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| **Requirements survey topics:**   1. General questions 2. Identification and citation 3. Curation 4. Cataloguing 5. Processing 6. Provenance 7. Optimization 8. ***Community support*** |

**ENVRIplus Theme 2:**

Requirements information gathering exercise

***ICOS (Integrated Carbon Observation System)***

*RI representative(s):*

* *Margareta Hellström,*

*ICOS Carbon Portal & Lund University*

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**7. Community support**

1. Training Requirements
   1. Do you use or plan to use e-Infrastructure technology?

In ICOS, we are not planning to set up or implement any (what we define as) “e-Infrastructure technology” instances ourselves. But we will certainly make use of some existing e-Infrastructure resources from external providers.

* 1. What is your community training plan?

At the moment, ICOS does not have a common training plan as such. The Carbon Portal organizes occasional training events, e.g. on Alfresco DMS (the Document Management System used by ICOS RI). The different Thematic Centers periodically organize training for their respective staff and in some cases also for data providers (station PIs). ICOS also (co-)organizes and/or participates in summer schools and workshops aimed at graduate students and post-docs in the relevant fields of greenhouse gas observational techniques and data evaluation. Representatives of ICOS have participated in training events organized by EUDAT, e.g. on PID usage and data storage technology.

* 1. Does your community consider adopting e-Infrastructure solutions (e.g., Cloud, Grid, HPC, cluster computing).

Yes. We will definitely make use of EUDAT services (including B2SAFE, B2FIND and B2STAGE). In addition, we are interested in some EGI services (including Federated Cloud), i.e. for supporting the creation of elaborated data products using advanced atmospheric and ecosystem modelling.

* 1. Is your community interested in training courses that introduce state-of-the-art e-Infrastructure technology?

Yes, very much so!

* 1. What topics (related to e-Infrastructure solutions) would your community be interested in?

Curation principles and software systems (especially for cataloguing and provenance tracking); storage systems (for archival purposes); cloud computing.

* 1. Who would be audience?

Mainly data professionals working within the ICOS organization, who need to expand their knowledge - i.e. people with a background in “computing” and/or data management.

* + 1. Please describe their knowledge background of e-Infrastructure technology

This is very diverse, and almost impossible to summarize. Some are researchers with many years’ experience of scientific computing; others are computing professionals with a background in programming and system architecture.

* 1. What are appropriate methods to deliver this training?

One- or two-day face-to-face workshops, concentrated on a given topic and with focus on hands-on activities, are probably the most effective. These should however also be backed up by webinars (including recordings from the workshops) and written materials.

1. Requirements for the Community Support Subsystem:
   1. What are the required functionalities of your Community Support capability?

ICOS needs to be prepared to support its user communities on several levels. Firstly, user-friendly and efficient web-based interfaces for discovering and accessing all of ICOS data products should be provided - both for humans (web site) and machines (APIs). Technical support must be available to solve any problems. Secondly, the data products that ICOS produces are complex and often require experience of, and detailed knowledge about, the underlying methods and science to be used in an optimal way. The ICOS Thematic Centers (for Atmosphere, Ecosystems and Ocean) are ready to provide information and guidance for data users. If needed, requests for information may also be forwarded to the individual observation stations. Thirdly, the mission of ICOS also comprises a responsibility to support producers of elaborated products (typically research groups performing advanced modelling of greenhouse gas budgets) by providing custom-formatted “data packages”.

* 1. What are the non-functional requirements, e.g., privacy, licensing, performance?

ICOS will not require its users to register in order to use the data portal or to access & download data. However, we plan to offer an enhanced usage experience to registered users (including automatic notifications of updates of already downloaded datasets, access to additional tools at the web site, and the possibility to save personalized searches and favorites in the user profile). Everyone who wishes to download ICOS data products must also acknowledge the ICOS data policy and data licensing. (Registered users may do so once, while others must repeat this step every time.)

* 1. What standards do you use, e.g., related to data, metadata, web services?

For data products, ICOS will primarily apply formats that are common in its user communities - i.e. comma-separated ASCII text files (CSV) and NetCDF for observation data and elaborated data products, respectively. Other formats will also be available on request.

ICOS metadata will be based on standards subscribed e.g. by the INSPIRE directive, augmented with fields specific to environmental and greenhouse gas research. For dissemination of metadata to users, ICOS will primarily apply formats that can be read by both humans and machines, including JSON, XML and CSV. In addition, RDF will also be available.

Regarding web services, ICOS will follow standards defined by OGC (Open Geospatial Consortium). This includes WCS (Web Coverage Service), WCPS (Web Coverage Processing Service) and WMS (Web Mapping Service). There is a strong commitment to make all APIs (Application Programming Interfaces) RESTful.

* 1. What community software/services/applications do you use?

Apart from providing advanced search interfaces, visualization tools and data downloading facilities for users at the ICOS Carbon Portal web site, we are currently also working on implementing several other features targeted at our various user-communities. These include FAQ pages and other materials targeted at a more general audience, outreach materials for educational institutes, a set of Wiki pages describing more technical aspects of ICOS data handling and our data products, and of course also a system for collecting user feedback.