RINGO | Readiness of ICOS

Readiness of ICOS for Necessities of integrated Global Observations

Deliverable 2.2

Concept document on collaboration with countries and stations outside European Union

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Contact:	eija.juurola@icos-ri.eu

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D2.2. Concept document on collaboration with countries and stations outside the European Union

Janne-Markus Rintala, Emmanuel Salmon and Eija Juurola

ICOS ERIC Head Office, Erik Palménin aukio 1, FI-00560 Helsinki

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Introduction

Integrated Carbon Observation System (ICOS) is a European research infrastructure dedicated to greenhouse gas observation. It has been founded as a European Research Infrastructure consortium (ERIC) by European countries that have put in common their national networks of greenhouse gas (GHG) measurement stations to build the pan-European, highly standardized and quality-driven network called ICOS. Currently, ICOS ERIC has 11 Member countries: Belgium, Czech Republic, Denmark, Finland, France, Germany, Italy, Netherlands, Norway, Sweden and United Kingdom. Switzerland is an Observer country in the ERIC. This represents a total of 135 measurement stations (Table 1) in the three scientific Thematic Centres established in ICOS: the atmosphere, the ecosystems, and the oceans (Figure 1).

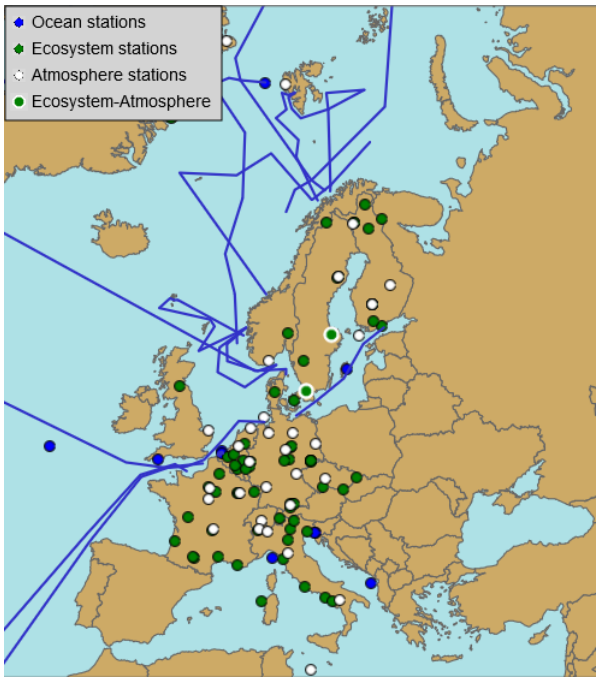

Figure 1. The ICOS network of GHG measurement stations

Table 1. The current situation of ICOS stations in member or observer countries

Member and Observer countries; partners	Ecosystem stations			Atmospheric stations		Ocean stations	Stations total
	Class 1	Class 2	Assoc.	Class 1	Class 2		
Belgium	2	4	0	0	1	3	10
Czech Rep.	1	1	1	1	0	0	4
Denmark	2	1	7	0	1	0	11
Finland	2	2	6	2	2	0	14
France	4	7	6	2	2	1	22
Germany	5	0	10	6	3	5	29
Italy	2	3	4	0	3	4	16
Netherlands	0	0	1	0	2	0	3
Norway	0	1	0	1	1	4	7
Sweden	0	6	0	3	0	1	10
Switzerland	1	0	0	1	0	0	2
UK	1	0	0	0	1	3	5
JRC	0	1	0	0	1	0	2
Total	**20**	**26**	**35**	**16**	**17**	**21**	**135**

The primary tasks of ICOS as a research infrastructure (RI) are defined in the statutes[1] of ICOS ERIC followingly:
1. 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.

2. ICOS ERIC shall provide effective access to coherent and precise data to facilitate research into multi-scale analysis of GHG emissions, sinks and their driving processes by making available measurement protocols, long-term data and data products. Technological developments and demonstrations, related to GHGs, shall be promoted by the linking of research, education and innovation. To this end, ICOS ERIC shall undertake and coordinate activities, including but not limited to:

(a) quantification of GHG atmospheric concentrations and terrestrial and oceanic fluxes over Europe and key regions of European interest, including the North Atlantic Ocean;
(b) facilitation of European research programmes and projects;
(c) contribution to the mobility of knowledge and/or researchers within the European Research Area (ERA) and increasing the use of intellectual potential throughout Europe;
(d) coordination and support of development of technology and protocols for high-quality and cost-efficient measurements of GHG concentrations and fluxes also to be promoted beyond Europe;
(e) contribution of timely information relevant to the GHG policy and decision-making;
(f) facilitation of the analysis of carbon sequestration and/or GHG emission reduction activities on global atmospheric composition levels, including the attribution of sources and sinks by geographical regions and activity sectors;
(g) facilitation of the aims of the ICOS RI to establish a template for the future development of similar integrated and operative GHG observation networks beyond Europe;
(h) scientific and management evaluation of the activities, the strategic orientation and operation of all components of ICOS RI by external evaluators.

These tasks constitute the roadmap of ICOS' activities and every strategic decision taken for the infrastructure is based on them.

This is of course true at the European level, which is ICOS' principal area of activity. At the global level, though, the Paris Agreement calls upon the need for "an effective and progressive response to the urgent threat of climate change on the basis of the best available scientific knowledge". As described in its Technical and Scientific Description[2], ICOS is a prominent European research infrastructure fully committed to this engagement. It strives to contribute to tackling this Grand Challenge by producing scientific data of the best possible quality and relevance.

In many ways, this endeavor for excellence necessitates partners. This is why WP2 in RINGO has been working on defining strategic guidelines that should be followed when considering potential partners for ICOS. In the European union, this is a rather straightforward procedure, as a member state can formalize its commitment by simply joining the ERIC. This applies also to associated countries and third countries of the EU, as well as to international

[1] ICOS ERIC statutes
[2] Technical and Scientific Description of ICOS RI

organizations, “if they contribute to the operation of ICOS ERIC and/or host ICOS Central Facility and/or ICOS National Networks”. The statutes allow for new members to join at any time by submitting an application to the Chairperson of the General Assembly of ICOS ERIC and describing how they will be involved, participate in the

realization of the tasks and activities of ICOS, and fulfil the attached obligations. Membership will always start from the beginning of the following year.

For countries that do not belong to the European Union or to the group of possible members of the ERIC, however, other collaboration frameworks must be designed. In the same way, it is possible to envisage an extension of ICOS’ observational network through partnerships with individual, existing measurement stations, or their host institutions, that cannot join the ERIC as such.

Thus, there is a need for specific guidelines describing the relevant procedure for establishing cooperation with ICOS. Drafting these guidelines is the objective of the present deliverable that gives an outline for strengthening the partnership with countries and stations outside of the European Union. This document will be further used in Deliverable 2.1 “Report on enhancing membership strategy for ICOS ERIC” of the RINGO project.

The possible extension of the ICOS network outside the European Union is only a part of a larger development process of ICOS as a research infrastructure. This development concerns all parts of the infrastructure, and also includes improvements in the network design through new stations in the current member countries, non-member EU countries, or in countries outside the European Union.

Why expanding the network?

Essentially, ICOS is facing a mismatch between its scientific ambition and its administrative requirements. Indeed, from the scientific point of view and as a distributed RI, the geographical coverage of the observational network of ICOS stations is essential, as is its’ diversity in terms of measurement stations in all scientific domains covered (atmosphere, ecosystem, and ocean). Thus, the design of an ideal GHG observing network generating a comprehensive data set should, in theory, be conducted regardless of administrative borders.

However, the conditions imposed by the statutes of ICOS ERIC on the eligibility of potential new members may hinder the integration into ICOS’ network of partners that would bring a clear added value. Moreover, the membership of a country is a prerequisite for the measurement stations of this country to be incorporated into the ICOS station network and the data to be recognized and distributed as official ICOS data. This means that the integration of a scientifically relevant station located in a country outside the EU is, at the moment, virtually impossible. On the other hand, the membership of a new country in ICOS ERIC can contribute with a network of already existing stations, whose location and specifications have been nationally determined and might not meet, from a scientific point of view, the requirements of an ideal network for ICOS.

At the global level, developing and strengthening the ICOS network is also of great interest. ICOS namely contributes, with its data and expertise, to the multilateral frameworks and global climate change initiatives, such as the United Nations Framework Convention on Climate Change (UNFCCC), the Group on Earth Observation (GEO), the Global Atmosphere Watch of the World Meteorological Organization (WMO/GAW). The added value ICOS creates to these fora is largely dependent on the quality and coverage of its observational network. Constantly improving the quality, number, and diversity of ICOS stations is therefore a major contribution to ICOS visibility and impact, both in Europe and globally.

Another factor that speaks for an extension of the ICOS network is the overall sustainability of the infrastructure. ICOS benefits from attracting new members, because an enlarged membership base supports the financial stability of the infrastructure as a whole, through the annual membership contributions paid to the ERIC by each of its members. The financial robustness is in turn a guarantee for the sustainability of long-time data sets and their appropriate curation.

Therefore, at the European level, ICOS consistently advocates for membership towards national stakeholders (ministries, funding agencies, research organizations maintaining measurement stations…), and supports the local scientific communities in their participation in national roadmap processes.

It appears from the previous description that developing ICOS through an extension of its observational network is a major goal of the infrastructure's strategy. But the rationale is primarily scientific: the objective is to have the most relevant and best performing network of measurement stations in all three domains in Europe. The financial considerations are secondary. The search for new partners must be seen in the light of their contribution to excellent science, and that light only.

A world of mutual benefits

With the sole purpose to foster scientific excellence, and to strengthen the EU's scientific competence and competitiveness, the strategic pooling of available – intellectual, operational & organizational – resources in ICOS has been considered the most cost-efficient solution. The standardization carried out in ICOS provides an example of international leadership where Europe is able to have an influence at the global level, and hence demonstrates the strategic importance of ICOS.

As has been shown before, attracting new partners, and especially new member countries in the ERIC, is clearly beneficial for ICOS' relevance and sustainability. But being part of ICOS also opens a world of benefits for the partner!

Structure and reinforce the scientific communities

In order to encourage new memberships, ICOS has engaged in enhancing the readiness of the scientific communities in the countries that are not yet, but could become one day, members of the ERIC. This is especially timely for the nine countries that are currently participating the RINGO project.

This goes through the continuous support to the national processes both at scientific and political level and arranging training opportunities. The countries which have clearly indicated their intent to join in ICOS ERIC are also invited to the General Assembly meetings as guests to foster the integration to the formal processes and decision making in ICOS ERIC.

One of the difficulties encountered in several countries is the low level of cooperation between the scientific domains. Coming from different communities having their specific history, the scientists active in atmospheric, ecosystem, and ocean research might have difficulties to coordinate efforts, although their research would serve the same purposes. It is important that, by the example it represents, ICOS highlights the benefits of integrating all domains into a common framework. It can also be stressed that, from a financial point of view, the synergies that arise from cooperation create resources that become available for the whole community.

Raise the standard and the sustainability of data

ICOS has developed a large range of standardization protocols in order to ensure the highest measurement standards of each ICOS station. This process, called station labelling, is the guarantee that all ICOS stations deliver

data that meet the necessary quality requirements. By going through the labelling procedure, the partner stations increase their quality, participate in the near-real-time data flow towards the ICOS Carbon Portal, and benefit from the curation and dissemination of ICOS data.

Support the partner in search for funding solutions

Reaching the highest level of quality usually requires investments, either in terms of instrumentation or staff training. This represents costs that not every country can immediately afford when they want to join ICOS. As it is of course advisable that the commitment to ICOS be a long-term one to maximize the return on these investments, the question of a sustainable funding of the partner is crucial. Also, an improved cooperation among national scientific communities through an enhanced integration of their scientific research activities, is beneficial for the end-results, but imply extra costs for the communities.

Apart from engaging with the national funding organizations, ICOS can support the applicant partner by providing timely information on the financial and administrative process, as well as on the scientific and technical prerequisites and developments within the ICOS station network.

Provide training and guidance

At the scientific level, but also on administrative/regulatory issues, the new partner will benefit from ICOS' experience and expertise. Having successfully integrated twelve national networks of stations into a high-level operational research infrastructure with the first stations labelled in November 2017 has given ICOS a set of good practices that can ensure the smooth integration of new partners.

The applicant partners may be invited in already existing trainings and workshops that are available within research infrastructure. Further, specific platforms dedicated to training and information sharing are planned to be set up within the RINGO project, that will greatly enhance the exchange of knowledge between the partners. These training events are of fundamental importance to improve contacts and cooperative actions inside and outside the ICOS network.

Reach out to international networks and advocate globally

ICOS is very well connected to global networks in charge of coordinating the activities of international RIs, or collating and curating the data. Its voice is increasingly acknowledged in international fora. This is for instance the case of Fluxnet, Socat or WMO/GAW, but also of the Subsidiary Body for Scientific and Technological Advice (SBSTA) of the UNFCCC. The expertise available in these networks and their detailed scientific knowledge of observational networks throughout the world is high-value information that flows both ways between ICOS (and its partners) and the global actors.

Raising awareness and advocating for scientific research on climate change issues are long-term activities that eventually benefit every part of the RI. The relevance of a high-quality observational network has better chance to be taken into account by decision-makers if the Grand Challenge of climate change is put on their agenda.

Be involved in international projects

ICOS is a party to many Horizon 2020 European projects. The funding associated with them allows for developments of the whole infrastructure, but above all, the valuable network of institutions and researchers built upon the projects is immediately available to new partners of ICOS.

New countries in the ERIC or new stations in the network?

It seems obvious that a systematic and focused expansion of the ICOS network will be a win-win situation for the infrastructure and its new partners. But the strategy to adopt towards which partners are the most suitable to achieve the primary goals of ICOS needs to be elaborated and elucidated.

ICOS has limited resources, and these must be predominantly used to deliver the excellent science the infrastructure is designed for. This means that the preferred way to extend ICOS' spatial and domain coverage should be to encourage countries to join the ERIC, as members or observers, whenever it is legally possible. ICOS is now a well-functioning infrastructure, with an established governance and an efficient portfolio of labelling protocols and internal routines. Adding a chair around the various tables where decisions are made is the solution that minimizes the resources involved by all parties compared to the obtained benefits.

As was mentioned before, for countries outside of the European Union, an involvement into ICOS poses certain financial, administrative and legal challenges. ICOS ERIC can in principle admit as a member or observer any country whose legislative corpus is compatible with the ERIC statutes. This may be the case in some countries outside European Union (e.g. South-Africa), but it might in practice prevent the full admission of many others.

It is therefore necessary to pragmatically analyse the possibility of establishing adequate collaboration agreements with measurement stations outside European Union (and the institutions that operate them). Under certain circumstances, ICOS has the possibility to negotiate third party agreements with organizations that are not eligible to become part of ICOS ERIC, if it is considered adequate by the General Assembly. Third party agreement would define the roles and responsibilities as well as financial contributions towards the research infrastructure. It would be important, however, always plan how the cooperation would be developed in long term and whether a full membership can be foreseen in future. As an example, ICOS has an agreement with the European Joint Research Centre (JRC), which contributes to the ICOS network with two measurement stations (atmosphere and ecosystem).

It is thus fully possible to imagine that some particularly relevant stations, that would bring a substantial added-value to the quality and diversity of the ICOS network, could benefit from this kind of agreement. In any case, building on existing scientific cooperation activities and targeting co-location of ICOS stations with existing measurement sites are solutions that must be systematically taken into account when considering a possible new partner.

Who could be the possible targeted partners?

This document deals with partners located outside the European Union. It is important, though, to remember that, through its member states, the EU has territories and activities that reach a lot further than the borders of Continental Europe. As an example, an ocean station in Cape Verde (Cape Verde Ocean Observatory) and an atmospheric station on the Réunion island (Maïdo) are currently part of ICOS station network.

To support the general goals of ICOS, a specific interest for cooperation with adjacent regions, such as the Arctic, Eastern Europe, and North Africa, is foreseen (Fig. 2). Specific partnerships could be established to support capacity-building in greenhouse gas observation in certain countries. Further, European countries are strongly involved in operating measurement stations in the most pristine environments of Antarctica. These possibilities will be systematically explored as a part of the strategic development of ICOS. EU projects that ICOS is currently participating, such as SEACRIFOG and INTAROS, can already act as bridges towards regions of particular interest of ICOS.

Figure 2. Map showing the existing Arctic and Eurasian Stations with varying measurement concept and setups within the INTERACT framework. (From: N.B. stations in Island & Russia: Detailed info available at stations cards: https://eu-interact.org/app/uploads/2017/11/INTERACT_CardGame2017_12Jan.pdf)

The way forward

As was pointed out several times, the trigger of a possible expansion of the ICOS network must always be scientific relevance. The first steps on the way towards cooperation have to take this into account, whatever partner is concerned: non- European country, international organization, individual station… 'What does it bring to the improvement of ICOS science?' must be the fundamental question.

It is thus a clear assessment of the scientific needs for development that has to be performed. Identifying the relevant actors (host institutions of a station or governmental bodies of a country) is the next step, as they will be the signing parties to a possible agreement. Clearly, a balance between the three scientific domains of ICOS must always be pursued.

Based on this analysis, it is possible to identify the countries that would be able to contribute, through all or part of their national networks, to the qualitative improvement of the ICOS observation system.

During the RINGO project, as part of the WP2, (Task 2.1 building partnership with countries) the detailed stepwise process to engage with non-EU countries and stations outside EU will be defined and circulated within ICOS community. The process needs to include for example the steps for confirming the interest of the identified country or a station, engaging a scientific dialogue with the national scientific community and the relevant ICOS Thematic Centres, assessment of the legislative situation, and negotiating the financial commitments. It is important to note that every situation is particular and that the process must be adapted to the individual situation in each country.

Factors for success

Some factors are important to keep in mind during the process, that can enable a successful outcome. The benefits from joining in ICOS observational network must be clearly communicated to the partner, but the corresponding obligations must not be eluded. Every partner must be fully aware of the implications an agreement will have, e.g. on the scientific community of the country or the long-term financial support.

It is also important that each step of the process is clearly documented, so that it is always possible to ensure transparency and to return to the decisions made at each step. This also allows to use the elements collected during a successful negotiation with one country as basic information for the next negotiation with another party.

Finally, the support of external actors along the process must not be neglected. It is particularly true of diplomatic representations that can provide instrumental support to the negotiation, especially with a country for future membership. Their knowledge, in the given country, of the local situation and its possible traps, of the key contact persons, or of the possible funding mechanisms can prove very helpful. Their involvement also ensures increased international visibility for ICOS and its activities.

It must also be kept in mind that strategic decisions – and partnership agreements are definitely strategic for ICOS – have to be endorsed by the General Assembly. A reasonable time frame must be established, taking into account this crucial step before an agreement can be fully operational.

Conclusion

Cooperation with other partners is vital for ICOS' relevance, scientific quality, impact, and international visibility. It is thus essential that a clear framework for cooperation is designed that allows every interested party to understand on what grounds and principles choices can be made.

However, when building the strategy for cooperation and expansion, ICOS must answer some important questions: how far is it willing to go in providing e.g. training or capacity-building to the new partners? How much resources can be dedicated to this activity, taking into account that the benefits for the infrastructure will appear with some delay compared to the necessary investments?

Useful literature

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