

# ICOS excellency in governance

Summary of the ESFRI Evaluation Report 2023



**ICOS** |  Integrated  
Carbon  
Observation  
System

[icos-ri.eu](https://icos-ri.eu)

**During the first 5-year operational phase (2016-20), ICOS RI has cemented its key management processes. As a result, the second 5-year phase (2021-2025) benefited from a robust foundation of managerial excellence. While the nature of a distributed research infrastructure means it takes time to perfect many processes and practices, ICOS has relied on the know-how, dedication, and resilience of its professional community and stakeholders. ICOS's journey towards long-term sustainability, regarding managerial stability and compliance with its vision and mission, has also been recognised by ESFRI (European Strategy Forum for Research Infrastructures) in the 2023 Landmark Monitoring Report. This document is the summary of the ESFRI evaluation report.**



### Efficient operational management

ICOS RI has utilised its first 5-year evaluation to develop a set of KPIs, further shaped during the ESFRI Landmark Monitoring process. This development has proven to be a very positive trend towards long-term sustainability. KPIs are related to the strategic objectives of ICOS that form a value chain from well-functioning, and well-managed observations via data management, distribution and usage towards scientific and societal impact. As ICOS provides data on an environmental problem of the highest urgency, the performance along this value chain is essential. While the fine-tuning of the final set of KPIs is under way, the current annually measured KPIs are already agreeably presenting ICOS's performance and development. The KPIs are also a very efficient means to detect any potential challenges early on.

As ICOS continues to expand to incorporate more member countries, its operations and the resulting data, data usage, and geographical and societal coverage increase. With this growth, challenges become more complex and require strong preparedness and an increasing number of mitigation methods. While the rigorous managerial processes and the use of KPIs help in foreseeing potential risks to the RIs operations, the evolvement of challenges means that ICOS needs to continuously reflect on its processes against potential risks that may only become apparent after several 5-year periods of the RI's life cycle. ICOS RI is, hence, developing its risk detection procedures and aligning them

increasingly tightly with its strategic goals. In relation to this, risk prevention and mitigation methods will be given a high priority in the next years. For example, a strong emphasis will be put on community engagement and training activities related to scientific and managerial aspects, to ensure that ICOS can maintain and grow its capacity to perform to the highest standards.



### Robust financial management

In order to build a strong foundation for its long-term financial sustainability, ICOS RI has developed and maintained efficient relationships with member countries -with the national station networks and host institutions of stations and central facilities- and with stakeholders such as ministries and other funding organizations. These relationships have been greatly developed through rigorous and transparent dialogue, reporting, auditing and long-term financial planning. With distributed RIs such as ICOS, it is often challenging to foresee varying national political and societal environments, and how they impact a member country's position or views related to continuous funding. At ICOS, awareness of countries' political and societal state of play is a crucial point of the financial management. This is achieved through frequent meetings between national networks, the ERIC, and the representatives from ICOS's internal management bodies who regularly engage with their countries' stakeholders. Currently, 16 countries are committed to ICOS RI. As noted by the ESFRI Landmark Monitoring board, important aspects of ICOS's sustainable financial structure are the current and future member countries, key stakeholders, and operations and services.

The use of core funding is densely monitored by the ICOS General Assembly via the annual reports, with the support of the Financial Committee. The internal distribution of resources has been relatively stable over the years, with a slightly increased share from the National Networks, due to new members joining ICOS. The majority of resources are spent on observations.

In terms of exploring new avenues for increasing the sustainability of its long-term funding, ICOS RI needs to reach the full potential of its data utilisation and access by the ICOS community and beyond. In addition, service development plays a key role in ensuring ICOS's

continuous value and brand appeal to stakeholders, policymakers and societies, expanding to potential future collaborations with the industry. ICOS RI works to secure external funding, mainly through the European Framework Programmes H2020 and Horizon Europe. The increasing number of externally funded projects indicates an increase in the globally leading role of ICOS in the field of greenhouse gas observations.



The key focus of ICOS RI is to support crucial aspects of climate science in three domains: ecosystem, ocean, and atmosphere. ICOS RI has established its position as the European pillar of greenhouse gas measurements through a set of procedures that are in place to ensure that accurate, high quality data sets are available via its data centre, the Carbon Portal.

ICOS has developed harmonised standards and protocols for data collection. ICOS's Thematic Centres and Calibration Laboratories provide quality control services for the measuring stations and make sure that all data released via the Carbon Portal is of the highest scientific standards. All stations of the ICOS network go through a process called "station labelling", resulting in their official recognition as 'ICOS stations'. This means that all the data from a labelled station is on par with the rest of the station network.

ICOS data is compliant with the FAIR principles and serves a wide, interdisciplinary research community. This can be seen through the increasing number of datasets downloaded and the growing amount of peer reviewed publications based on ICOS data. ICOS thrives at allowing easy access to its different types of data sets, including support for data users. ICOS data is accessible not only to researchers, but also to the wider public and for educational purposes. Furthermore, ICOS supports other RIs by offering co-location at its stations. ICOS data are found and downloaded by users from all over the world: the main users are of course coming from the EU-27 countries, but a substantial amount of data is downloaded from the USA and China.

ICOS works continuously towards narrowing the gaps between the scientific areas it is involved with. ICOS RI participates in a growing number of relevant projects to

develop its infrastructure and strengthen its scientific, technical and organisational capacity. The ICOS Cities project, for example, focuses on urban measurements, and brings together European citizens, policymakers and top scientists in co-designing pioneer greenhouse gas measurement methodologies and services for cities to support climate action. In the ocean domain, novel technologies to improve ocean observations are explored in a project called Next Generation Multiplatform Ocean Observing Technologies for Research Infrastructures (GEORGE).

ICOS RI is also increasingly relevant on a global scale. ICOS leads an EU project called Knowledge and Climate Services from an African Observation and Data Research Infrastructure (KADI). KADI aims at improving the knowledge about climate change in Africa and at developing tools to combat the resulting negative consequences. Recent projects have also focused on the usage of ICOS data in services like the Monitoring and Verification Capacity for GHG emissions by COPERNICUS and using the ICOS experience in global observation systems.

ICOS supports and initiates scientific cooperation between the scientific organisations part of its network. The ICOS Science conference, organised every two years, serves as a facilitator for scientific cooperation and dialogue within and beyond the ICOS community. Monitoring the outcome of these initiatives shows how ICOS is enabling scientific excellence.



As emphasised by the 2023 ESFRI Landmark Monitoring report, the connection between an RI's activities and the economic and social decision-making is fundamental. These are the two crucial elements of the value chain that determine the social significance of an RI. As a distributed environmental RI, the socio-economic impacts that ICOS RI generates are diverse. Their materialisation is often challenging to directly demonstrate, mostly due to the long time lapse between ICOS's activities and their concrete impact on society. ICOS RI closely observes the evolution of the impact of its data on concrete actions by for example policymakers in their mitigation actions to fight climate change. The first impact assessment was carried out in 2018, and the first

periodic evaluation took place in 2020, further addressing the ways to monitor the impact of ICOS's activities. As also noted by the ESFRI Landmark Monitoring report, the development of ICOS's strategy and KPIs have greatly contributed to ICOS's ability to determine its impact. ICOS RI uses impact pathways as one way of demonstrating and narrating its developing socio-economic impact. Currently, the "publications-citations pathway" bears the biggest increase. Publications using ICOS data have augmented in numbers during the second 5-year period. ICOS data has been used in a number of different scientific domains. In the 6th IPCC's assessment report, 233 ICOS-related publications were cited. Other key publications where ICOS data has been used include WMO Greenhouse gas bulletin. Furthermore, the use of ICOS data in education has increased as well, in the number of PhD and MSc theses. To further strengthen the value chain from data production to decision-making, ICOS RI invests efforts to maintaining strong stakeholder engagement. Member countries and prospective new member states are provided with a thorough insight into the value of the ICOS networks, its products and services.

A particular emphasis is put on the benefits related to the increased geographical coverage and the resulting accuracy of future climate risk recognition, and the potential services to science and society. In addition to engaging with its stakeholders, ICOS engages with the general public and city officials in exploring ways to implement climate-smart cities, through the ICOS Cities project for example.

However, being a regional research infrastructure in Europe, ICOS needs to integrate itself into a global system of greenhouse gas observations as greenhouse gases are not confined within national borders. Data and information derived from global observations are a common societal objective to address "the need for an effective and progressive response to the urgent threat of climate change on the basis of the best available scientific knowledge" (Paris Agreement). ICOS actively participates in global and regional events that aim at tackling climate change, such as the COP, SBSTA, ICRI and EGU, among others.

ICOS RI also supports other environmental RIs and strengthens the ERA's (European Research Area) capacity to respond to the emerging needs to recognise, communicate on and mitigate climate change. In this respect, ICOS ERIC chairs the Board of European Environmental Research Infrastructures (BEERI) and represents the environmental RIs in the executive board of the ERIC FORUM.

## ICOS in brief

The Integrated Carbon Observation System (ICOS) produces high-quality, standardised European-wide measurements of greenhouse gas emissions and atmospheric concentrations of greenhouse gases and the observation of the carbon cycle.

Most economic activities produce emissions that increase greenhouse gas concentrations in the atmosphere, accelerating climate change and disrupting natural processes. A better scientific knowledge of carbon sources and sinks is vital to making informed and sustainable decisions for a better future. With its data, ICOS supports climate change mitigation actions based on science.

The ICOS network integrates over 173 stations from 16 European countries: 46 atmosphere stations, 99 ecosystem stations and 29 ocean stations. ICOS Central Facilities carry out data processing, quality control, calibration, instrument development and training. Following a rigorous protocol, ICOS integrates atmosphere, ecosystem and ocean greenhouse gas observational networks to provide near-real-time, standardised datasets and products.

ICOS has established state-of-the-art standardised methods to continuously gather, treat and distribute observations through the ICOS Carbon. The ICOS Carbon Portal facilitates unrestricted data access to various audiences, such as researchers, students, journalists, decision-makers, or citizens. The ICOS data is FAIR, open and free of charge, available under the Creative Commons CC BY 4.0 licence.

[Read more on icos-ri.eu](https://www.icos-ri.eu)

**Through data and scientific knowledge, ICOS contributes to support climate change mitigation decisions.**