Report of the plenary discussion of the CCCS WS held on 17-18 February 2014

This document summarizes the main points discussed during the plenary meeting of the workshop held on 17-18 February 2014 at ECMWF to discuss the possible scope and content of the Copernicus Climate Change Monitoring Service being proposed by the European Union.

1. Context

At its 80th Session on 4-5 December 2013, ECMWF Council tasked the Centre to organize a workshop to discuss the possible scope and content of the Copernicus Climate Change Monitoring Service being proposed by the European Union (EU). The rationale for the workshop was to bring climate experts together to provide input to the community for responding to the EC 'Call for Expressions of Interest' in operating the Climate Change Copernicus service.

The workshop took place at ECMWF on 17-18 February 2014. The first day was dedicated to keynote presentations describing the existing European and international landscape of Climate Services, as well as discussing the currently available information regarding the EU's vision of Copernicus Climate Change Services, which is articulated within four main areas:

- Climate Data Store
- Sectoral Information System
- Evaluation and Quality Control
- Outreach and Dissemination

The second half of the first day and the second day were dedicated to working group discussions to define the content and scope of each of these areas, followed by a plenary session to provide recommendations on the scope of the Climate Change Service.

2. Summary of plenary discussion

The plenary discussion, chaired by ECMWF Director of Research, Erland Källén, started with reports by the chairs of the four working groups:

- Climate Data Store (CDS WG; chair M Doherty)
- Sectoral Information System (SIS WG; chair R Vautard)
- Evaluation and Quality Control (EQC WG; chair J Schulz)
- Outreach and Dissemination (O&D WG; chair S Zebiak)

Topical discussions followed each presentation. Finally, a general discussion on CCCS and the topics raised by the chairs' reports was held.
The summary presented below is not intended to extract consensus statements from the discussions, but rather report as faithfully as possible what was said during the discussions.

2.1. Main points discussed after the report of the CDS WG

The CDS data-base should be distributed, providing access to the data that reside in local archives. The data store should not duplicate existing databases, but rather provide improved access to them, via a one-stop shop, generate and maintain a documented European catalogue. More importantly, the CCCS should identify the existing gaps in the currently existing climate information datasets and ensure that the CDS will fill these gaps. The CDS should have a global scope, with higher-resolution coverage over Europe and possibly other regions of particular interest to European users. Data should include essential climate variables (ECVs), uncertainty estimates, reanalyses, multi-model data, and in-situ and satellite data. CDS should contain only 'climate compliant' data, as defined by EQC. The

concept of ‘climate compliant data’ is extremely important and has to be clearly defined, and the CDS data base has to adhere to the definition.

The CDS should include datasets covering the time scales of CCCS interest (past, present and future): observations, reanalyses, seasonal forecasts possibly decadal forecasts, and longer term centennial projections (scenarios). There was some discussion on whether ‘decadal forecasts’ and ‘climate projections’ should be included in CDS. Someone argued that decadal forecasts should be included, with a clear estimation of their uncertainty: the responsibility on whether and how to use them should be left to the users. However, a majority argued that decadal forecasts should not be included since they cannot be verified, the science is not mature enough, and there is a high risk of failure as an operational service.

CCCS should adopt the most open possible data policy, with CDS data having open access and maximum traceability. Software developed under CCCS should also be freely available. CDS data should be consistent and compatible with national archives. CCCS should adopt and comply with existing standards regarding data formats and exchange protocols. CDS information should be authoritative and therefore of high quality, include uncertainty estimations (generally implying the need for multiple datasets), be traceable and validated.

One of the areas that need clarification is the boundary between the CDS and the sectoral data bases. The boundary should be well defined, e.g. with CDS including FCDRs, ECVs, model outputs, recognising GCOS as a reference for user requirements, while SIS focusing on tailored and sector specific indices and indicators (including impact indices, extremes, etc.)

The CDS should include existing as well as newly generated data such as reanalyses, seasonal forecasts and up-to-date climate projections. In other words, CCCS should, in general, not only include or provide access to existing data, but also support some ‘production’ capabilities (i.e. of reanalyses). As part of this production activity, CCCS should also support ‘continual improvement’ activities (i.e. development and short-term research aimed at data production). By contrast, the more fundamental, long-term research needed to guarantee continuous improvements should be funded by other sources, e.g. European programmes such as the EU-Horizon 2020 (H2020). A close interaction between CCCS and the EU bodies responsible for the planning and funding of the EU projects such as H2020 should be promoted to ensure alignment between the objectives of CCCS and EU-funded research on themes relevant for CCCS.

Finally, there was a general discussion on the interaction between CCCS and its users. The whole CCCS service must include a ‘user consultation process’. However, the CCCS should not only react to new requirements from the users but should also follow a scientifically based agenda with the primary goal of serving EU policy needs. In particular, CCCS should aim to support EU activities in adaptation and mitigation.

2.2. Main points discussed after the report of the SIS WG

SIS will produce tailored, most likely high resolution, and European domain (including surrounding oceans) oriented datasets, building on a very strong interaction with users. Since the SIS database will address a wide community, and include a wide variety of sector specific datasets, it is essential that SIS data follow a consistent definition. Standards must be agreed (units, format, metadata, descriptors, ..) and enforced. The SIS datasets

From a users’ perspective, data policy needs to be as transparent as possible, recognizing that some data and information will have reuse restrictions applied. Any restriction needs to be transparent and handled flexibly by the CCCS portal and has to be taken into account at every stage of the design of the system.

One of the key questions is to define which sectors should be chosen for a first implementation. It was suggested to start focussing on a few (say a maximum of 8) sectors and then explore the possibility to further expand with additional sectors.

The SIS data base will include not only climate indices but also 'impact indices' that provide best estimates of particular impacts of climate variability and change on a range of sectors. The generation of these impact indices will require multi-disciplinary approaches: CCCS should provide leadership in this area.

One of the key challenges that CCCS in general, and more specifically whoever is going to be in charge of establishing SIS information data bases, will have to address is how to access the global impact data of interest for CCCS (i.e. from the EU commission and its member states, non-EU countries and or international bodies). How will CCCS collect data on socio-economic activities and health from non-EU regions?

Another challenge that CCCS will have to address is to estimate uncertainties, given that some user communities are not ready to provide any uncertainty estimations (e.g. because they have not yet developed a methodology to gauge them). CCCS might need to support, or promote, research and development activities in this area.

2.3. Main points discussed after the report of the EQC WG

EQC should be thought of as a bundle of coordinated and focused activities for CCCS. It should include both an internal and an external component, the first focussing on evaluating the scientific and technical quality of the CCCS data bases, while the latter on evaluating the scientific quality of the CCCS process and the efficiency of the whole CCCS service. The external component should rely on existing international expertise (including non-EU, to guarantee independence). The internal component should establish what should be included in the CDS and SIS data bases. It should also provide an objective evaluation of the maturity of specific data types (e.g. are decadal projections mature enough to be included in the CDS database?).

EQC should define the evaluation metrics to be used to decide not only which data should be included in the CDS and SIS data bases, but also how much development is required and should be included in the CCCS activities. CCCS has to include 'continual development': the question is how much of the planned funds should/could be allocated to this activity, and how much should be done in the H2020 context. EQC will be the appropriate vehicle to address this question, based on evaluating evolving user requirements and feedbacks, and translating them into new technical specifications.

EQC metrics should be tailored and user-oriented: different metrics should be used to assess the quality of observations, reanalyses, seasonal forecasts or climate projections. Metrics that still need to be more clearly defined are, e.g., in attribution studies and in socio-economic analyses.

2.4. Main points discussed after the report of the O&D WG

This activity will involve outreach and communication processes, and interaction with stakeholders. The communication and outreach activities have to be designed to guarantee that CCCS (and the other Copernicus services) activities support and build on national capabilities.

The CORE-CLIMAX project (Coordinating Earth Observation Data Validation for RE-analysis for Climate Services) was mentioned as an interesting precursor activity. This project has listed in a survey three key demands related to observations and reanalysis datasets: (a) interpolation and production of gridded data sets, (b) provision of statistics based on observations and (c) homogenisation of station data. This type of survey would be an excellent starting point for the CCCS to extend its portfolio.

There is a need to bring innovation into CCCS. CCCS should involve a continuous interactive process of knowledge sharing and innovation. CCCS is also a source of knowledge, not just of data. CCCS should also include a capacity building component (build and share knowledge) and a training component. CCCS should not just build data bases, but also involve continuous innovation and development activities.

Open data policy is key and essential. Concerning input data, CCCS should use only publicly available data if it has to support policy makers, and disregard data with restricted access. Concerning output data, CCCS dissemination to the general public should be envisaged.

2.5. General discussion

Defining the interface between the CCCS and the various relevant national activities will require a lot of attention. At the national level, discussion of climate change impacts is rather broad and extends beyond just the meteorological domain. National initiatives that aim to build a common architecture for climate information portals in various domains must not be ignored.

Although long term research is outside the scope of the CCCS, there should be a strong development component inside the CCCS.

Trusted local information providers must be included in the service. A layered structure is required, in which the main task of the CCCS will be to provide shared climate data products and processing services. The CCCS will also be in a position to supply common, overarching and authoritative messages. However, final dissemination of climate information should be handled via national services. The issue of trust is important: The same message is often trusted more when delivered locally.

A flexible approach is needed to address the diverse requirements of the entire European community. Each country is different and may require different solutions. The CCCS should provide best practices, as a networking activity, to the national level. It should improve the shared knowledge base with the aim to support and improve national services, and to help establish new ones.

While significant activities related to climate services are done by national meteorological services, it is important that the capabilities of other types of institutes and services are also exploited by the CCCS (e.g. ECV product generation by ESA CCI or EUMETSAT Climate SAF).

The CCCS needs to be inclusive and engage with a broad user community. It will need to call on a wide range of expertise in various domains. The technical infrastructure developed by the meteorological services naturally provides them with a leading role in this endeavour. The development of the Copernicus Atmospheric Service illustrates well how very diverse communities can be involved in building a shared operational service.

Among all Copernicus services, climate represents the cross-cutting theme. The implementation of the CCCS therefore needs to build on elements of the other services. The required links and dependencies among the various services should be made explicit in the implementation plan.