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Deliverable D9.3

*Common lessons learned relevant for the development of the Copernicus
Climate Change Service*

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1. Executive Summary

This report summarises the common lessons learned by the five projects funded under the 2013 FP7 Space Call relevant for the development of the Copernicus Climate Change Service. The five projects involved are ERA-CLIM2, UERRA, QA4ECV, CLIPC and EUCLEIA. There is a common website containing links to the websites of the five projects at <http://www.clipc.eu/c3s-precursors/c3s-precursors>. The five topics were chosen to specifically target preparations for the Copernicus Climate Change Service (C3S). The five projects funded to tackle these projects started in late 2013 and early 2014. Together they aim to develop the scientific and technological foundations for C3S.

The main lessons learned so far under these projects for the development of the Copernicus Climate Change Service are as follows:

- 1) Active user engagement is crucial to the development of a climate service to support decision making. CLIPC has found that active user engagement not only helps the project to stay in touch with what users want, but also has facilitated communication between different domains by forcing all to communicate in a jargon free language. This has helped to mitigate one of the major problems, the huge differences in approach and methodology between the many disciplines which need to be brought together to create a credible climate service.
- 2) It is vital to have a clear understanding of the scientific uncertainties involved and a clear communication of the robustness of assessments for decision making. A forthcoming meeting sponsored by CLIPC and co-organised by EUPORIAS, EUCLEIA and QA4ECV will investigate different aspects of uncertainties in climate data, focussing on communication of uncertainties in a manner which develops confidence. This is as important for a reanalysis product as being developed by UERRA as it is for the attribution products being developed by EUCLEIA.
- 3) There is a need for products to be tailored to the varied needs of different user groups for such products to be useful in their decision making. EUCLEIA has found that there is a clear demand for attribution services across sectors but there are different requirements concerning aspects such as timeliness of products and communication protocols. CLIPC, in seeking to address a spectrum of users from climate scientist, impact scientists, intermediaries and societal end users, has learnt that an information portal needs to speak to all types of users allowing them to navigate through the portal in a natural way without making the specialist versus non-specialist distinction.

2. Project Objectives

With this deliverable, the project has contributed to the achievement of the following objectives (DOW, Section B1.1):

No.	Objective	Yes	No
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1	Derive the requirements that targeted user groups (including regional stakeholders, re-insurance Companies, general public/media) have from attribution products and demonstrate the value to these users of the attribution products developed under EUCLEIA.	YES	
2	Develop experimental designs and clear ways of framing attribution studies in such a way that attribution products provide a fair reflection of current evidence on attributable risk.		NO
3	Develop the methodology for representing the level of confidence in attribution results so that attribution products can be trusted to inform decision making.		NO
4	Demonstrate the utility of the attribution system on a set of test cases of European weather extremes.		NO
5	Produce traceable and consistent attribution assessments on European climate and weather extremes on a range of timescales; on a fast-track basis in the immediate aftermath of extreme events, on a seasonal basis to our stakeholder groups, and annually to the BAMS attribution supplement.	YES	

3. Detailed Report

There are five Copernicus Climate Change Service Precursor Projects funded under the 2013 FP7 Space Call. These are ERA-CLIM3 (European Reanalysis of the Global Climate System), UERRA (Uncertainties in Ensembles of Regional Re-Analysis), QA4ECV (Quality Assurance for Essential Climate Variables), CLIPC (A Climate Information Portal for Copernicus) and EUCLEIA (European Climate and Weather Events: Interpretation and Attribution). This report summarises the main common lessons learned relevant for the development of the Copernicus Climate Change Service.

The lessons learned fall into three categories which are discussed below.

3.1 User Engagement

Active user engagement is crucial to the development of a climate service to support decision making. CLIPC has found that active user engagement not only helps the project to stay in touch with what users want, but also has facilitated communication between different domains by forcing all to communicate in a jargon free language. This has helped to mitigate one of the major problems, the huge differences in approach and methodology between the many disciplines which need to be brought together to create a credible climate service.

3.2 Communication of robustness of products and scientific uncertainty

It is vital to have a clear understanding of the scientific uncertainties involved and a clear communication of the robustness of assessments for decision making. A forthcoming

meeting sponsored by CLIPC and co-organised by EUPORIAS, EUCLEIA and QA4ECV will investigate different aspects of uncertainties in climate data, focussing on communication of uncertainties in a manner which develops confidence. Further details are as follows.

3.2.1 Forthcoming workshop on communication of workshop.

As a result of common lessons learned so far under the precursor projects, a workshop has been organised to take place in February, 2016.

The meeting will be hosted by GERICS in Hamburg, sponsored by FP7 project CLIPC and co-organised by additional FP7 projects EUPORIAS, EUCLEIA and QA4ECV. The workshop will discuss different aspects of uncertainties in climate data, focussing on communication of uncertainties in a manner which develops confidence. The sub-title of the workshop, "Presenting Uncertainty with Confidence", is designed to emphasize that uncertainty is part of the scientific result, not a limitation. Contributions, within the context of climate change and its impacts, will be invited the following topics:

- describing quantitative and qualitative uncertainty;
- successful exploitation of data with high uncertainties;
- approaches to communicating value, quality and uncertainty in scientific knowledge, how important soft skills are in the communication (i.e. sharing knowledge, etc.) compared to hard skills (i.e. statistics, etc.).

The objectives are:

1. to share information between delegates;
2. to create an authoritative report on best practices, paradigms of success, problems and emerging solutions, particularly with regard:
 - to communicating and exploiting information about uncertainty and data quality;
 - accurate propagation of uncertainty information through the processing chain from environmental measurements or simulations through to policy relevant indicators;
3. to publish the workshop report in a peer review journal.

In order to meet the third objective, a lead author team will be identified well in advance of the workshop, and a series of telephone conferences will be held in advance of the workshop to determine the outline of the report and the associated organisation of breakout groups in the workshop.

The workshop will be limited to around 25 invited delegates. We hope to obtain a broad range of views by inviting delegates from collaborative projects who will be able to represent the breadth of activity in their project team.

The objective of the workshop will be to produce a report for peer review publication which would deal with obstacles and opportunities associated with building confidence in climate services (or building services which deserve confidence), particularly in association with communication of uncertainty.

The meeting will be spread over 3 days, starting and ending at 1pm to allow delegates to, in general, travel to and from the meeting on the first and last day. There will be introductory presentations, breakout groups, and a final plenary session for discussion of the conclusions from the breakout groups. There will be an extra session in the afternoon of the last day for a lead author team.

3.2.2 Lessons learned for development of reanalysis products

UERRA has found that long term biases in reanalysis products need to be monitored and compared with other references and there may be some aspects of the system that introduce biases, usually a component of the model parameterisation. In combination with changes in the observation coverage, this may introduce spurious climate trends. These aspects may or may not be difficult to handle but we need to monitor them and then communicate the resultant uncertainties to users.

3.3 Tailoring of Products

There is a need for products to be tailored to the varied needs of different user groups for such products to be useful in their decision making. EUCLEIA has found that there is a clear demand for attribution services across sectors but there are different requirements concerning aspects such as timeliness of products and communication protocols. CLIPC, in seeking to address a spectrum of users from climate scientist, impact scientists, intermediaries and societal end users, has learnt that an information portal needs to speak to all types of users allowing them to navigate through the portal in a natural way without making the specialist versus non-specialist distinction.

4. Lessons Learnt

The main lessons learned have been:

- 1) Active user engagement is crucial to the development of a climate service to support decision making.
- 2) It is vital to have a clear understanding of the scientific uncertainties involved and a clear communication of the robustness of assessments for decision making.
- 3) Products need to be tailored to the varied needs of different user groups for such products to be useful in their decision making.

5. Links Built

CLIPC, EUPORIAS, and QA4ECV have coordinated in the development of a workshop to discuss different aspects of uncertainties in climate data, focussing on communication of uncertainties. Teleconferences have been held involving all five projects, CLIPC, EUCLEIA, QA4ECV, UERRA and ERA-CLIM2 to exchange information. There is a common web portal for all the projects.