Mid-term meeting of ERA4CS projects

17-18 September 2019, Brussels

Meeting report

Context

ERA4CS (Research in support of Climate Services) is an ERANet funded by the European Union (Grant Agreement 690462) and 45 Research Funding Organizations (RFO) and Research Performing Organizations (RPO) from 18 European countries. ERA4CS has selected twenty-six research projects for three-year funding (covering end 2017 to early 2021). Three meetings of all projects will be organized (Kick-off, mid-term and final meetings). For these meetings, ERA4CS also invites representatives from the JPI-Climate Transdisciplinary Advisory Board, from the Climate KIC, from other actions of the JPI-Climate, and from funding agencies, in order to hear their comments.

ERA4CS also supports a monitoring team (WP5) with the objective of helping the projects to reach their objectives and communicate on their results. Members of the monitoring team have been invited to the mid-term meeting in order to clarify any issue resulting from the mid-term evaluation exercise.

The mid-term meeting held in Brussels on 17-18 September had therefore the following objectives:

- Take stock of the progress of the projects at the middle of their lifetime, and inform a variety of stakeholders of the on-going findings and developments
- Help the projects to optimally use the second half of their lifetime by collecting comments and advices from all stakeholders present.
- Clarify any issue remaining after the mid-term evaluation exercise
- Provide an opportunity for exchanges between the Copernicus Climate Change Service team and the ERA4CS projects.

Each project had the possibility to send up to three representatives to the meeting, to cover various objectives. For oral presentations of results, the projects were grouped by clusters sharing a similar societal benefit or interest (see the Programme in Annex 1). For each cluster, a roundtable of project lead investigators was organized, to discuss issues common to all projects and to hear the stakeholders' comments. The projects also had the possibility to present a poster, and a time for bilateral discussions between project representatives and evaluators or funding agencies was arranged.

The final session allowed a revisit of the main issues identified during the roundtables, and opened a discussion of new actions to be undertaken under ERA4CS.

All presentations are available on:
https://antiphishing.vadesecure.com/2/UGhpbGlwcGUuQk9VR0VBVUxUQGFnZW5jZXJlY2hlcmNoZS5mcnxWUkM4MDQ0MzI%3D/drive.google.com/open%3Fid%3D19eie-WtIMd17wi_-9tELDSRnwjT7Rcf-

(Access restricted to ERA4CS members).

Highlights of presentations and discussions

Opening session

Miguel-Ángel Martínez-Botí (EC) thanked ERA4CS and JPI-Climate for their participation and the activities organised at the ECCA2019 conference. Miguel reminded the participants that Climate Change is a priority for the new EC President-elect, Ursula von der Leyen, who has proposed a European Green Deal. Miguel mentioned the new commissioner for Innovation and Youth, Mariya Gabriel, responsible for Horizon Europe. Miguel mentioned the Horizon Europe missions, especially the one on Climate Adaptation, which aim to show EU citizens the impact of the funded research. An important issue for the future is to advertise what ERA4CS could offer to the missions.

Mar Rodríguez (BSC) explained briefly the mid-term evaluation process and introduced the members of the ERA4CS monitoring team.

Freja Vamborg (European Center for Medium-Range Weather Forecasts - ECMWF) presented the Copernicus Climate Change Service (C3S). The aim of C3S is to deliver user-driven operational services. To guarantee open and free access to data, C3S has created the Climate Data Store (CDS). C3S also includes a sectoral information system to show what the data can be used for. The CDS ensures traceability and transparency of the data and tools. The CDS also includes training activities for users. So far, there are 21 123 users on the CDS and 63 Tbytes downloaded every day. New aspects that could be developed in the near future are decadal predictions and attribution of extreme events. Concerning the relations between C3S and ERA4CS, Freja asked which ERA4CS activities could be operationalised. She mentioned as possibilities datasets, workflows and business cases.

Cluster 1: Water-Agriculture-Energy

Aquaclew (Christiana Photiadou): The project supports the quality of climate services for the water-related sectors in general. It uses C3S data. Deliverables are on time. The feedback loops (on-line survey to get feedback) are a success. The project also includes training of master students. The project uses an iterative approach to assess the usability of the service between users and providers. The project has introduced climate friendliness measures. The project has experienced “user fatigue”: southern EU stakeholders are more interested in reviews and questions than northern EU stakeholders.

CIREG (Stefan Hirsch): The goal of the project is to support decision-making in the West African energy sector, with an opportunity to “leapfrog” towards renewable energy generation (REG). The project relied on the WASCAL community to reach African end-users and has composed a panel of 40 to 50 such users. Several workshops have been organised with them and 2 papers have been published in collaboration with local researchers. Although the project had access to the official development plans of several African countries, they are aware that the most sensitive information remains protected and

inaccessible. The upscaling opportunity (applicability to other countries) is also an interesting question.

CLIM2POWER (Sofia Simoes): The project develops assistance to decision making in the energy domain, focusing on seasonal time horizon. It has created several user boards (one European User Board and national user boards for Austria, France, Portugal and Sweden). These boards include policy makers and energy providers. A user-friendly website has been set-up with interactive maps and infographics. They intend to continue operation of the website for at least two years after the end of the project. The discussion focused on the acceptability of uncertainties of seasonal forecasts by the energy sector.

CLIMALERT (Cláudia Pascoal): The project is targeting users from the agriculture and water sectors (farmers and water managers). A large number of stakeholders and end-users have been involved. It is developing a user-friendly mobile app (now available as beta version), with information on historical data, current situation and short-term weather forecast, vegetation status, and soil moisture at very small scale, with high spatial resolution, mainly useful for farmers. Another objective is to build a user friendly web application that will contain relevant information on current status of biodiversity and ecosystem services (e.g., water provision, water quality) while providing scenarios for those ecosystem services according to different projections of climatic change and management options. This should open windows of opportunities for promoting water and agriculture sustainability with benefits for stakeholders and end-users.

CLISWELN (Roger Cremades): This project aims to show how climate data impacts the Water-Land-Energy nexus (WELN). It has invested a lot of efforts in dealing with users and produced a guide of the Interaction with the users, with ten principles. The project has demonstrated that the WELN is a useful concept for policy makers. It will organise a session at the Adaptation Futures 2020 conference. The project uses SWICCA, which is a tool for hydrology (from C3S). The project is also organising training sessions locally.

CO-MICC (Petra Döll): The goal of the project is to derive from a multi-model ensemble an estimation of hydrological hazards due to climate change at the global scale, co-developing suitable methods for communicating this information to relevant stakeholders in a user-friendly way together with experts at the basin (Ebro) and transboundary scale (Morocco, Algeria, Tunisia). It covers the elaboration of the best methods to present the uncertainties of the hydrological hazards, the development of a pre-operational web site to deliver the service and the development and description of methods for utilizing the global-scale information for local adaptation planning. In the discussion, limitations due to lack of information on water reservoir operations were highlighted. This reveals the need to improve the access to reservoir data in order to better calibrate hydrological models

WATEXR (Rafael Marcé): The project focuses on the use of seasonal predictions and ecosystem impact modelling for water quality management. It includes 7 case studies (including 1 in Australia) and the development of several tools. As expected, probabilistic information has revealed difficult to assimilate by some users, especially as seasonal predictions often have very low information content over Europe. But there exist windows

of opportunities. The project has also organised training sessions for early career researchers. All project outputs will be widely accessible (open data and open source).

MEDSCOPE (Silvio Gualdi): The project uses C3S seasonal predictions for the Mediterranean region. Its users are the MedCOF (Mediterranean Climate Outlook Forum) user community: National hydro-meteorological services from more than 30 Mediterranean countries. The project focuses on the development of new tools to manipulate the data and prepare forecasts, making them more suitable for production of climate services. The tools are functions for forecast calibration, bias correction, downscaling, verification and visualisation. A first release of the tools is already available on CRAN (R repository), with examples showing how to use them. Prototypes of climate services based on seasonal forecasts have been developed for particular set of users, such as, for example, the Spanish water management authorities.

ROUNDTABLE on CLUSTER 1 (chaired by Asuncion StClair)

- Engagement with users: All projects encounter the same difficulty: it is not so much difficult to initiate a dialogue with the end-users, the real difficulty is to develop mutual confidence and to maintain the user community alive for a long period. One should also recognize that every user has different needs and may not always want to reveal its own vulnerabilities. There is a need to develop measures for the quality of the engagement with users, for instance to appreciate if a project has built a really representative panel of users and got honest replies from them. The representativity of the users should be evaluated during the course of projects.
- Need for benchmarking: the discussion stressed that in many cases, users have already access to some climate information for their daily business. Any new climate service will be evaluated to decide if it brings added-value compared to what existed before. This should be subject to a specific evaluation: Projects should ask their users what type of information they were using before, and if they are willing to change because of the success of the project.
- Seasonal forecasts were a focus for several projects of this cluster. They present specific difficulties, as the quality of seasonal forecasts is generally low, and especially over Europe. Some categories of users are currently going away from seasonal predictions because they were disappointed by the skill. One must be very careful to exploit only the “windows of opportunities” were the forecasts contain some real information.
- Legacy of the projects. Most projects are not sure how they will update the data on the platforms and maintain the developed tools after the end of the projects. In many cases it is obvious that the climate service cannot be delivered on a commercial basis, because the quality of the information is not sufficient. On the other side, governments have already paid for this information, so what would be the rationale to sell it to users? In some cases a climate service developed by a project should be delivered for free by a state organization after the project, if it represents a real societal benefit. Not all climate services are meant to be put on the market. It does not mean that they are not useful climate services.

- Many comments also stressed that more climate science is needed to improve the tools under development.

Cluster 2: Marine and coastal issues

COCLIME (Caroline Cusack): The project is focusing on climate services for the marine ecosystems, essentially to protect against the ecology, economy and health impacts posed by proliferations of harmful microorganisms (microalgae). Harmful Algal Blooms and pathogen bloom events constitute the climate change indicator in itself that requires a local and short temporal scale hindcast and forecast modelling. Also CoCliME is linking harmful events with other related vulnerability and adaptation social and economic indicators. The project has identified 183 users (stakeholder mapping exercise). User interest is assessed using an interest and influence grid. An extension has been requested due to difficulty to hire staff to address modelling tasks. From the gained experience with users, face-to-face consultations create more interest from users than surveys.

ECLISEA (Melisa Menendes): The project focuses on waves, currents, winds and sea level at European scale. The intention is to develop the prototype of a coastal climate service. Its outcomes should be used by local coastal managers and renewable energy companies throughout Europe. The projects make use C3S data, but the methodology developed can be applied in the future with different datasets.

INSEAPTION (Goneri Le Cozanet): the project develops coastal services in various parts of the world, with due regards to the expected sea-level rise due to climate change. Each end-user has different decisions to take and solutions should be specifically tailored to fit their needs (e.g. different projections…). The project has collected user needs at the global scale and at regional scales for specific case studies. They also conduct some upstream research to reduce e.g. the uncertainties due to sediment transport and changes in the shoreline. The project also noted a few surprising statements in the mid-term reviews and provided complementary information.

SALIENSEAS (Machiel Lamers): The project is developing services for maritime transport in the Arctic Ocean. They noted that users have a high demand for weather-scale information, with a serious focus on sea-ice and icebergs. Seasonal forecasts are also of interest if their quality can be improved. In addition to C3S, the project is also in contact with the Copernicus Marine Environment Monitoring Service. The project has developed a serious game as part of an experimental approach to engage with stakeholders. The Danish partner is developing its own model. One lesson is that co-production with end-users means flexibility and potentially changing some of your plans to fit their needs.

ROUNDTABLE of CLUSTER 2 (chaired by Anne Coudrain)

- Like in other sectors, users of the maritime industry sector appear more concerned by short-term issues than by long-term issues such as climate change. Goneri Le Cozannet noted that one way to motivate industry for long-term issue was to work on new regulations with governments.

- Interesting lessons have been learnt from engagement with users and should be shared. For instance, several users from the private sector are afraid that government stops funding the development of climate services and this may generate a bias in their statements.
- It was noted that several projects of this cluster could work together on common interests and publish their results (article, policy brief…). Identified common interests: stakeholder engagement and seasonal predictions.
- This sector will certainly need a new initiative to continue the development of relevant services after ERA4CS. It was recommended to create an "ERA4CS projects WG" as a sub-group of the Climateurope Climate Services WG.
- As publicly-funded projects, all projects should pay special attention to the impact of the project.
- It was also noted that this sector is one where mitigation comes naturally into discussions. This is offering opportunities for the future.

Cluster 3: Policy, finance, tourism

CLIMINVEST (Miriam Dahl): The project addresses the needs expressed by the Task Force on Climate-related Financial Disclosures, to better understand physical climate risks and incorporate it in useful indicators to monitor investments. The project has set up a co-design platform called "Science practice labs". Another objective of the projects is to determine how investments in green projects can help climate adaptation.

INDECIS (Enric Aguilar): This project addresses potentially a large number of sectors, focusing on increasing the quality and usability of small-scale climate data. It builds largely on the existing ECA&D and C3S services. The needs of a variety of users have also been collected. The project has co-developed 136 indicators with stakeholders and will produce them in a more systematic manner. Most of the project results are freely available online.

SENSES (Elmar Kriegler): The aim of this project is to make climate change scenarios more accessible and usable by effective communication, and empowering users to explore scenario information. Its users are expected to be Climate Policy Makers, Business Actors, Finance Actors, and Regional Actors. The project has an on-going case-study in Kenya on transnational climate impact and another one in the Netherlands. The project created the SENSES toolkit which includes a visualisation contextualisation and co-production tool. There is a strong focus on mitigation in this project. It appears that the project has not yet started using CMIP6 scenarios.

WINDSURFER (Len Shaffrey): This project is about extreme winds and waves. Deliverables include a catalogue of European windstorms and a wave reanalysis. The users are the insurance companies, the offshore infrastructure sector, including oil and gas companies, and the forestry sector. Users were found motivated and ready to engage in discussions with the project. The project has participated in OASIS conferences (open risk assessment model for insurance companies) as part of their user-engagement process. The project has experienced some delays due to the CMIP6 delays.

EUPHEME (Peter Stott): The aim of the project is to demonstrate the capability of an operational attribution system, in order to place extreme weather events in the context of a changing climate and help society to adapt. It is building on the legacy of the FP7 EUCLEIA project. The main users are local and national policy makers, the media, the transportation sector and other Climate Services providers. The project has already delivered a scientific platform with a capability of rapid attribution of an extreme event, as demonstrated during the June 2019 heat wave in France. The mid-term review has identified a weakness in stakeholder engagement, but the PI argued that this has greatly improved in the last six months. Furthermore, the C3S is about to launch a pilot operational attribution service, and the project has the capacity to strongly influence and enhance this pilot service.

ROUNDTABLE for CLUSTER 3 (chaired by Elisabeth Worliczek)

- The discussions addressed the various difficulties of interacting with the Finance sector, which is known for its lack of transparency. The projects stressed that it takes a long time to understand how the actors of this sector are really functioning, the nature of the conflicts of interest, and what type of information can be shared or not. Attending discussion forums such as OASIS is the best way to achieve this. There was a general consensus that projects funded by public money must publish the totality of their results.

- Another issue was the sustainability and legacy of projects in this cluster. While C3S offers potential operational continuation for at least one project, what are the perspectives for the other projects? The PIs appeared confident that their work was central to the missions of their organizations and would easily find a framework for operational continuation.

Cluster 4: Social-science driven projects

CO-CLI-SERV (Jean-Paul Vanderlinden): The project objective is to develop a methodology to establish a “climate-change-aware” mentality and planning in local communities, based on five case studies. A key principle is that the relationship with users must be based on trust. One of the major issues for the project is to determine how to deal with uncertainty in climate prediction. To reach end-users, media coverage is essential. The project partners have a long experience of collaboration between climate and social science and humanities scientists.

EVOKED (Amy Oen): The project is based on the development and test of the “Living Lab” concept to accelerate the change of mentalities and the orientation towards adaptation/mitigation at local scale. It has selected end-users in five local communities. The project has also organised interactions with youths.

INNOVA (Maria Manez): The aim of the project is to understand how the use of climate services by local communities for adaptation can be accelerated. It is based on four case studies, with a collaborative platform to share the information between the case-studies. One key deliverable of the project is a step-by-step guide to implement Climate Services (the "cook book"). Recently a new case-study has been added to the work plan (Kiaoshung, Taïwan). One important lesson is that user expectations can rapidly become unrealistic, so the co-construction of climate services should always remain conscious of the scientific limitations.

ISIPEDIA (Katja Frieler): The project objective is to enhance the work of the ISIMIP community by developing an open climate-impacts service portal, offering tailored access to state-of-the-art, cross-sectoral climate impact assessment and data. The fast improvement of spatial resolution is remarkable. Stakeholders are multi-sectoral but with a focus on Eastern Europe and West Africa. The dialogue has concluded to a high interest in high resolution data, extreme events, impact attribution, adaptation options and economic evaluation.

ROUNDTABLE of CLUSTER 4 (chaired by Inès Alterio)

- The remarkable effort of projects in this cluster to develop user engagement was noted with appreciation. But it should be kept in mind that the initial opinion of the stakeholders is not necessary relevant. Projects PI stressed that the most important is to understand how the users work, not what they think they need.

- All projects in this cluster have experienced the challenges of inter-disciplinarity as they addressed multi-sectoral needs. This requires a real effort to understand the agenda of other communities, which can be driven by priorities not related to climate change. It is possible that climate scientists can be instrumentalized but it is worth to take that risk.

- Working with different local communities also reveals that the wealth of existing climate observations is very different in various parts of the world. As a consequence, it is difficult to develop universal methodology to foster the development of climate services.

Cluster 5: Cities, fires and health

CITISENSE (Tina Neset): The project objective is to increase resilience of cities to extreme climate events by a participatory risk management system. This system will use data from existing weather services, from automated sensor stations deployed at the scale of the pilot cities, and from weather and risk reports contributed by citizens on the CitizenSensing web app. The system also includes a web portal to provide users with an easy access to the collected data. The case studies take place in the pilot cities of Porto, Trondheim,

Norrköping and Rotterdam. Gamification has been implemented in the app as incentive for users. One unforeseen issue that the project encountered was GDPR and its implications on the users of the app.

CLIMAPP (Chuansi Gao): The objective of the project is to develop a climate service tool to cope with thermal stress of the human body. It relies on heat balance models and weather data. Results will be available to everyone via a mobile phone app. The project has identified sectorial target end-users: outdoor workers, elderly people caregivers, and children. The app prototype is freely available. The project is collaborating with the H2020 Heat-Shield project. The app will be translated into 9 languages. CLIMAPP needs openly accessible short-term weather forecast data with easy-to-use application programming interface (API). They hope such data will become soon available.

DUSTCLIM (Athanasios Votsis): This project develops a climate service for sand and dust storms hazards in Africa, the Middle East and Europe. It builds upon efforts of the WMO Sand and Dust Storm Warning and Alert System (SDS-WAS). One key deliverable is a reanalysis of atmospheric dust and sand content, which forms the basis for a high spatial-temporal resolution climatology of sand and dust storms, and for specialized products in the aviation (visibility, engine degradation), solar energy (output reduction, optimal cleaning frequency), and air quality (early warning system of PM10). Working with end-users implies depending on their needs and being reactive and flexible.

SERV-FOR-FIRE (Rosa Lasaponara): The project develops integrated services and approaches to assess the effects of climate change and extreme events, for fire and post-fire risk prevention. It will develop an international collaborative community of experts on these themes. It uses data from two Copernicus services (Emergency Management Service and Land Management Service). It also explores the uses of C3S seasonal forecasts for predicting the fire risk at the seasonal and sub-seasonal horizon. It already provides maps to PROTEZIONE CIVILE during the fire season. They are also able to estimate the evolution of the fire.

URCLIM (Valéry Masson): The projects develop climate services for large cities, focusing on the urban heat island effect and its mitigation. The major end-users of the projects are urban-planners, but also environmental agencies and health agencies. They are asking for maps of the climate risks at the scale of urban blocks. The project is developing high resolution urban maps for climate studies, methods to downscale results of regional climate models to city scale, including uncertainties, multi-criteria impacts and evaluation of adaptation strategies, and visualization methods at a scale adapted to the needs of the users. There are five large European cities selected as case studies.

ROUNDTABLE of CLUSTER 5 (chaired by Gabriella Teodorescu)

- It was noted that WMO has programmes where projects of this cluster can contribute (e.g. the Subseasonal to seasonal prediction programme S2S, the urban part of the Global Atmospheric Watch), and projects PI were encouraged to develop

their cooperation with WMO as this can provide opportunities for operationalization.

- The audience also noted the opportunity of collaboration between projects to test the validity of the input data (ex: Climapp and CitiSense).

Final discussions and conclusions

The final session started with a presentation of Petra Manderscheid on upcoming events relevant for ERA4CS. Petra mentioned the African Climate Risk Conference, to be held in Addis-Ababa on October 7-9, 2019; the kick-off meeting of the AXIS ERANet (Brussels, November 5-6, 2019); the 6th international conference of the Climate Service Partnership (Feb 11-13, 2020, Puna, India); the 6th International Climate Change Adaptation conference (April 20-27 2020, New Delhi, India); the 3rd ClimatEurope Festival (June 16-18, Riga, Latvia); and the next ECCA conference, to be held in the second half of May 2021 in Ljubljana, Slovenia. The ECCA 2021 will be organized by SINCERE and JPI-Climate with a contribution of ERA4CS.

Petra opened the discussion on the opportunity to hold the final ERA4CS event in the frame of the ECCA2021 conference, as this would ensure a large audience. This was well received by the ERA4CS projects PIs. However, this would demand a formal extension of all projects to make sure that the travel costs of the projects members to the final event would remain eligible. Philippe Bougeault warned that if such an extension was decided, all projects should still deliver all deliverable and reports following the previously agreed schedule, in order to allow the coordination to produce all final documents of the ERANet on time.

Then Marco Carreira-Silva, from Climate-KIC, was invited to deliver some key messages concerning the possible interactions between ERA4CS and the Climate-KIC. The five key messages are as follows:
1. Identify problem-owners first and take their issues as a starting point.
2. Design the project for sustainability and scalability from the beginning.
3. Integrate design thinking in climate service development.
4. Adopt a systemic view on climate service usage.
5. Combine efforts to provide a combined solution to problem-owners.
Marco concluded his presentation with a few success stories of the Climate-KIC.

Finally Philippe Bougeault presented a synthesis of discussions during the roundtables and formulated several proposals. This was a lively session with a very reactive audience. Discussions are summarized below following the main items of the presentation.

Relations with Copernicus

The presentations of the 26 projects seem to indicate that knowledge of C3S data and tools is already well developed within ERA4CS projects. However, C3S offers are expanding

continuously: there is a need to find a mechanism to ensure continuous uptake by ERA4CS projects.

The meeting also highlighted opportunities to transfer to Copernicus Services (or continue under a Copernicus funding frame) some of the activities/productions of the 26 ERA4CS projects. A rapid show of hands indicated that at least 10 projects were feeling concerned by such opportunities. However, C3S representatives explained that they do not have the resource to monitor closely the results of all 26 ERA4CS projects to identify these opportunities. They suggested that ERA4CS should organize itself to conduct such monitoring and identification. This idea was supported by some projects LPIs, but others seemed opposed to the idea. Philippe Bougeault mentioned that even if the ERA4CS coordination would engage in such role, ERA4CS Project Consortia would still have the possibility to contact directly Copernicus to promote their activities/products. Projects requested clarification on what type of data/input C3S actually needs. Another possibility is that once C3S requirements are clarified, the ERA4CS coordination may transmit the information to the 26 projects, and the projects will explore if they could qualify. Finally, it was also mentioned that C3S has a mechanism to fund very small tasks, perhaps one of these tasks could be the identification of relevant ERA4CS productions.

Sharing experience with users and defining best practices

Discussions indicated that a real opportunity exists to share the experience of projects in their contacts with users and define best practices, as this could be an important legacy of ERA4CS.

Philippe Bougeault noted the diversity of situations both on the users side (from lack of interest for CS to very proactive role, and in several cases, a reluctance to reveal their own vulnerabilities) and on the approaches of the ERA4CS projects (some projects have a very formal approach, resulting in guidelines, others have taken a more informal and pragmatic approach). It will be difficult to prepare a synthesis and there is a real question of how we could organize this work. The various lessons learned by the projects may be stratified in several manners (by cluster of projects as in this mid-term meeting, by horizons of the forecasts forming the basis of the CS, by types of users, by type of sectors, (e.g. health, agriculture).

Harilaos Loukos expressed a strong opinion that the only useful classification is by category of users. Ghassem Asrar stressed that diversity is not a problem, but a wealth, and should be preserved in the analysis work. This opinion was supported by several participants.

Philippe Bougeault asked how much time the projects would be ready to invest in such an activity, which was not initially planned. Several LPIs mentioned that they really want to work on this issue and would be prepared to participate in a working group with an objective to analyze the experiences of all projects and prepare such a synthesis. One LPI suggested that a special issue in a peer-reviewed journal could be prepared with articles containing the thoughts of each project. Philippe supported the idea of a dedicated working group populated by representatives of the projects on a voluntary basis. He mentioned that

under certain conditions (validation by ERA4CS GA and identification of interested Research Funding Organizations) ERA4CS could support the WG, for instance by funding a physical meeting. He will carry the proposal of a WG to the next GA and try to identify interested Research Funding Organizations to support its work. Amy Oen (from project EVOKED) proposed to take the lead of the Working Group.

Preserving the legacy of knowledge and services created by ERA4CS projects

This aspect is very important and will be crucial to demonstrate to all funders the value created by the ERANet. From the discussions at the meeting, it is obvious that a large diversity of situations exist, both in the nature of projects productions, and in perspective for their future. In some cases, the projects are so important for the missions of the organizations involved in the Consortia, that preserving the legacy is not an issue, it will happen naturally. In other cases, this preservation appears conditioned by further funding that could be obtained only by applying for new projects or contracts. In other cases, results should really be transferred to an operational organization to form the basis of operational climate services. Such operational organization may comprise Copernicus services, national meteorological services, other government agencies, and private companies.

Philippe Bougeault suggested that one way to clarify the situation was to work out a typology of the production of the projects. This may comprise publications, internal reports, software, networks of proactive users, full methodology, standards and tools for new climate services, Internet portals, Mobile Phone apps, etc. In many cases these productions will require regular maintenance to survive. Philippe proposed to circulate a draft for such a classification, giving the opportunity to all projects to revise the draft and make sure none of their productions will fall outside. Then, when the typology will be accepted by all, he would ask the projects to fill the table with their own productions, indicating also their wishes and constraints for the future (e.g. interest for continuing exploiting/maintaining software, providing a service, etc…). The proposal was well received by the audience. Francisco Doblas-Reyes noted that this may become part of the final evaluation exercise.

Identify salient remaining research questions

Discussions also led to identify such questions. Ghassem Asrar argued that the demand for fresh water, food and energy production poses a major challenge to nations throughout the world. The need for information on water resources will be increasing and the water reservoir will be a major means for such purpose. This is in favour of starting a serious effort on collecting data from reservoir operators, in order to calibrate hydrological models with complete data. Other suggestions covered essentially the need to improve the performances of long-range forecasts (subseasonal-to-seasonal, seasonal, decadal). More generally it was stressed that climate science research is still needed in order to improve the climate services tools in development. It was also noted that within JPI-Climate, another action group (New Generation Climate Science) is also dealing with these aspects.

Benchmarking

The need to benchmark climate services appeared several times in discussions, in particular for documenting if ERA4CS projects are really bringing added-value compared to climate information already available to users. It was noted that benchmarking is also a relevant question for relations with users. It was also noted that the real benchmarking is the opinion of the users on a service. ERA4CS already plans to survey the opinions of a selection of users of the 26 projects in its final evaluation. There was a discussion on whether user opinions can really reveal the quality of the climate services, some participants were of the opinion that benchmarking the quality of the data and products independently of users' opinion was also needed. It was stressed that the wide range and diversity of stakeholders, communities and nations/regions involved in ERA4CS projects offer invaluable knowledge and information for this purpose for Horizon Europe and overall European investment in R&D in this area.

Annex 1

Mid-term meeting of ERA4CS projects

17-18 September 2019

CIVA
Rue de l'Ermitage 55
1050 Brussels
Belgium

Programme

Tuesday, 17 September

8.30 – 9:00 Registration and Coffee

9.00 – 9:45 **Welcome** by Philippe Bougeault (ANR), coordinator of ERA4CS

Introduction by European Commission (Miguel-Angel Martínez-Botí)

Presentation of the mid-term evaluation process (Mar Rodriguez, BSC)

9.45 – 10.15 **COPERNICUS**
General presentation on C3S data and service offers (Freja Vamborg, C3S-ECMWF)

10.15 – 11:15 **CLUSTER 1: WATER-AGRICULTURE-ENERGY** (8 PROJECTS)
Pitches of 12 min with highlights of progress and outcomes ***(Part 1)***

Session chair Asun StClair, BSC

10:15 Aquaclew
10:30 Cireg
10:45 Clim2power
11:00 Climalert

11.15 – 11:45 *Coffee break*

11.45 – 13.15 **CLUSTER 1: WATER-AGRICULTURE-ENERGY** ***(Part 2)***

11:45 Clisweln
12:00 Co-Micc

12:15 Watexr
12:30 Medscope

12:45 ***Roundtable for Cluster 1***

13.15 - 14.15 *Lunch*

14.15 – 15.45 CLUSTER 2: MARINE AND COASTAL ISSUES (4 PROJECTS)

Session chair Anne Coudrain, IRD
14:15 Coclime
14:30 Eclisea
14:45 Inseaption
15:00 Salienseas

15:15 ***Roundtable for Cluster 2***

15.45 – 16:15 *Coffee break*

16.15 – 18:00 CLUSTER 3: POLICY, FINANCE, TOURISM (5 PROJECTS)

Session chair tbc
16:15 ClimInvest
16:30 Indecis
16:45 Senses
17:00 Windsurfer
17:15 Eupheme

17:30 ***Roundtable for Cluster 3***

from 18:00: Reception at hall CIVA

Wednesday, 18 September

9:00 – 9:15 Information on important upcoming events for ERA4CS (Petra Manderscheid, BELSPO)

9.15 – 10.45 CLUSTER 4: SOCIAL-SCIENCE DRIVEN PROJECTS (4 PROJECTS)

Session chair Inès Alterio, ANR
9:15 Co-Cli-Serv

9:30 Evoked
9:45 Innova
10:00 Isipedia

10:15 ***Roundtable for Cluster 4***

10.45 – 11:15 *Coffee break*

11.15 – 13:00 CLUSTER 5: CITIES, FIRES AND HEALTH (5 PROJECTS)

Session chair Gabriella Teodorescu, Valahia University of Targoviste
11:15 Citisense
11:30 Climapp
11:45 Dustclim
12:00 Serv-for-fire
12:15 Urclim

12:30 ***Roundtable for Cluster 5***

13:00 – 14.00 Lunch

14.00 – 15.30 Time for bilateral discussions between evaluators and LPIs, discussions between funders and LPIs and the ERA4CS Advisory Board (including JPI Climate TAB, EEA, Copernicus, Climate KIC)

15.30 – 16.45 Wrap-up and conclusions (Philippe Bougeault)

- Comments from all stakeholders on ERA4CS activities
- Discussion of initial lessons of ERA4CS (Petra Manderscheid and all WP5 team)
- Input from ERA4CS projects PIs to JPI Climate visioning process (all)
- Discussion of timeline for the end of ERA4CS

16.45 Closure of the meeting followed by coffee/biscuits and get together (end 18.00)

There will be space to show posters and other materials from the projects, which can be used as discussion hubs during day 1 (coffee breaks, lunch and the reception) and day 2 (after lunch, and after the closure of the meeting).

Annex 2: List of participants

Nr	Name	Surname	Organisation
1	Fanny	Adam	ERA4CS
2	Enric	Aguilar	INDECIS
3	Samuel	Almond	ECMWF / Copernicus Climate Change Service
4	Inès	Alterio	French National Research Org/ERA4CS
5	Lars	Arneborg	SMHI, CoCLIME
6	Susana	Arad	University of Petrosani
7	Ghassem	Asrar	Pacific Northwest National Laboratory
8	Cornelia	Auer	PIK Potsdam,SENSES
9	Elisa	Berdalet	ICM-CSIC, CoCliME
10	Sandy	Bisaro	Global Climate Forum, INSeaPTION
11	Berill	Blair	Wageningen University, SALIENSEAS
12	Dagmar	Bley	DLR, ERA4CS
13	Philippe	Bougeault	ANR, ERA4CS
14	Pascale	Braconnot	CNRS-INSU
15	Benedicte	Bucher	IGN France, URCLIM
16	Patricia	Bueno	IHCantabria
17	Julie	Calkins	Climate KIC
18	Louis-Philippe	Caron	Barcelona Supercomputing Center (BSC), ERA4CS
19	Marie	Carrega	Nation observatory on the effects of climate change
20	Marco	Carreiro Silva	Climate KIC
21	Louis	Celliers	INNOVA
22	Anne	Coudrain	ERA4CS
23	Roger	Cremades	GERICS/AZG
	Caroline	Cusack	Marine Institute, Ireland, CoClime
24	Miriam	Dahl	CICERO Center for International Climate Research, ClimINVEST
25	Anne	De Rudder	BIRA IASB, CoCliServ
26	Petra	Döll	Goethe University Frankfurt, CO-MICC
27	Kristina	Dr. Fröhlich	Deutscher Wetterdienst
28	Ghislain	Dubois	Ramboll- TEC, JPI Climate TAB
29	Laurent	Dubus	EDF R&D
30	Nicoleta	Dumitrache	UEFISCDI, ERA4CS
31	Liliana	Dumitrache	University of Bucharest
32	Alexandre	Fernandes	JPI Climate, ERA4CS
33	Patrick	Fournet	Met Eireann
34	Maria Dolores	Frias	University of Cantabria, WATExR

35	Katja	Frieler	Potsdam Institute for Climate Impact Research, ISIpedia
36	Hans-Martin	Füssel	European Environment Agency
37	Giulia	Galluccio	CMCC, ERA4CS
38	Chuansi	Gao	Lund University, ClimApp
39	Silvio	Gualdi	Centro Euro-Mediterraneo sui Cambiamenti Climatici
40	Rafiq	Hamdi	RMI, URCLIM
41	Cedric	Hananel	Artic Climate Fit-City
43	Daanen	Hein	ClimApp
44	Diego	Intrigliolo	Agencia Estatal de Investigación
45	Jelmer	Jeuring	SALIENSEAS
46	Boris	Kingma	ClimAPP
47	Fabian	Kneier	Goethe University Frankfurt, CO-MICC
48	Holger	Hoff	PIK Potsdam,CIREG
49	Kasper	Kok	Wageningen University, SENSES
50	Angela	Köppl	Austrian Institute of Economic Research
51	Elmar	Kriegler	PIK Potsdam,SENSES
52	Grazyna	Krzywkowska	European Commission
53	Erwin	Lambert	Utrecht University, INSeaPTION
54	Machiel	Lamers	SALIENSEAS
55	Mathieu	Lanin	SINCERE
56	Francesca	Larosa	CMCC, CLARA
57	Rosa	Lasaponara	CNR
58	Gonéri	Le Cozannet	BRGM ECLISEA, INSeaPTION
59	Asun	Lera St. Clair	ERA4CS
60	Stefan	Liersch	PIK Potsdam, CIREG
	Harilaos	Loukos	Climate Data Factory – Climate KIC
61	Maija	Malnaca	JPI Climate, ERA4CS
62	Petra	Manderscheid	JPI Climate, ERA4CS
63	Maria	Manez	HZG GERICS, INNOVA
64	Rafael	Marcé	ICRA, WATExR
65	Iulia	Marginean	CICERO, ClimINVEST
66	Miguel A.	Martínez-Botí	European Commission
67	Valéry	Masson	URCLIM
68	Melisa	Menendez	IH Cantabria
69	Inga	Menke	Climate Analytics, ISIpedia
70	Hermine	Mitter	University of Natural Resources and Life Sciences, CLISWELN
71	Boris	Mueller	Fachhochschule Potsdam, SENSES
72	Johann	Muller	ANR
73	Tina-Simone	Neset	Linköping University, CitiSense
74	Andre	Obregon	ECMWF / C3S
75	Amy	Oen	EVOKED
76	Tomasz	Opach	CitiSense
77	Jose Pablo	Ortiz de Galisteo Marin	AEMET, ERA4CS
78	Cláudia	Pascoal	University of Minho, CLIMALERT
79	Adriaan	Perrels	Finnish Meteorological Institute, URCLIM

80	Christiana	Photiadou	SMHI, AQUACLEW
81	Rafael	Pimentel	University of Cordoba, AQUACLEW
82	Mar	Rodríguez	Barcelona Supercomputing Center (BSC), ERA4CS
83	Francisco Javier	Rodríguez Marcos	AEMET
84	Ernesto	Rodriguez-Camino	AEMET, MEDSCOPE
85	Ignasi	Salvado Estivill	Universitat Rovira i Virgili
86	Sara	Santos Cruz	CITTA /University of Porto, CitiSense
87	Laura	Sedaine	CNRS
88	Thanasis	Sfetsos	NCSR Demokritos
89	Len	Shaffrey	NCAS, University of Reading, WINDSURFER
90	Sofia	Simoes	NOVA-FCT, CLIM2POWER
91	Sebastian	Sterl	Vrije Universiteit Brussel, CIREG
92	Peter	Stott	EUPHEME
93	Gabriela	Teodorescu	Valahia University of Targoviste
94	Freja	Vamborg	ECMWF - Copernicus Climate Change Service
95	Gerard	van der Schrier	Royal Netherlands Meteorological Institute
96	Bert	Van Schaeybroeck	Royal Meteorological Institute of BE/URCLIM
97	Jean-Paul	Vanderlinden	UVSQ, CEARC, CoCliServ
98	Sophie	Verheyden	SINCERE
99	Sergio	Vicente-Serrano	CSIC, INDECIS
100	Athanasios	Votsis	Finnish Meteorological Institute, DustClim
101	Elisabeth	Worliczek	BOKU University