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Community research

Climate Information Portal

CLIPC Interim Review, first reporting period

Sept. 2014

Project status and outlook

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1 Introduction

CLIPC will provide access to climate information of direct relevance to a wide variety of users, from scientists to policy makers and private sector decision makers. Information will include data from satellite and in-situ observations, climate models and re-analyses, transformed data products to enable impacts assessments and climate change impact indicators. The platform will complement existing GMES/Copernicus pre-operational components, but will focus on datasets which provide information on climate variability on decadal to centennial time scales from observed and projected climate change impacts in Europe, and will provide a toolbox to generate, compare and rank key indicators. Expanding climate data volumes will be supported with a distributed, scalable system, based on international standards. Guidance information on the quality and limitations of all data products will be provided. An on-going user consultation process will feed back into all the products developed within the project.

The “one-stop-shop” platform will allow users to find answers to their questions related to climate and climate impacts data, and to ensure that the providence of science and policy relevant data products is thoroughly documented. Clarity of provenance will be supported by providing access to intermediate data products. Documentation will include information on the technical quality of data, on metrics related to scientific quality, and on uncertainties in and limitations of the data. A climate impacts toolkit will provide documentation on methods and data sources used to generate climate impact indicators. The toolkit will be made available for integration with Climate-ADAPT. The CLIPC consortium brings together the key institutions in Europe working on developing and making available datasets on climate observations and modelling, and on impact analysis.

The initial portal is close to being released, and can be viewed here: http://test6.maris2.nl/ . This will soon be moved to www.clipc.eu, to replace the temporary site currently at that location.

1.1 Background

CLIPC is a large FP7 project, but it is small in the context of the Copernicus programme. Aligning the CLIPC programme of work with other aspects of Copernicus and ensuring uptake of CLIPC outputs will be critical to the success of the project. Many aspects of the operation of the Copernicus Climate Change Service Portal will be governed by the delegation agreement between the European Commission and the organisation designated to operate the Copernicus Climate Change Service (CCCS). This negotiation agreement is currently the subject of negotiations between the Commission and the European Centre for Medium Range Weather Forecasting (ECMWF). In parallel to these negotiations, which are closed to 3rd parties, ECMWF has been holding a series of open workshops for community discussion of the shape and objectives of the CCCS.

The four main components of the CCCS will be:

- Consistent Climate Data Store (CDS)
- Sectoral Information System (SIS)
- Evaluation & Quality Control (EQC)
- Outreach and Dissemination (OD)

One clear and constant objective is to provide input to support the European Climate Adaptation Platform (Climate.ADAPT).

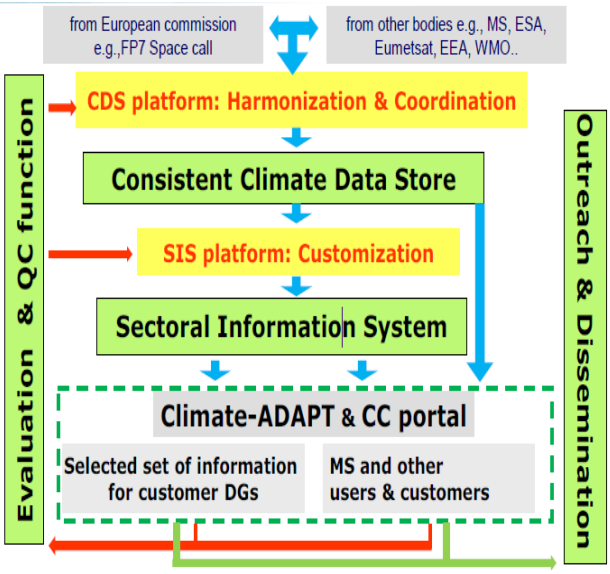


Fig. 1: Organisational diagram for the CCCS, from presentation by Jean-Noël Thepaut at the 2nd ECMWF Climate Change Service Workshop, 25-26 June 2014.

1.2 The role of research data and past observations

The Climate Change Service of Copernicus will depend not only on the active stream of data from the Copernicus space segment, but also on analysis of past observations and climate projections.

1.3 Structure of the project

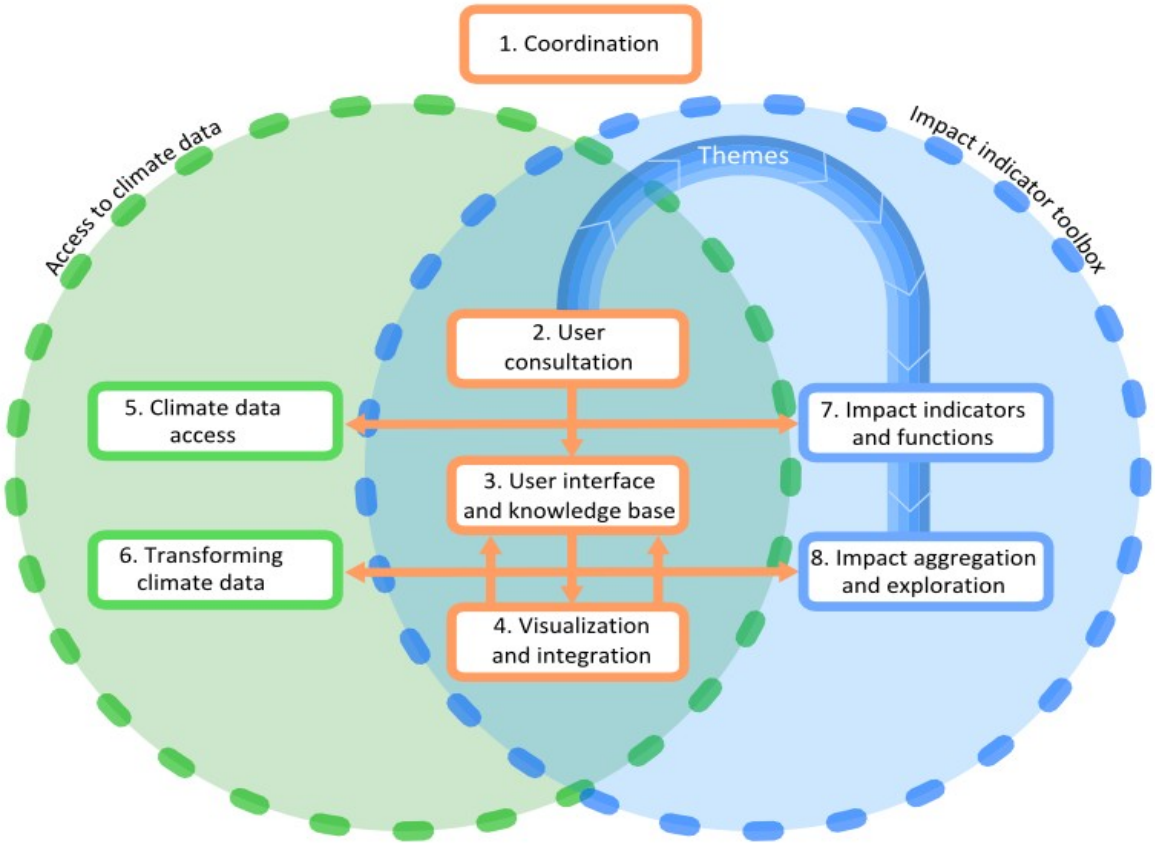
The project follows the call text in having two major components: access to climate data and the climate impacts toolkit. The data access component is will provide a data service infrastructure giving seamless access to a comprehensive range of climate data products. The climate impacts toolkit will build on this resource to provide products which are usable for a wide range of users.

The core technical work in each of these components is split across two work packages (WPs). In the data access component, WP5 Climate Data Access and WP6 Transforming Climate Data work on the technology of data services and the science behind preparation of high value climate data products respectively. In the climate impacts toolkit component, WP7 Impact Indicators and functions and WP8 Impact aggregation and exploration look at methodologies for first creating a broad range of climate impact indicators and secondly presenting them in a coherent framework which allows ranking and aggregation. Approximately 66% of the project resources is spread evenly

across these 4 WPs.

A further three WPs deal with gathering user requirements (WP2), visualisation and integration of services (WP4) and delivery of the services and associated information through a project portal (WP3).

Finally, four WPs are dealing with managerial issues: WP1 Project Coordination, WP9 Scientific Leadership, WP10 Dissemination and WP11 Overarching coordination (the interaction with 4 related projects funded in the same call).



9. Scientific leadership 10. Dissemination 11. Overarching Coordination (cross project)

1.4 Structure of the CLIPC infrastructure

1.4.1 The Earth System Grid Federation (ESGF)

The CLIPC data service infrastructure will be based on the Earth System Grid Federation (ESGF) architecture used to deliver the CMIP5 archive. ESGF is both a software provider, through a collaboration of projects with shared objectives, and a service provider through archive centers and modelling groups running data services. The ESGF software stack provides a flexible platform for creation and management of a distributed archive. The ESGF distributed archive was launched for the CMIP5 archive. Observational data has also been published through ESGF by the obs4mips

project. More recently the ana4mips projects has started to publish re-analysis data (from major forecasting centres, including ECMWF, NCEP, JRA).

ESGF software is an enabling technology and ESGF services are a best-effort collaboration: neither the software package nor the loose collaboration of partners running the ESGF service are capable of ensuring guaranteed levels of service. The quality control of datasets has not been implemented consistently across the ESGF federation, and there are many inconsistencies in the existing service. Within the ESGF federation the centers funded through the IS-ENES and IS-ENES2 FP7 projects have demonstrated that, with appropriate levels of support and coordination, reliable and consistent services can be provided. Nevertheless, ESGF has demonstrated the ability to disseminate large data volumes from multiple data and service providers.

CLIPC will address some technical limitations of the existing ESGF software, and also support the development of data standards which are critical to the creation of usable data collections.

What is ESGF?

ESGF software

The ESGF software stack provides a bundle of data access services which give users the flexibility to exploit complex data resources:

- Authentication and authorisation;
- Data publication;
- Single catalogue of distributed resources;
- Efficient and flexible search;
- Support for 3rd party client software.

ESGF Services

The ESGF software is implemented at a large an expanding number of centers. Many, but not all, of these centers are contributing to the development of the software stack. The success of this federated archive infrastructure depends on the ESGF software and a number of supporting services:

- Consistent file level meta-data and naming;
- Quality control of data;
- Earth System Model Documentation (ES-DOC);
- Archive back-up and curation services.

1.4.2 Next Generation Earth Observation data (ngEO)

The ESA ngEO project is equivalent to ESGF in that it provides a rich bundle of data services designed to support access by 3rd party software clients. We do not expect ESGF to be able to evolve to cover all the needs of the Earth Observation community (not least because it is serving the needs of the Earth System Modelling community – serving two masters would be bad enough, but there is further complexity because each of these communities has many faces). In order to ensure the flexibility needed to provided a comprehensive data service, CLIPC will develop a interface which allows users to submit queries to both ngEO and ESGF services.

1.4.3 Climate impacts toolkit

CLIPC will deliver a toolkit which will support production of climate impact indicators, and the aggregation and ranking of such indicators.

1.4.4 Visualisation and service integration

CLIPC will exploit developments in IS-ENES, IS-ENES2 to provide users with a visualisation service for data exploration and an intuitive search interface. The default ESGF search interface

provides flexibility and efficiency, but may be opaque to those who are not familiar with the jargon of the Earth System Modelling community.

1.5 Science in CLIPC

CLIPC is not a science research project, yet there are aspects of the services which require the active engagement of scientists within the project evaluating climate data and impacts of climate change and variability.

1.5.1 Harmonising climate data

Climate data comes in many forms, and also with many types of errors and uncertainties. For many applications it is desirable to have datasets which are at least consistent, with consistency usually defined in terms of the mean offset, or bias. There is no magic formula for removing bias, and careful scientific analysis of the data and the objectives in order to avoid degradation of information through the data transformations associated with harmonisation.

1.5.2 Characterising climate impact indicators

The creation of a framework which permits the description of a broad range of climate impact indicators with imposing misleading or ambiguous labels is, because of the huge range of phenomena and sectoral terminology, a challenging task. CLIPC is able to tackle this through involvement of a broad range of scientists actively involved in development of new climate impact indicators.

1.5.3 Ranking and aggregation of indicators

Moving beyond the characterisation of indicators, comparison and aggregation of indicators poses new challenges. The framework developed in the ESPON-CLIMATE project will be exploited to tackle this problem.

1.5.4 Data quality

A data quality working group is addressing critical cross-cutting issues around uncertainty and data quality. Dealing with uncertainty in climate projections is always challenging: within CLIPC we need to address additional challenges associated with sectoral impacts and users who are not accustomed to dealing with uncertainty. The task is made manageable by the fact that CLIPC is focussed on describing the state of knowledge, rather than trying to resolve outstanding issues.

2 Work Package Reports

2.1 WP1 Consortium Management

Partners: ***STFC***

2.1.1 Work carried out

Provide a brief review of work carried out. Describe any technical achievements, meetings organised etc.

T1.1 Project coordination and internal communication

Organisation of the first General Assembly.

Email lists established and maintained.

Document management system configured at clipc.author-e-eu

T1.2 Project execution

Template for deliverables.

Timetable and reminders to authors

Drafting of amendment to Grant Agreement.

Breakout session at the CLIPC First General Assembly.

2.1.2 Deliverables (completed and in progress) and main results

D1.1 Administrative procedures.
Delayed due to delay in publication of European Commission guidance on procedures for financial reporting. Now completed.

2.1.3 Problems encountered and proposed solutions

Improve consolidation of minutes and associated material.
Action: exploit the new portal developed by MARIS in WP3 and expected to be live in October.

2.1.4 Plans for the next 9 months

Indicate the issues you intend to tackle, and approach to be taken.

Preparation of financial reports for end of first reporting period.
Configure the online tool provided by EU-fin.

Second General Assembly
A provisional decision has been taken to hold this in Dortmund, with TUDO as as the local hosts.

2.2 WP2 User consultation

*Partners: **ALTERRA,** TEC, MET Norway, HZG Climate Service Center 2.0*

2.2.1 Work carried out

The objective of WP2 is to determine the requirements for the data access platform and the climate impact tool kit through consultation across a range of users. In the first six months a review has been carried out to examine the lessons learnt with user interaction in earlier and on-going scientific networks and projects. 11 Projects have been reviewed in detail and another 55 projects and initiatives have been quickly scanned. The review showed a diversity of potential user groups and their priorities, and, different consultation strategies. Based on the lessons learnt, a choice has been made to interact with three priority user categories including climate scientists, impact researchers, and intermediary organisations such as EEA and consultants. For each of these a specific

consultation strategy has been outlined. A detailed report discussing the outcomes of the review is available as deliverable 2.1.

A data base has been developed including more than 500 names and e-mail addresses of potential users from all over Europe. Just before the summer break, these contacts have been invited to respond to a short on line survey which aimed to quickly identify their preferences for data portals and indicators in a general way. It also identifies the way(s) these potential users are willing to become involved in the further development of the CLIPC portal. The survey is still ongoing. Based on the first responses a user group is being established (milestone MS4) consisting of a mix of people users from the three priority user categories. As people are still responding to the survey, the user group is still in development. Discussions on the focus of the planned qualitative interviews with user group members are ongoing.

Other ways to involve potential users in the development of the portal include presentations and workshop at conferences (Adaptation Frontiers: Conference on European Climate Change Adaptation Research and Practice, 10- 12 March, 2014 Lisbon; EEA –CLIPC meeting, 13 -14 May 2014, Copenhagen; EIONET meeting 24 June 2014, Copenhagen; meeting of the European Network of Environmental Protection Agencies (EPA) 8-9- September, Oslo).

2.2.2 Deliverables (completed and in progress) and main results

WP2 has completed deliverable 2.1 *User requirements, part 1- strategies for user consultation and engagement and user requirements: synthesis from past effort's* in June 2014. The review showed a diversity of potential user groups and their priorities, and, different consultation strategies. Four user categories will be considered in the CLIPC projects: Climate scientists, impact researchers, intermediary organizations such as EEA and societal end users, including policy makers and NGOs.

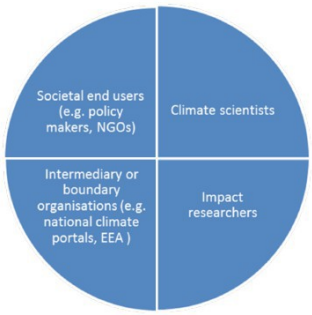


Fig. 1: Four user categories will be considered in the CLIPC project

However, informed on the one hand by the review and expectations about what CLIPC will offer on the other hand, categories climate scientists, impact researchers and intermediary organizations are considered *priority* user groups for the CLIPC project. Societal end users are assumed to be reached primarily via intermediary organizations. Consequently, a consultation strategy has been developed for the first three user categories only.

The establishment of user groups (MS4) has started in June as one of the outcomes of the online survey. As the survey is still ongoing, the user group is still in development. The user group brings together people working for intermediary organisations, impact researchers and climate scientists who will provide regular feedback to pilot versions of the architecture, platform and indicator tool box.

2.2.3 Problems encountered and proposed solutions

A change in personnel caused a slight delay in the beginning of the project. Some of the tasks of

METNo are taken over by HZG Climate Services Centre. Therefore deliverable 2.1 has been completed one month later than expected and the establishment of the user group(s) will take place in the end of September (M10). We hope to be able to deliver D2.2 *User requirement part* according to the DOW (M12).

2.2.4 Plans for the next 9 months

- Designing and implementing qualitative interviews to further explore user requirements
- Planning and implementing the user requirement workshop (MS5) (February, 2015)

2.3 WP3 User interface and knowledge base

Partners: MARIS, BODC, KNMI, SMHI, STFC

2.3.1 Work carried out

In the first year of the project the work in WP3 consisted of the following actions:

T3.1: Development of the administrative and project dissemination web portal (T3.1).

MARIS has designed and developed the first version of the portal website in close cooperation with coordinator and WP10 (dissemination work package) leader STFC. Design and initial content was discussed in various work package leaders teleconferences. The website is supported by an underlying database and Content Management System in which coordinator and other assigned users can update website content.
As the project develops more services and user interfaces will be added to the website.

Draft portal: http://test6.maris2.nl/

T3.4: Architecture Team (AT).

The architecture team has the task to document the portal architecture in which all developments of the project fit and interconnect in the correct way. The core team consists of STFC, KNMI and MARIS, but is actively supported by NERC-BODC (vocabulary service integration T3.2), Alterra (storyline), SMHI (knowledge base T3.3), PIK (climate impact indicators and storyline) and other partners.

In a complex project like CLIPC which aims to combine data and services from various domains (atmosphere data (meteo), marine data, and climate impact indicators) this task is very important. It started with an inventory of the existing, followed by drafting an architecture infrastructure, using a real storyline to support discussions and identify necessary services.

The AT has physically met twice in the first year at BODC (Liverpool) and KNMI (De Bilt), plus several KNMI / Alterra meetings in the Netherlands dedicated to the storyline, and the AT also had bimonthly teleconferences to support progress.

AT results are being documented in an internal project document which is aimed to be a discussion document, readable by all partners, to support interaction between the work packages and partners in the project. The actual developments of the architecture will start with services to retrieve data for the storyline, process data to create tier 1, 2 and 3 datasets and visualise this. This will lead to a prototype of the more general services in the CLIPC infrastructure.

2.3.2 Deliverables (completed and in progress) and main results

WP3 has no deliverable deadlines yet in the reported period.

MS8: Development of administrative portal (PM5).

Technical developments were delivered with slight delay (although provisional portal by STFC was online immediately at start project). Content editing was done in summer period leading to version 1 of the website in September 2014.

The first deliverable and further milestones are due in November 2014:

D3.1 Conceptual design (M12)

Underway. Will be based on outcome of the Architecture team document, plus portal developments.

MS9 Vocabulary server design (M12)

Underway. Close communication between AT and NERC-BODC has already lead to concept to setting up and using the vocabulary service as means for harmonised data discovery and required mappings. Vocabulary service also supplies term descriptions and is part of the knowledge base.

MS10 Knowledge base design (M12)

Underway. The knowledge base will consist of a combination of various services: Vocabulary service, glossary (plus embedding this in the webpages), WIKI pages on technology and documentation, ESDOC. This is documented in AT document but will be fully designed in a milestone document.

2.3.3 Problems encountered and proposed solutions

No problems reported.

2.3.4 Plans for the next 9 months

- Finish Architecture Team document
- Create initial services for storyline and embed this in the web portal
- Deliver designs for vocabulary server, knowledge base and integration of these services
- Expand web portal with first (visualisation) services of the storyline.

Indicate the issues you intend to tackle, and approach to be taken.

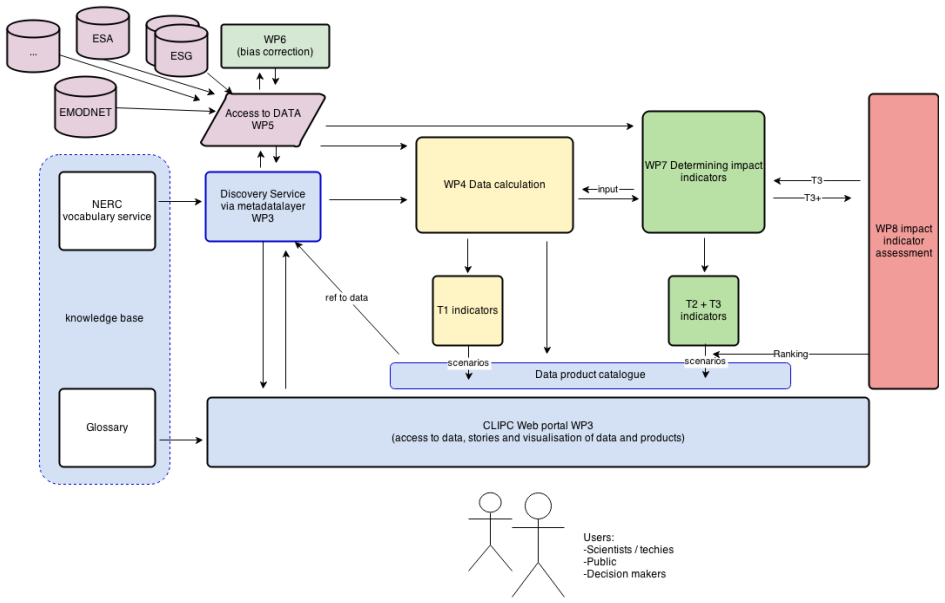
2.4 WP4 Visualisation and integration

*Partners: STFC, Alterra, **KNMI**, PIK,TUDO, CMC, JRC .*

The goal of WP4 is to develop suitable means for visualizing impact indicators to enable easy comparison and ranking of those indicators to the stakeholders to establish an overall user friendly 'lay out' for mapping and presentation of impact indicators and indices, using generic and uniform cartographic principles.

2.4.1 Work carried out

The work done is developed around a 'storyline'. The storyline is a real world case needing real data, a data flow around it, processing, documentation and visualisation, so it tests out the ideas and developments immediately. The big advantage of this approach is that there are quick results in the development work in the form of a working prototype, which make communication internally in the project and to external users much easier. Also, design flaws can be detected in an early stage. Therefore the storyline is also used in the Architecture board for conceptual testing the envisaged CLIPC architecture.



Goal for the story line: Provide urban heat vulnerability interactive map for Europe (T3 indicator) interesting for to C : Intermediary organisations and boundary workers. Interactivity will be in comparing current and future climate scenario's for cities in Europe on different maps. The goal of the product is raise awareness and to get the policy makers attention for this problem. The map will enable boundary workers to show comparisons between cities to policy makers. The map will not provide information for local city problems because of the map resolution, more local research for the specific city is needed to answer questions on a city scale.

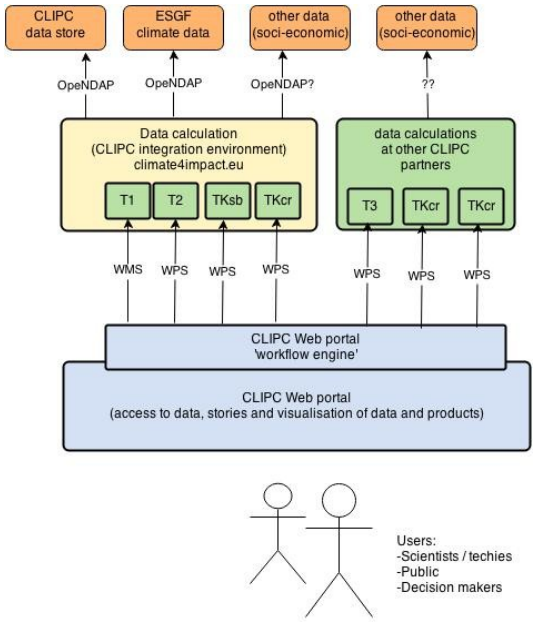
Task T4.1 – Development and deployment of generic visualization components
Work carried out: Development of the storyline.
Answers developed for the questions: what data is needed, what software is needed, who will run the software, what will be the workflow, which aspects will be interactive for the end user. We have a clear view of the data need, workflow and visualisation aspects. The T1 indices needed (summer days, tropical nights) can be interactively calculated and visualised. A pre-processed dataset based on CORDEX data is made available. The climate4impact portal is used to provide the data and data services.

Task T4.2 – Toolkit integration and indicator processing
In discussion with WP8 and WP7 the D4.1 Toolbox interface specification document has been written. As there are many developments in parallel (in WP3 WP8 and WP7) the document will be updated during early 2015 using the D7.1 review of climate impact indicators and D8.1 Impact models and aggregations. In the document is proposed to use OGC services for integration. In this way calculations and visualisations can be done integrated in e.g. climate4impact or deployed locally at a partner, exposed as a OGC WPS service.

Task 4.3 – Impact indicator toolkit
The work on task 4.3 will start practically at the beginning of 2015 (Jan-Feb, as soon as the products from the other relevant tasks become available). This is mainly due to the fact that currently there is not enough information about the nature of the products of CLIPC that will be integrated in Climate-ADAPT.

2.4.2 Deliverables (completed and in progress) and main results

- D4.1 Toolbox interface specification document (M6): Draft version available. Update is planned in January 2015
- D4.2 Effective visualisation (M18) Started with the storyline to start designing how to approach it.
- D4.3 Visualisation Manual (M34 Not started
- D4.4 Integrated toolbox report (M35) Not started
- D4.5 Link to Climate-ADAPT (M35) Task 4.3 will effectively start in January 2015, using the results (D7.1. and D8.1) to start discussions with JRC on the approach of integrating specific results in Climate-ADAPT.



From the CLIPC Web portal the different components can be accessed using the WPS protocol, regardless of their location in the integration environment or at a partner site.

In the figure example components are displayed, where: T1= tier 1 indices calculation, T2 =tier 2 indices calculation, T= tier 3 indices calculation, TKsb = toolkit component for scenario based exploration, TKcr = toolkit component for comparing, ranking and aggregation.

2.4.3 Problems encountered and proposed solutions

The writing of the D4.1deliverable took longer than expected, especially as not all technical aspects were sufficiently known and needed research. It was agreed to have an update of the document early 2015 based on the D7.1 and D8.1 deliverables.

CMCC Bologna will lead task T4.3 Impact Indicator Toolkit in stead of TUDO. CMCC has closer working relations with JRC/Climate-ADAPT, which will easy integration activities.

2.4.4 Plans for the next 9 months

- Develop the storyline to a working prototype (deadline February 2015, show as example at CLIPC user workshop). T1 is produced, next will be T2 and T3, and the visualisation of the end product.
- Contribute to the Architecture team (visualisation and integration of services). Agree on decision points sketched in D4.1.
- Based on feedback from the user workshop refine the storyline and visualisation components
- Update D4.1, in cooperation with WP7 and WP8.
- Start on integration of first prototypes from WP7 and WP8.

2.5 WP5 Harmonized Data Access

*Partners: **STFC**, KNMI, MARIS, SMHI, CNRS, CMCC, LIU, Magellium, UREAD, MetOffice*

2.5.1 Work carried out

The objective of WP5 is to harmonise access to a range of climate-relevant datasets through the portal developed in WP3 and WP4. The technical mechanism to achieve this will be by publishing selected datasets into the Earth System Grid Federation and interfacing the CLIP-C portal with ESGF.

An initial review of climate-relevant datasets available to the project was conducted and summarised in the CLIP-C dataset inventory (D5.1). We have selected 2 ESA CCI ECVs (SST and Ocean Colour) for publication into ESGF and agreed their inclusion with the CCI teams.

Within the cross-WP architecture working group we have developed the architecture which will link ESGF interfaces to the CLIP-C portal to enable authentication with ESGF, data visualisation and download. The CLIP-C architecture identifies the NERC Vocabulary Service as a central component; in preparation for extending its use to CLIP-C we have deployed a mirror of the service at STFC.

On September 22/23rd we held a workshop to design an interface between tape archives and ESGF. The workshop developed further an initial design known as SODA and preliminary work at LIU and UKMO to translate of ESGF search terms into tape archive queries. Further work at SMI is ongoing to develop Data Reference Syntax for the EURO4M 3D-VAR reanalysis.

2.5.2 Deliverables (completed and in progress) and main results

D5.1 : Climate Dataset Inventory

A draft under internal review (and submitted for discussion in interim review meeting). The inventory captured metadata and quality information about re-analyses (EURO4M 3D-VAR), regional models (CORDEX), observations (ECA&D, HadOBS) and satellite ECVs (ESA-CCI, EUMETSAT ECVs) into a common framework and identified datasets that could provide the source for Tier1 and 2 indicators.

D5.2 : Metadata and controlled vocabularies (due month 24)

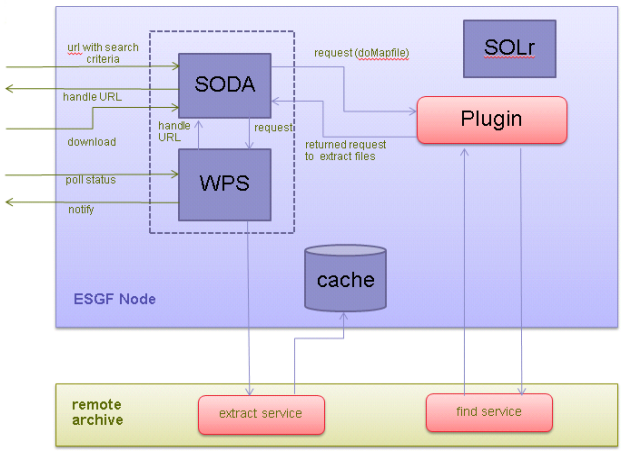
A Data reference syntax is in progress for EURO4M 3D-VAR re-analyses and the ESA CCI Ocean Colour and SST products. The NERC Vocabulary Service mirror is being deployed at STFC.

D5.3: Publication of project datasets (due month 30)

Not started.

D5.4 : Tape archive interface (due month 30)

In progress. An ESGF architecture design proposal is being developed from the outcomes of the tape archive integration workshop held in September. WP5 is developing 2 specific use cases targeting the LIU MARS tape system and the UKMO MASS-R tape system.



Design of System for Offline Data Access (SODA) for publishing tape archived data to ESGF

D5.5 : Interoperability demonstrator (due month 36)

Not started.

2.5.3 Problems encountered and proposed solutions

- The current climate dataset inventory does not meet all the needs of other CLIP-C work packages in providing a comprehensive overview of available sources including information on suitability for different analyses purposes and strengths/weaknesses. This will be addressed in an update to the inventory.

2.5.4 Plans for the next 9 months

- Incorporate more detailed dataset evaluation into the dataset inventory.
- Complete SODA design specification and present at ESGF Face2Face meeting in December 2014. Begin implementation of SODA at LIU.
- Encode CORDEX and CMIP5 Data Reference Syntax terms into the Vocabulary Service.
- Bring the HadOBS datasets to the JASMIN infrastructure at STFC and prepare some initial HadOBS datasets for publication into ESGF.
- Publish the ESA CCI SST datasets into ESGF.

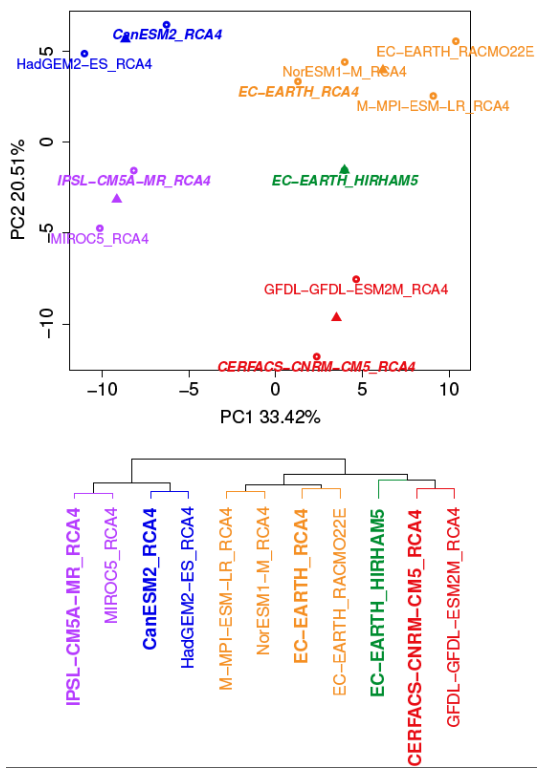
2.6 WP6 Transforming climate data

*Partners:**SMHI**, KNMI, CERFACS, CNRS, FMI, HGZ, MetNo, UREAD, SYKE*

2.6.1 Work carried out

WP6 work has progressed mainly along the following lines: i) development of bias correction methods and tools; ii) development of tools for calculating Tier-1 Climate Change Impact Indicators (CCII-T1); iii) development of methods for producing reduced ensembles; and iv) contribution to the horizontal work on uncertainty.

Bias correction tools are under development based on existing methods and tools. An inter-project initiative on comparing various popular bias-correction methods was launched in spring 2014 with participation from a number of institutes and groups, of which several are in the CLIPC consortium. The aim is to compare methods (and tools) by following an agreed common protocol that specifies the input data (several reference datasets and an ensemble of climate scenarios), as well as a standard set of evaluations and analyses. This protocol has been agreed, and the relevant datasets have been distributed to the participating groups. By using multiple reference datasets and comparing several methods it will be possible to deduce quantitative information contributing towards better understanding



Example of the ensemble reduction method: an ensembe of 11 scenarios are redused to four groups from which one member is picked.

of ensemble uncertainty, quality and fitness for specific purposes.

Tools for calculating CCII-T1 are developed in close collaboration with IS-ENES2 activities. We anticipate that WP7 will provide examples of suitable indices. One has already been identified; an Urban Heat Index (UHI) based on temperature and humidity (and wind speed).

Work on developing methods for selecting a representative reduced ensemble is ongoing and first results have been produced (see Figure). The method is very flexible and the analyst is free to choose a combination of variables and/or indices, as well as which regions, to use as basis for the selection procedure.

2.6.2 Deliverables (completed and in progress) and main results

WP6 has no deliverable in this period.

2.6.3 Problems encountered and proposed solutions

Milestone MS24 was scheduled for month 6. A major component of this milestone is making the EURO4M high-resolution downscaled surface reanalysis dataset available for use within CLIPC. However, after that the EURO4M project was finished in April 2014, some quality issues were discovered. This resulted in that during May-September substantial resources (internal to SMHI) have been spent on resolving these issues before dissemination of the dataset through CLIPC. The sources of the problem were found; it was a combination of software bug and quality problems in the input (observational) data. These issues are now resolved and the data is currently being converted to adhere to the data and metadata standards developed in WP5.

2.6.4 Plans for the next 9 months

- Dissemination of the EURO4M high-resolution downscaled surface reanalysis dataset (imminent).
- Work is ongoing to meet Milestone MS25 (month 12). Much of the work has already been done. Dissemination of the data within the CLIPC consortium in collaboration with WP5.
- Completing Deliverable D6.1 (month 18). Milestone MS25 is a major step towards this. Dissemination of the datasets in collaboration with WP5.
- Continue the work on the bias-correction inter-comparison initiative.
- Continue and expand the work on methods for selecting representative reduced ensembles.
- Continue work on the toolkit for calculating CCII-T1 in collaboration with IS-ENES2.

2.7 WP7- Impact indicators and functions

Partners: ***PIK****; ALTERRA; CERFACS; FMI; HGZ; JRC; SYKE; UAB; TUDO.*

2.7.1 Work carried out

WP7 work has been on documenting the methodological basis, data and requirements, usability, relevance and scope of use of potential indicators to be provided via the CLIPC portal. The indicator documentation started with the selection of criteria to be provided by the involved partners in regard to indicators across the three investigated themes in CLIPC, namely, Urban, Rural and Water. As part of the selection of criteria an expert 2-day meeting was conducted at the European Environmental Agency (EEA) in May 2014 in order to discuss a preliminary set of criteria

circulated by the work packages leaders' forehand. Relevant institutions where invited such as JRC (in the role of climate change impact data and services), the Task Group on Scenarios for Climate and Impact Assessment (TGCIA) and the Data Distribution Centre (DDC) were also involved. The meeting was not limited to WP7 partners. Due to the importance of an early alignment of indicator collection and CLIPC users expectations the leading institution of WP2 was also invited to provide the preliminary outputs on the work related to priority users/user groups for CLIPC user strategy. Finally, potential connections to the EEA and platform functionalities regarding climate impact and change indicators where discussed and a subsequent (more small) meeting was proposed when more WP7 results become available. A more detailed report of the main outcomes is available as part of Milestone 29 in WP7 (Expert group workshop to review climate change impact indicators).

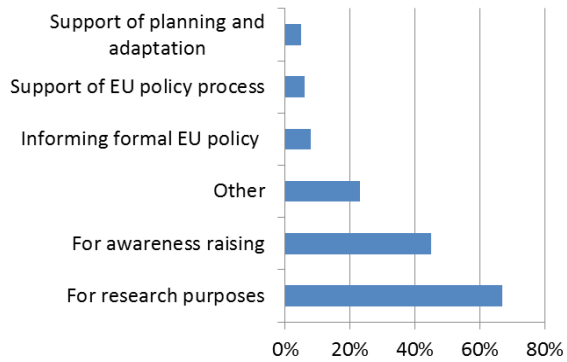
Discussions undertaken served to refine criteria listing and a tentative calendar for the conclusion of the first WP7 deliverable was set forward. Posterior discussions with theme leader of WP7 lead to a final version of the criteria to be documented. An online form was created to facilitate criteria selection and made available to all the partners contributing to WP7[1]. Gathering of indicator criteria started in July 2014 and since then information for about *60* impact and climate change indicators have been documented. During the period of criteria collection a first draft of deliverable 7.1 entitled "A review of climate impact indicators". The first draft lays down the rationale behind the criteria selection, reviews a number of concluded and ongoing EU projects that have produced climate change and impact indicators and outlines a tentative analysis of the criteria for the set of indicators documented (as in 4-10-2014).

In parallel with the work described forehand, WP7 also engaged on the formulation of story-lines together with the Visualisation and integration group (WP4) in exploring how the future integration of climate impact and change indicators can progress within the CLIPC project. Priority was given for now to the case of heatwave impacts.

2.7.2 Deliverables (completed and in progress) and main results

Work package 7 has completed the milestone of bringing together an expert group to discuss criteria to document climate impact and climate change indicators.

Deliverable 7.1 (see above) is currently in progress. Preliminary conclusions point for the need to reinforce the search of Tier 2 and 3 indicators (that is, indicators that inform on social and economic consequences of climate change) within the next months. This is also expected to correct the unbalanced number of indicator whose scope of use is research (see figure on the right). The knowledge base of indicator in WP7 is therefore expected to be expanded.



Example of the current distribution of indicators according to their scope of use in the WP7 indicator database.

In addition, the criteria documented are expected to allow the alignment of potential impact indicators to particular user groups in CLIPC, for example, according with the length of time series required, scope of use of an indicator or the conceptual framework underlying the indicator (e.g., climate change vulnerability, risk-hazard).

[1] *Available at: https://docs.google.com/forms/d/1SSWYuMdYPK1WdY9uOANDZPqUJjwJYrcCKPN9qajt1KE/viewform*

2.7.3 Problems encountered and proposed solutions

A slight delay in completing D7.1 is expected. The main reason for such has been the large overlap of criteria collection with the main holiday period (August). Additionally, there is the need to devote more efforts to the collection of particular indicators Tiers (see above).For such reasons it was agreed within the WP leaders to give one more month to finalize D7.1 without substantial consequences to further work. The upper-side of such delay will be a more complete picture os user requirements emerging from WP2.

2.7.4 Plans for the next 9 months

- Complete the documentation of indicator criteria.
- Finalizing deliverable 7.1.
- Finalize the integration of Tier 2 and 3 in the heat-wave story line together with WP7 in a working prototype to facilitate the communication of CLIPC potential results.
- Begin the drafting of deliverable 7.2 on building a framework for new indicators.
- Preliminary calculations of impact indicators.
- Research will also continue with respect to new Tier-2 and Tier-3 indicators, which information will then be used within the developed framework

2.8 WP8 Impact aggregation and exploration

Partners: TUDO, HZG, PIK, Alterra, FMI, SYKE, JRC

2.8.1 Work carried out

The main objectives of WP8 are to develop methodologies and tools for comparing, ranking and aggregating impact indicators and for exploring scenario-based indicators and their uncertainties.

WP8 builds on the work of all preceding indicator-oriented work packages, most importantly WP7 which identifies, collects and describes existing and develops additional tier 3 impact indicators. These indicators will subsequently become inputs for the various tools that are developed in WP8 and will eventually be integrated into the interactive user interface developed by WP4. Therefore work carried out until the Interim Review comprised coordinating with these work packages and conducting preparatory work that will culminate in methodological outlines of WP8 tools.

Within Task 8.1 WP8 partners participated in the design of the impact indicator metadata template of WP7. This was to ensure that sections on the conceptual models underlying the indicators are integrated in the template and the respective information is collected in the on-going impact indicator survey. A first set of criteria was defined which will be the basis for reviewing the indicators regarding their conceptual and methodological compatibility, once the WP7 indicator compilation is completed. This assessment will identify different types and degrees of indicator compatibility and is an important prerequisite for Tasks 8.2 and 8.3., whose tools will link indicators in various ways.

Within Task 8.2 work has started on identifying and reviewing existing sensitivity scenarios, which will later on form the basis for the scenario-based impact indicator exploration tool. Special attention has been given to exploring the potentials and limitations of the new shared socio-economic pathways (SSPs) that complement the representative concentration pathways (RCPs) that are currently used by the modelling community within the new parallel modelling approach of the IPCC. Based on the impact indicators finally included in the WP7 indicator

collection and the outcome of the compatibility assessment of Task 8.1 the next steps will be to identify the most suitable scenarios and devise methodologies for possibly modifying and differentiating them further – both thematically and spatially.

Within Task 8.3 existing tools for comparing, ranking and aggregating climate change impact indicators are currently being reviewed. Technical possibilities and requirements for programming tools that will be integrated into CLIP-C's impact toolkit, which will comprise user input and quick visualisation of results, have been explored and exchanged with WP4. As a next step first and forthcoming results of the user consultations performed by WP2 in regard to user needs will be examined that will likewise feed into the first outline of the comparison, ranking and aggregation tools.

Within Task 8.4 WP8 partners engaged in the WP7 indicator compilation process and ensured that relevant information on indicator uncertainty was integrated in the impact indicator metadata template. Since Task 8.4 has to also take account of uncertainties stemming from WP5 and WP6 indicators, a working group was formed with representatives of relevant work packages. This working group discussed the issue of uncertainty of different data types (from in-situ observations, satellites, climate models and impact models) and set up tasks for reviewing state of the art methods on uncertainty assessment, comparing developments in other relevant European research projects and collecting respective information for the CLIP-C knowledge base.

2.8.2 Deliverables (completed and in progress) and main results

WP8 had no deliverables due in this period. Work on Deliverable D8.1 (Assessment of impact indicators regarding their conceptual compatibility) has started (see Task 8.1 descriptions above) and will be completed based on the completed WP7 indicator compilation.

2.8.3 Problems encountered and proposed solutions

The slight extension of the impact indicator compilation of WP7 (leading up to D7.1) might impact the delivery of D8.1, which is largely based on Task 7.1, from M12 to M13. However, measures have been taken to hopefully avert this by starting the analysis before full completion of D7.1.

2.8.4 Plans for the next 9 months

- Complete the indicator compatibility assessment (Task 8.1, M12)
- Develop an outline of objectives and tools for scenario-based indicator exploration (Task 8.2, M13)
- Develop a draft methodology for scenario-based exploration of climate impact indicators (Task 8.2, M16)
- Develop an outline of objectives and tools for comparing, ranking and aggregating impact indicators (Task 8.3, M13)
- Develop a draft methodology for comparing, ranking and aggregating impact indicators (Task 8.3, M17)
- Develop an outline of objectives and tools for assessing the uncertainty of climate change impact indicators (Task 8.4, M13)

Develop a draft methodology for uncertainty assessment of climate change impact indicators (Task 8.4, M18)

2.9 WP9 Scientific and technical coordination

Partners: STFC, Alterra, SMHI

2.9.1 Work carried out

T9.1 - Strategy for scientific delivery

In order to foster discussion of the technological challenges and potential pathways to service delivery, a meeting at KNMI is being organised in November. The meeting will bring together technical developers from a range of projects.

2.9.2 Deliverables

No deliverables in this period.

2.9.3 Problems

No significant problems.

2.9.4 Plans

Creation of the sustainability plan, due in month 10. The pathway for sustainability of the infrastructure will be within the Copernicus Climate Change Service. The issues to be addressed are the maintenance of appropriate interactions with the users, the flow of scientific information, and ensuring that data standards are maintained at a level which supports the needs of the scientific community.

2.10 WP10 Dissemination

Partners: ***All (STFC lead)***

2.10.1 Work carried out

T10.1 - Coordination of dissemination activities. [Months: 1-36]

A Google form has been created to collect information about the meetings, conferences and other events that the project team attend and present about CLIPC.
A Powerpoint template for project presentations and a poster template have been created, with branding consistent with the project webpage.
The Dissemination Plan (D10.1) has been drafted.

T10.2 - Addressing the scientific community. [Months: 1-36]

CLIPC members attended the following meetings:

Name of event	Date of event (mm/dd/yyyy)	Place of event
CIRCLE2: Science-practice interactions for effective climate change adaptation	1/29/2014	Bonn, Germany
4th CCI Collocation Meeting	2/4/2014	Frascati, Italy
(Re)Thinking National Climate Scenarios	12/16/2013	Reading, UK
4th CCI Integration Meeting	6/2/2014	Exeter, UK
EPA Interest Group (IG) Climate Change Adaptation.	9/8/2014	Oslo
RCM2014	6/16/2014	Lund, Sweden
Adaptation Frontiers	3/10/2014	Lisbon
ECMWF Copernicus Climate Change Monitoring Service Work-shop	2/17/2014	Reading
2nd ECMWF Climate Change Service Workshop	6/25/2014	Reading

T10.3 - Addressing society [Months: 1-36]

The project website, as the primary source of project information for users, has been developed and will be live in October 2014.

T10.4 - Addressing policy [Months: 1-36]

Work on this task is planned for later in the project, when results from the project can be disseminated to policy makers in an appropriate format.

2.10.2 Deliverables (completed and in progress) and main results

2.10.3 D10.4 : CLIPC flyer

A flyer describing the project and the planned portal, targeted at the general public, has been developed and provided through the portal as a pdf document. [month 9]

D10.1 : Dissemination plan

A report on the points of contact and avenues for dissemination towards society and policy has been created. This plan includes a list of organisations to be contacted, detailing the type of information the organisations deal with, the mode of contact (e.g. visit, inviting them to a workshop, attending an event hosted by the, telephone call, posting a briefing).[month 15]

2.10.4 Problems encountered and proposed solutions

Improve reporting of meeting attendance.

Meeting attendance is captured by a Google form. Project members need to be reminded to complete the form after attending any meetings where they present CLIPC.

2.10.5 Plans for the next 9 months

Indicate the issues you intend to tackle, and approach to be taken.

Continue dissemination efforts

Write a Wikipedia page for the project, aimed at the non-scientific user, detailing the planned project outcomes and linking to the CLIPC website.

Continue to collect information about dissemination efforts, targeting appropriate scientific meetings as they arise.

Work with the other work packages to coordinate the first in the planned series of workshops targeted at various stakeholder groups.

2.11 WP11 Overarching coordination

The overarching WP, coordinated by KNMI, is designed to promote coordination between five projects funded to prepare pre-operational Copernicus Climate Change Service components: ERA-CLIM2, UERRA, EUCLEIA, CLIPC and QA4ECV. The WP is run jointly in the 5 projects. A single telephone conference has been held, with further calls expected every 3 months.

In the initial call there was some discussion of a joint web site. The CLIPC proposal includes allowance for provision of a joint web page. The resource costs of providing an additional content management system to support an independent web site would be €3000 to €5000, depending on the options required. It is not clear who would provide resources for moderating and updating the content of such a site.

3 Highlights and Outlook

CLIPC has brought together a large and diverse consortium, which has made a successful start on the complex task of service integration across the multiple disciplines of climate science and across the diverse sectors of climate impacts, and between these two broad and disparate activities.

3.1 Highlights

User requirements

CLIPC was not expecting to have a full analysis of user requirements at this stage of the project, though we already have a clear understanding that there is a need for greater ease of access. The user requirements WP has produced a valuable review of user needs and approaches to the process of user engagements across 55 research projects.

Preliminary Impact Indicator Catalogue

Climate change and variability has the potential to impact on a huge range of human activities, and a correspondingly broad range of methodologies and conceptual models have been used to assess, illustrate and quantify this impact. In order to present the information to the users in a useful and coherent manner we need to bring this intellectual and phenomenological diversity into a single framework which gives the information some structure without distorting it. A procedure for

gathering appropriate information about impact indicators has been developed and used to assemble a preliminary catalogue.

Harmonising climate data

Through coordination with parallel projects dealing with biasses in climate datasets, CLIPC is helping to create a coherent set of products which reflect best practise in adjusting for bias and are complemented by comprehensive assessments of uncertainty which reflect data limitations and methodological uncertainties.

Harmonising access to climate data

CCCS data infrastructure will, in order to avoid duplication, need to interact seamlessly with existing data infrastructure operated by European national weather centres and the European Centre for Medium Range Weather Forecasting. This requires work on interactions between ESGF and the MARS tape storage system. This task needs to address both the different data access characteristics associated with data on tape and the format of the stored data. Progress is being made through a series of meetings with staff at ECMWF responsible for development of the MARS system.

3.2 Outlook

The CCCS operator

The conclusion of the delegation agreement appointing the operator of the CCCS service is expected this Autumn. Once this is announced, CLIPC will be able to engage with the operator to ensure that CLIPC can provide effective input into the development of an operational service.

Portal design meeting

A meeting to discuss portal design is being convened at KNMI in November. This meeting will be an opportunity for technical experts to discuss opportunities and obstacles.

User Requirements meeting

A user requirements workshop is being organised for February 2015. At this workshop WP leaders will present early designs to members of user communities and engage in discussion to gather feedback.