an ICOS member country?
  - For more information about ICOS RI membership, please contact the Head Office, Strategy and International Cooperation:

    Head Office contacts

Station network, station labelling and ICOS data

- How is the station labelling process initiated?

  - The first step is for the host institution of the station and the ICOS member country to approve the addition of the station as part of the ICOS network.
  - For more information about the station labelling process, see:

    ICOS Handbook

- Who to contact about questions on station labelling?
  - For basic information about station labelling procedures, please contact the Head Office, Operations Unit:

    Head Office contacts
  - For specific, domain-related information about station labelling, please contact the relevant Central Facilities and consult the labelling specifications and protocols (scroll down the page):

    Central Facilities contacts

    Reports and documents
- How do I access ICOS data on Carbon Portal?
  - Information about CP:

    About Data Portal
- How should ICOS data be cited?
  - Guidelines for citing ICOS data can be found here:

    How to cite ICOS data
- Who to contact about questions on ICOS data?
  - For information about access to ICOS data, please contact the Carbon Portal:

    Carbon Portal contacts

Externally Funded Projects

- Where to find information on externally funded projects that ICOS RI is participating in?
  - Please see the ICOS website:

    projects
- Who to contact about externally funded projects?
  - Please contact the Head Office, Operations Unit:

    Head Office contacts

ICOS Science Conference

- How often is the ICOS Science Conference organised?
  - The ICOS Science Conference is organised every two years
- Who to contact about information of the ICOS Science Conference?
  - Please contact the Head Office, Operations Unit:

    Head Office contacts

ANNEX 4: Responsibilities and process owners

Strategic Focus Area (SFA)	Set of processes in SFAs	Processes	Process owner / responsible component in the RI* / Units in HO and CFs**
1. Sustainability	Administrative Management Processes	Support and coordination of the GA and SAB and the implementation and dissemination of governing decisions	ICOS ERIC HO (DG, all HO units)
		Financial management of ERIC and coordinating RI budget distribution, ERIC general administration	ICOS ERIC HO, Unit 1
		Monitoring and evaluating the RI's performance and societal impact / Infrastructure-internal services: Scientific and management evaluation	ICOS ERIC HO (DG, all HO units
	Network sustainability Processes	Ensuring high geographical coverage	ICOS ERIC HO, units 1 and 4
	Data sustainability Processes	Ensuring data life cycle including provenance, rich metadata, and digital object identifiers for data citation	ICOS ERIC CP
	Infrastructure-internal service Processes	Infrastructure-internal services: Strategic orientation	ICOS ERIC HO DG, all HO units
	Community engagement and integration Processes	Facilitating collaboration	ICOS ERIC HO, Units 2, 3 and 4
		Showcasing community impact	ICOS ERIC HO. Unit 3
		Maintaining a strong ICOS identity	ICOS ERIC HO, Units 2, 3 and 4
		Maintaining stakeholder relations	ICOS ERIC HO, DG. Unit 3, Unit 4
2. Scientific Excellence	Operational and scientific management Processes	General network management	ICOS ERIC HO, Unit 2
		Monitoring and evaluating the RI's performance	ICOS ERIC HO, DG, Unit 2
	Network operation processes	Data generation and transfer	ICOS RI CFs
		QA of measurements	ICOS RI CFs
	Data operations Processes	Data processing and data QC	ICOS RI CFs
		Providing access to data and ensuring data FAIRness	ICOS ERIC CP
	Services to scientists	Science facilitation	ICOS ERIC HO, Unit 2
		ICOS Science conference and contribution to other conferences	ICOS ERIC HO, Unit 2 coordinates, all units contribute
		Facilitation of European research programmes and projects	ICOS ERIC HO, DG, Unit 2, Unit 4, CFs
	Communication, data- and scientific results dissemination processes	Dissemination of scientific results	ICOS ERIC HO, Unit 3
		ICOS Science Conferences	ICOS ERIC HO, Unit 2, Unit 3, Unit 4
		Training and user support	ICOS ERIC HO, Unit 2, Unit 3, CP
3. Societal Impact	Knowledge management Processes	Handling of information and resources	ICOS ERIC HO, Unit 3
	Processes for ensuring societal relevance of observations	Quantification of GHG atmospheric concentrations and terrestrial and oceanic fluxes over Europe and key regions of European interest, including the North Atlantic Ocean	ICOS RI CFs
	Processes for providing data accessibility for societies	Elaborated data products	ICOS ERIC CP
	Processes for providing services to societies	Contribution of timely information relevant to the GHG policy and decision-making	ICOS ERIC HO, DG, Unit 4
		Support of analysis of carbon sequestration and/or GHG emission reduction activities on atmospheric composition levels	ICOS ERIC HO, DG, Unit 2
		Support of attribution of sources and sinks by geographical regions and activity sectors	ICOS RI CFs
		Transcribing between science communities and policy makers	ICOS ERIC HO, DG, Unit 2, Unit 3, Unit 4
	Processes for communication of ICOS-provided knowledge	Participation in UNFCCC and SBSTA	ICOS ERIC HO, DG, Unit 4
		ICOS Science Conferences	ICOS ERIC HO, Unit 3
4. Cooperation: European and International cooperation	External cooperation management	External cooperation management	ICOS ERIC HO, DG, Unit 2, Unit 3, Unit 4
	Network-related cooperation processes	Network expansion activities: Promoting the advantages of ICOS RI membership on national and global levels	ICOS ERIC HO, DG, Unit 4

		Developing collaboration opportunities by co-location and common access	ICOS ERIC HO, DG, Unit 2, CP
		Adoption of ICOS standards at European and global level	ICOS ERIC HO, DG, Unit 4
	European and global data cooperation processes	ENVRI common data FAIRness policy	ICOS ERIC CP
		Support of global data integration	ICOS ERIC HO, DG, Unit 4
	Cooperation services	Contribution to the mobility of knowledge and/or researchers within the European Research Area (ERA)	ICOS ERIC HO, DG, Unit 2, Unit 4
		Actively looking for new opportunities and developments within the ENVRI and EU/global RI landscapes	ICOS ERIC HO, DG, Unit 2, unit 4
	International visibility processes	Cooperation within UN Climate system, ICOS Science Conferences	ICOS ERIC HO, Unit 4
		International visibility: ICOS Science Conferences: ICOS Science Conferences	ICOS ERIC HO, DG, Unit 4
5. Innovation	Innovation management processes	Network development	ICOS ERIC HO, DG, Unit 2
		Industry liaison management	ICOS ERIC HO, DG, Unit 2, CFs
	Innovation-related network processes	Industry application of ICOS standards	ICOS ERIC HO, DG, Unit 2, CFs
		Promoting new technical developments	ICOS ERIC HO, DG, Unit 2, Unit 3, CFs
		Providing demonstrators of innovative technologies	ICOS ERIC CFs
	Innovation-related data processes	Industry application of ICOS data standards	ICOS ERIC CFs
		Promoting big data approaches	ICOS ERIC HO, DG, Unit 2, CP
	Processes for innovation-related services	Industry liaison services	ICOS ERIC HO, Unit 2
		Coordination and support of development of technology and protocols for high-quality and cost-efficient GHG measurements	ICOS ERIC HO, DG, CFs
	Processes for supporting visibility for research activities and projects	Science Conference Vendor expos	ICOS ERIC HO, Unit 2
		Business-Science Forums and similar events	ICOS ERIC HO, Unit 2

* Please note: Process owner / responsible component in the RI* means the component in the RI that ensures the process is followed and outcome is validated – there are multiple components of ICOS RI involved in tasks included in the processes. Only the main responsible component is named here. For more details for individual task responsibilities, please refer to Part 2 of the Management Plan.

** The ICOS ERIC Head Office has 5 units: DG Unit, Unit 1 (administration), Unit 2 (Operations), Unit 3 (Strategy and International Cooperation), Unit 4 (Communications). Each CF has different units where responsibilities are divided. For more details, please refer to Part 2 of the Management Plan.

ANNEX 5: Services

Type of services	Name of service	Aimed at	Purpose
Infrastructure-internal service Processes	Scientific and management evaluation	ICOS RI internally	Support sustainability and operability of ICOS RI
	Strategic orientation	ICOS RI internally	Support sustainability and operability of ICOS RI
Services to scientists	Science facilitation	ICOS RI internally	Support all SFAs
	ICOS Science conference and contribution to other conferences	ICOS RI internally	Support all SFAs
	Facilitation of European research programmes and projects	ICOS RI internally	Support all SFAs
Processes for providing services to societies	Contribution of timely information relevant to the GHG policy and decision-making	Policy-makers and other stakeholders	Support knowledge provision to societies
	Analysis of carbon sequestration and/or GHG emission reduction activities on atmospheric composition levels	Policy-makers and other stakeholders	Support knowledge provision societies
	Attribution of sources and sinks by geographical regions and activity sectors	Policy-makers and other stakeholders	Support knowledge provision to societies
	Transcribing between science communities and policy makers	Policy-makers and other stakeholders	Support knowledge provision to societies
Cooperation services	Support of global data integration	Other RIs and scientific communities and stakeholders	Support European and international cooperation
	Contribution to the mobility of knowledge and/or researchers within the European Research Area (ERA)	Other RIs and scientific communities and stakeholders	Support European and international cooperation
	Actively looking for new opportunities and developments within the ENVRI and EU/global RI landscapes	Other RIs and scientific communities and stakeholders	Support European and international cooperation
Processes for innovation-related services	Industry liaison services	Industry	Support innovation / industry cooperation
	Coordination and support of development of technology and protocols for high-quality and cost-efficient GHG measurements	Industry	Support innovation / industry cooperation