

The logo for COOPEUS features the word "COOPEUS" in a large, serif font. The letters "COOP" are dark blue, "EU" is blue with a red outline, and "S" is red. Above the letters "PEUS" are seven stars: three yellow and four white, arranged in a semi-circle.

COOPEUS

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DELIVAREBLE 8.2: COOPEUS RI SUMMARY REPORT

DoW Description of deliverable: FMI will compile a COOPEUS summary report on research infrastructure commonalities, opportunities and joint research infrastructure development needs as a synthesis of deliverables 2.2, 3.1, 3.2, 4.1, 4.2, 5.1, 5.2, 6.1-6.4, 7.1. It is related to activities within the task 8.1 and 8.2.

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AIMS

This document summarizes the found commonalities and needs between the EU and US RIs participating in COOPEUS. This document should be considered as the base document for the long-term communal strategy of Environmental RI development between the two main global areas of environmental measurements.

IMPORTANT NOTE: The actions and description of this document are the views of WP8, not necessarily representing the partner RIs. The document is meant to be a discussion document, giving overview for further development. This is not a complete re-writing of the deliverable results, but instead concentrates on issues shared on several RIs, or specific important points raised in the discussions.

METHODOLOGY

ANALYSIS OF DELIVERABLES ALREADY SUBMITTED

A key part of the analysis provided in this deliverable is based on analysis of the submitted ready deliverables. These were downloaded from the COOPEUS website, and they contain all deliverables submitted before 19.2.2014. Specifically they contain the deliverables: D2.1, D2.2, D2.3, D3.1, D3.2, D4.1, D4.2, D5.1, D5.2, D6.1, D7.1.

Note that this list differs in some minor ways from the list presented in the original Deliverable description in COOPEUS Description of work (above). These differences are from practical changes in the COOPEUS project advancement.

QUESTIONNAIRE

WP 8 designed a non-technical questionnaire for the COOPEUS RIs, specifically to determine long-term commonalities and strategies of the RIs. This questionnaire was sent to RI coordinators and COOPEUS WP leaders via email in October 2013. The main aspects we need from this questionnaire were: which **areas of operation** the cooperation is wanted and/or needed; what are the **main benefits** for the RIs, funders and end users from the cooperation; and what are considered to be the **key steps** for the strategy to work. The target year was set to 2020. The questions are presented in Appendix I.

This questionnaire was answered by a majority of participating RIs. Although some did not answer the questionnaire issues in writing, the discussion on the questionnaire results within the COOPEUS meeting in

Boulder, Colorado, in September 2013, provided some additions for the missing questionnaire results. Based on the results from the questionnaire, the WP 8 generated initial discussion documents for the interviews.

Actions supported or derived from the questionnaire information are represented by identifier [Que]

INTERVIEWS

Based on the questionnaire results, the WP8 team organized interviews for the RI representatives. Before interviews, a short summary of the potential collaboration modes were prepared by WP8 for discussion. The overall theme of the interviews was to map in general level what is actually being done at the moment, and what do the RIs consider to be the main issues at hand. Not all RIs participated on these interviews, but more comprehensive results were obtained from WPs 3,4 and 5.

Actions supported or derived from interview information are represented by identifier [Int]

COVERAGE

Not all WPs and RIs participated in all actions. This was due different stages of development within the project, and in some cases, within the RIs themselves. The answering rate is shown in Table 1.

Table 1 Coverage of RIs in participating actions for this deliverable

		Deliverables	Questionnaire	Interview
Space Weather	EISCAT 3D	3	x	no
	AMISR		x	
Carbon Observations	ICOS	1	x	x
	NEON ¹		x	
Biodiversity	Lifewatch	1	x	x
	NEON ¹		x	
Ocean Observations	EMSO	2	x	x
	OOI		no	
Solid Earth observations	EPOS	2	no	no
	UNAVCO			

RESULTS, CONCLUSIONS AND RECOMMENDATIONS

Based on the methodology described above, the WP8 team summarized the current development needs in limited set key actions:

Technical cooperation, containing direct developments to the infrastructures, in physical level (e.g. joint measurement sites, instrumentation development) or in computational level (e.g. metadata standardization).

Information and personnel exchange, containing direct communication between the RIs, common workshops and newsletters, and direct personnel exchange for efficient building of trust and common practices.

Outreach Collaboration, containing collaboration on the communication and interaction with outside actors, such as users, stakeholders or general public.

Some of these issues are interlinked, but are described only once in the following.

TECHNICAL COOPERATION

INTEROPERABILITY OF INFORMATION INFRASTRUCTURES

General principles of data policy and data sharing is the most common suggested commonality action in almost all documents. These actions require common developments on e.g.

- Access rights for data, including defining policies when and who should have data access, developing common shared data access models and authorization, and in some cases, agreeing on open access policy [D3.1, D4.2, Que, Int]. This is an urgent issue, where the work has at least in WP3 and WP4 started in COOPEUS.
- Developing cross-national strategies on intellectual property rights issues, including finding out legal challenges related to data sharing, using, and ownership [D3.1, Int]. This is a medium term aim.
- Bibliometric indicators for data usage (e.g. DOIs) are needed to provide RIs possibility to follow usage and gain independent confirmation for the scientific benefit of each RI. There is a clear need to define when, how, and what kinds of datasets should be permanently identified. However, this kind of activities cannot be only derived by the RIs, and will require cooperation with other actors, e.g. Research Data Alliance. However, common solutions can be needed and working as a common unit will make the needs of RIs better taken into account. This issue also includes the best practices for offering co-authorship vs. acknowledgement in publications [D2.2, D3.1, D4.2, D5.2, Que, Int].
- Metadata access and harmonization is a strongly needed activity. The metadata should be in general openly available and the interfaces to e.g. GEOSS could be standardized between the RIs. Similarly (domain specific) metadata requirements and standards need to be agreed between the EU and US partners, in collaboration with data user groups [D2.2, D3.1, D4.2, D5.2, Que, Int].
- Data integrity standardization, which includes internal data integrity (e.g. checksums) and external data integrity (common documentation, workflow descriptions) for data users [D3.1, D4.2, Que].
- Near Real time standardization, determining the workflows and timing related to fast data provision. Work has been started on this in WP3 and on the WP4 Tsunami case study [D3.1, Int, Que]
- In the case of WP2, the main interest in the development of common *correlated data* products and file formats D2.2. These requirements are clearly stated in the deliverable D2.3, and present detailed requirements for the needed data formats. This activity is ongoing in COOPEUS and will be continued D2.3.

- For WP3, an direct ICOS/NEON cooperation in developing RI data portals is being considered [Que, Int].

In addition to these, more longer period plans are also suggested, but they are commonly vaguely defined at the moment, e.g. co-operation on building common data handling tools.

JOINT INSTRUMENT AND METHOD DEVELOPMENT

There are several potential development needs described, connected with instrument and methodology development. The corresponding RIs have many similar technological challenges, leading to similar requirements for instrumentation development. Particularly mentioned were

- Need of common quality control and assurance plan [D3.1, Int, Que]. This task is addressed partly within COOPEUS, but will need longer period collaboration.
- Exchanging experiences on collaboration with commercial activities, and finding common approaches for RI/private sector collaboration. Collaboration on finding potential industry partnerships [D3.1, D4.2, Int, Que].
- Instrument development collaboration, specifically in WPs 2, 3 and 4. E.g. ICOS/NEON collaboration on base instrumentation selection and development projects [D2.2, D3.1, D4.2, Int].
- Developing common terminology and a conceptual understanding of RI data flows. One potential method suggested is the ENVRI reference model framework, which could be used to define common terminology, roles and functions in an RI operation from raw measurement to data publication. This approach seems to be ongoing in WPs 4 and 5 [D4.2, D5.2].

CO-LOCATION POSSIBILITIES

The possibility of co/location of the practical physical instrumentation was described in WP2 and WP3. This was also under consideration in relation to the use cases for WP4. In practice, this would mean temporary or semi-permanent co-operation period, where the instrumentation, personnel and/or facilities would be directly shared between the infrastructures. The aims for such collaboration action would be find out the methodologies and best practices of RIs, do cross-calibration work of the instrumentation, develop common workflows and processes, establish personal contacts between the partners and exchange experiences. Some of this work is already started in COOPEUS, but could be extended later on in the project.

CROSS-ATLANTIC PERSONNEL AND INFORMATION EXCHANGE

One commonly mentioned communality need is personal contacts between the RIs in all levels of operation. The WPs with operational or almost operational processes (WPs 2,3,4) were all very highly positive on development of more organized information and personnel connections between the RIs. In the case of WP5 and (based on deliverables) WP6, the current situation does not seem to yet necessarily warrant common cross-Atlantic development in this technical or practical level, before the corresponding RIs get their internal procedures developed.

COMMON WORKSHOPS AND COMMUNICATION CHANNELS

In WPs 2,3 and 4, the need of common channels of communication both to user groups (scientists, politicians, public, etc) and to the funders, was generally viewed in a positive sense. From this point of view, a common (e.g. annual) workshops or conferences to the workforces of the RIs were seen as potentially useful activity in WP3 [Int]. However, even more direct need is to have common ways to communicate with the end user groups, organizing common or at least similar workshops to obtain the user needs and to facilitate user interaction [Int]. This kind coordinated user group finding was seemed to be especially crucial for WP4, where the need of locating the users, especially Earth System modeling community, is clearly evident in both sides of the Atlantic [Int]. The WPs welcome such organized meetings, but clearly funding for them is not available for all RIs in their own operating budgets and they are not either directly covered by current COOPEUS activities.

The RIs will also need permanent or semi-permanent methods of close communications. This might be partially covered by personal exchange (next subsection), but will also need close and frequent communication channels between the RIs, in all levels of operation from planning to technical solutions. This requires mostly will and trust, as the technical costs for e.g. teleconferences are relatively low.

PERSONNEL EXCHANGE PROGRAM

In WP3 and WP4, there is a clear need to have constant exchange of ideas, procedures and methods. A method, which got support from both directions, was establishing a method of coordinated personnel exchange/training programs, where the key scientists and technicians would visit to the corresponding RI for a longer period. This kind of program would have several advantages:

- Knowledge of practical methodologies and workflows. Even in mature RIs, some of the processes might be documented differently than actually done in practice, or the documentation level is not in suitable detail. Practical hands-on experience can be very helpful in understanding the produced datasets. The personnel exchange also can provide information for further development plans of the RIs into locations where the other RI is more experienced. The best practices travel best via actual practical knowledge of them.
- Personal contacts are a critical factor for successful cross Atlantic co-operation. The long term personnel exchange projects create direct and easy points-of-communication between the RIs, and help directly to build necessary trust on the co-operation. Additionally, the personal knowledge of needs and capabilities of both RIs and individuals can help significantly in motivating and on career aspects of the personnel.

However, such activities are not currently funded by either RI basic budgets, and would require common and reliable funding instruments from both continents.

OUTREACH COLLABORATION

Several RIs have a need for better contact to their stakeholders. In some cases, potential key participants, such as Earth System Modeling communities are not yet identified or even knowable of the RI products. All of the interviewed RIs and most of the questionnaires supported collaboration on large scale outreach processes, including

- Common or at least interlinked web portals for different user groups
- Informing each other on best practices and successes in outreach activities
- Creating common outreach sessions in e.g. international conferences
- Finding new user groups and sharing their needs

- Creating common publications in scientific and more general level (e.g. iLEAPS newsletter)

CONCLUSIONS

This deliverable shortly summarized the main issues and raised ideas on the currently available deliverables of COOPEUS, questionnaire and the interviews. They point out some of the general trends of short to medium term collaboration between the RIs. Many of the activities can already be done or started within the COOPEUS project, and the overall view of the collaboration is very positive from RI and from WP8 team points of view.

However, there are some issues, which clearly need consideration. Very few RIs answered in detailed on questions of strategic developments and long term plans. This is understandable, as many of the RIs are still in design or construction phase, but raises the importance of WP8 work in the next months to start developing true long term strategic collaboration plan. Secondly, some of the clearly needed collaboration modes, especially on workshops and personnel exchange, lack the resources and possibly even funding instruments, for successful completion.

APPENDIX I QUESTIONNAIRE QUESTIONS

A) Scientific goals

The aim of these questions: Determine the commonalities of long-term scientific goals between the US and EU partners, and to find out possible cross-disciplinary interactions

A1) How do you see the development of your scientific goals from now to 2020, or do you see new scientific problems which could be addressed by your infrastructure? Are these already starting to be addressed, or do you see room for development?

A2) If you see new scientific goals to be addressed, are these already been extensively studied in the research community? Do you think there is need for cross Atlantic co-operation to answer these questions?

B) Capacity Building

The aim of these questions: Finding out how to co-ordinate building improvements in the infrastructures between EU and US. These include things as growing to new regions and improving existing infrastructures (new measurements, standards, calibrations, data infrastructures).

B1) Spatial growth: Do you plan to grow by 2020 to new geographical regions (including growth outside of the national (or EU) borders)? Do you have already a plan for this?

B2) Do you see similar infrastructures being developed in regions nearby (e.g. Caribbean for US, Africa for EU)? Do you plan to support these actions? How (e.g. best practices, standards, common instrumentation, training)?

B3) Do you see potential of co-locating your current of new measurements with measurements from another infrastructure (different discipline)? Do you have such activities already or a concrete plan of such activity?

B4) Do you see changes in your measurements strategies (location, temporal profiles, etc) in the near future? What kinds?

B5) What are the main advances you consider for your networks IT development in the future? Special issues of interest: connection to GEOSS, development of standard names, data format development. (note: data assimilation questions are in new product development later on). This is a very wide question, so please be verbose.

B6) Are you planning to include permanent identifiers for your datasets (or improve the current method, which one)?

C) Legal and policy issues

The aim of these questions: Finding out your plans for use and development of legal and policy frameworks related to your infrastructure. Coordinating these could be of great use to the end users and data providers.

C1) Would you see agreements on common data sharing policies (EU-US) to be realistic for your infrastructure? This includes policies towards private sector users.

C2) Would you see the benefit of common agreed policies and aims, to be used for lobbying, media outreach and cross-regional development?

C3) Would you see development of more institutional approach towards collaboration between Environmental infrastructures to be realistic? What would be the best way to do this? Informal "discussion club"? More rigid "board"? Institution?

C4) Do you see the need to develop the legal framework for data licensing, ownership and policies across the infrastructures?

C5) How important do you see the role of infrastructures (including your own) to develop career paths for data scientists and earth system scientists. Do you think there should be a common policy of e.g. including data citations for review?

D) Outreach and education

The aim of these questions: Finding out how much common educational, career, dissemination and stakeholder co-operation can be developed between EU and US infrastructures?

D1) What kind of developments you see in our outreach elements? Do you plan to organize or help to organize courses (university, public, citizen scientist)? Do you plan or do on-site training for scientists? Do you see collaboration possibilities in this field?

D2) What are the developments expected in the dissemination methods? Are these such that collaboration between the infrastructures would be beneficial? Common portals, dissemination channels, newsletters, etc?

D3) How do you see our infrastructure's role in supporting science projects (including ones for new measurements in your field)? Would you see need of coordinating such operations as useful?

D4) How do you see your role in supporting private sector involvement for use of your results? Do you see possibilities to agree on common formats, methods and policies?

D5) Do you see need of including new stakeholder groups for your infrastructure? Do you see other infrastructures as your potential data users?

E) New products

The aim of these questions: Finding out how much common educational, career, dissemination and stakeholder co-operation can be developed between EU and US infrastructures?

E1) How do you see your infrastructure as supporting for instrumentation development in your field? Do you plan (or do) such developments yourselves?

E2) Do you plan to collaborate with modeling groups or develop your own modeled products? This specifically includes all data assimilation activities. Would collaboration with your cross-Atlantic partner be useful? How about infrastructures in other fields, e.g. to produce interdisciplinary products?

E3) Do you develop new products with active collaboration with the private or public sector data users? Would this need also cross-Atlantic collaboration?