Annex 2 to the Framework Agreement

C3S_429g_BSC: Climate Media Portal

C3S_429g_BSC
ISSUED BY: BSC Earth Sciences Department
Date: 2nd September 2019
Version: 2

Table of Contents

1 Executive summary

Climate change communication to the public sphere is crucial to raise awareness and motivate climate action. Yet, balanced climate narratives are difficult. The challenge lies in the complexity of the topic itself, usually oscillating between robust evidence-based messages with low impact and emotionally-powerful but hyped stories. This contract proposes an application that facilitates the use of the Climate Data Store (CDS) data products for the creation of **effective and emotionally impactful climate change messages to be used by one of the major players creating narratives about climate change: journalists**.

Climate narratives, created by words, data, and images, are critically framed by the media. Journalists are not only the mediators of climate data with the general public, but they are also opinion-makers and knowledge brokers for policy and business audiences. However, having climate data is not a guarantee for journalists being able to create a good climate narrative. 49% of data stories are created in a day or less according to the Google News Lab survey issued in 2017[1], and more than a half of the respondents signalled cleaning, processing, and analysing data as a skill difficult to pick up that required too much training. The *Climate Media Portal* aims to provide journalists with **an application that allows them to create tailored and compelling visualisations using three key products (ERA5 reanalysis, ECMWF S5 seasonal forecasts and CMIP5 projections)**. These products will help enrich articles with climate information for the past, the near-term future and the long-term future while simplifying the interface and interaction with the CDS. The application will be co-designed in close collaboration with journalists, creating a co-design group that will participate in the creation and testing of the prototypes. This is fundamental to ensure that the design and the data provided is actually relevant and salient to the needs of journalism, besides ensuring it provides added value compared to other available applications.

Recently, we have seen how successful visualisations of climate information (such as the climate spirals from Ed Hawkins[2] or the Earth Temperature Timeline by Randall Munroe[3]) have rapidly become viral, regardless of the origin of the information they use. As we envision it, the Climate Media Portal could become the reference for creating such visualisations and other climate change communication formats. Additionally, **the application would provide a certification of data origin, placing Copernicus as the main source of data for journalists seeking information for climate change reporting.** This certification would be indicated by the C3S or CDS brand appearing on the generated materials within the application. This would assure journalists and their readers of the robustness and authoritative character of the data used; and would **help positioning the European Copernicus Climate Change Service and the CDS together with other well-established climate information sources worldwide**, such as the National Oceanic and Atmospheric Administration (NOAA) or the National Aeronautics and Space Administration (NASA) from the United States.

[1] https://newslab.withgoogle.com/assets/docs/data-journalism-in__2017.pdf?_ga=2.119058954.2039456046.1549442099-1198

[2] https://www.climate-lab-book.ac.uk/spirals/

[3] https://xkcd.com/1732/

2 Technical description

2.1 Introduction

Climate narratives, created by words, data and images are critically framed by the media. In today's knowledge society, journalists are not only the mediators of climate data with the general public; they are also opinion-makers and knowledge brokers for policy and business audiences and other public stakeholders. Ideally, journalists should use authoritative, robust and quality checked climate data and information to create beautiful, creative and compelling stories about climate change and its impacts that inspire interest in climate action through an emotional connection with the readers.

However, this is not always the case, since media professionals often have limited time and resources to properly understand, manipulate and tailor data to support their stories. Furthermore, only the biggest newsrooms can afford staff dedicated to data journalism, visualisation, or climate science journalists–let alone specialists with the three skills. Consequently, the vast majority of journalists worldwide do not have the technical resources to properly communicate climate issues using data-based evidence.

We propose the Climate Media Portal as an application to solve this gap. The Portal aims to provide journalists with tailored and compelling visualisations of targeted messages for their articles, using relevant key products provided by the Copernicus Climate Data Store. The proposed application will transform the robust yet raw and dry data into material for creative, memorable and impactful information, that can help journalists emotionally engage a wider audience.

2.2 Preliminary consultation with journalists

During the preparation of this contract, we reached out to journalists from *El País, Ara.cat*, University of Miami School of Communication, *Financial Times*, and *Associated Press*. These consultations helped us define potential user profiles and understand some of the needs for the different profiles to start working in the technical solution of the offer. Many of their comments have helped shape the sub-sections of this contract.

All of the journalists contacted indicated their interest in such an application and were willing to be contacted for providing feedback in the co-design phase. Some of the initial feedback from these consultations have included the desire to have information organised by topic (e.g. heat waves, ice loss, hurricanes, storms) so they can easily find facts, explanations and visualisations related to the topic, knowing that the data and the information come from an authoritative source. This is particularly useful when weather or climate become a hot topic and an article has to be prepared with very tight deadlines. Another recurrent comment was that only a limited range of datasets and variables are usually needed to frame a story about climate change. Depending on the profile of the journalist and the time given for preparing the story some journalists (data journalist, visualisation experts) would probably be willing to have access to data while others (freelancers, online media) would probably be happy with ready-to-embed visualisations.

2.3 User engagement and co-design

The Climate Media Portal will be co-designed in close collaboration with journalists. This is fundamental to ensure that the design and the data provided is actually relevant for journalists and suited to their needs, besides ensuring that it provides an added value with regard to other applications available.

We will engage with as many journalists as possible and feasible during the co-design phase to hear their needs, expectations, and capacities to shape the functionalities of the application developed by

the offer. These journalists will be part of the **Co-design group**. In order to be able to reach a good number of journalists, this will be a flexible group that journalists can join in or leave at any moment with very limited obligations. Journalists in the co-design group will participate through personal interviews or teleconferences to provide their advice at the initial development of the application, provide feedback during the different development stages or participate in the testing of the prototypes.

We also propose the creation of an **Advisory board** composed by well-known experts in the field of journalism, visual journalism or research on the role of media in framing climate change communication. Its purpose is to provide a wider perspective and feedback to the application. A suggested board is listed below. All of them have already indicated their interest in being part of the Advisory board of the C3S_429g contract once it starts.

- Elisabeth Eide, Professor at Department of Journalism and Media Studies, Oslo Metropolitan University, and director of the Journalism and Media International Center (JMIC) *(accepted)*
- Lou Del Bello, International Environment Correspondent at Bloomberg BNA. (accepted)
- James Painter, Research Associate at the Reuters Institute for the Study of Journalism, University of Oxford, former BBC journalist. *(accepted)*
- Alberto Cairo, Knight Chair in Visual Journalism at the University of Miami, former head of infographics at Globo (Brasil) *(accepted)*
- John Burn-Murdoch, Senior data-visualisation journalists, Financial Times *(accepted)*
- *Maarten Lambrechts, Freelance data-visualisation journalist (accepted)*

2.4 User persona

In design thinking, a persona is an abstract representation of many people with similar characteristics. Defining a user persona helps focus on how to design a solution for that persona taking into account requirements, preferences and goals. Based on the preliminary consultation and our previous knowledge of the media industry we have created three user personas for the Climate Media Portal that will allow in the following sections to present the technical solution.

Chloe Is a freelance journalist who usually collaborates with *Le Monde*. Due to the latest heat wave in North France, she is preparing a two-page article for the newspaper. She has only one day to prepare the piece and needs to provide some visuals to support her story. In order to build a strong initial story, she wants to find information about the past evolution of temperature in the country to show how exceptional or not the heat wave is.

Julia works in the online section of *Ara.cat*, a regional newspaper in Catalonia, Spain. Two days before the seasonal change from spring to summer she has to publish a 400-word news article about the season. She is looking for a visual aid that attracts readers' attention and does not have much time to comprehensively research and prepare for the story.

Thomas is a freelance infographist. He creates attractive infographics to illustrate stories for magazines, and he has been commissioned to work for *National Geographic* Magazine. After the publication of the 1.5º special IPCC report, the magazine is publishing a story about it and he has to prepare an infographic, focussing on future climate projections and their impact.

2.5 User journey

Co-creation entails that we will avoid having any structured pre-defined idea of the application to avoid introducing our bias in the design process. Nevertheless, for completeness and to better describe some technical aspects of the application, we describe below the user journey of the three

user personas defined above. In the context of this contract, a user journey is the series of hypothetical steps a user could do when interacting with the application, and they are described below to provide an overview of how we envision the potential of the Climate Media Portal.

Chloe's user journey: Chloe accesses the Climate Media Portal through her personal laptop at home. After a free registration she accesses the main interface where she is presented with a range of topics related to climate change: hurricanes, rising seas, precipitation and flooding, droughts, heat waves, and more. When she chooses the heat waves section, she finds a range of facts, explanations, and sample charts about how heat waves will be affected by climate change. She needs a few facts, and specially some easy explanations, which she selects from a frequently asked questions section. Everything is written in plain language and terminology clearly identifiable by journalists, avoiding as much as possible technical jargon and helping Chloe focus on "her" story. However, she chooses to expand information about certain terms and scientific information, helping her understand and then explain a scientific concept to help her create a more scientifically-relevant article. Finally, she browses some of the sample charts, and finds one that seems to be appealing: an historical chart of temperature, annotated with past events. She decides to recreate this chart to support her article with visuals. She chooses it, adjusts her desired timeframe (she settles on 30 years back), and the exact region to display (not Europe but the North of France). She adds context annotations to the chart like relevant events and dates (e.g. "2003 heat wave caused at least 3000 casualties in France"). Transparently to her, the application is using ERA5 data, which she could learn more about if she clicked on the caption of the chart.

Chloe modifies the default style to better suit the *Le Monde* graphical guidelines, changing colour scales, backgrounds, and fonts, and discovers that she can save this style as a favourite to reuse it in the future. As the application only provides the graphic information in English, she translates the titles and labels to French. Once she is happy with the figure, she downloads it both in a high resolution format for print, and a lower one for the web. The figure, with proper credit to Climate Media Portal and the C3S CDS, is now ready to be included in her news story.

Julia's user journey: Julia usually checks the seasonal prediction provided by NCEP[4] or the Spanish State Meteorological Agency (AEMET) on their website[5]. The forecast says that it will be warmer than usual and that precipitation is expected to be within the average for that period of time. She uses this information for the story but she wants to know more about the causes. She does not like the visuals in the AEMET website so she accesses the Climate Media Portal, where she knows that she can also find information about seasonal predictions and graphically appealing visuals. Looking at the portal topics, she sees one about the effect of climate change on seasons, and reads through the recent content about how seasons are changing. She picks a short quote about it to include in the article, and decides to recreate the chart from AEMET by switching into a more advanced charting mode. She zooms to the region of Catalonia, the seasonal time-scale and the variables of temperature and precipitation. She creates a figure that includes both maps and selects an attractive and clear colour scale from a choice of presets. She then selects the embed option so she can directly upload the figure online without having to undertake the extra steps of downloading or managing issues with resolution, as in other programs. The final figure shows the credit to the Climate Media Portal and the CDS. In the application she also selects the share in Twitter option and the figure is attached to her tweet. She adds the headline and the link to her published story in her personal Twitter account.

[4] e.g. https://www.cpc.ncep.noaa.gov/products/CFSv2/htmls/euT2me1SeaMask.html

[5] http://www.aemet.es/en/serviciosclimaticos/prediccion_estacional

Thomas' user journey: Thomas accesses the app through his desktop computer. He signs into the application and goes directly to the advanced charting mode. He selects the option to get global information and then selects long-term future as he wants to see projections at the end of the century. He selects temperature and all the RCP scenarios. He chooses one colour scale and downloads the chart in vectorial format (.eps). He removes the axis and all additional information except the trend lines. He changes the colours of the lines and overlaps this information to a more complex infographic with his own customised temporal scale that also shows a map about current CO2 emissions by country that he has found in the Global Carbon Atlas[6]. In the caption of the figure, he adds a reference to the different sources including the Climate Media Portal.

2.6 Overall requirements

The user journeys are a vision of the concept behind the Climate Media Portal. During the requirements-gathering phase with the co-design group of journalists, technical and time limitations will frame which of the functional and non-functional requirements are feasible to be included in the application. Co-designing the application with many journalists will help us filter and rank functionalities to focus on the most important for the majority of users first. There are some requirements, however, that we envision at an overall level.

ACCESS REQUIREMENTS: The application will be a website available online. It will be optimized for access from desktop computers but it will work on a responsive design so that it can be used from tablets or smartphones. The website will be implemented following the Web Content Accessibility Guidelines[7] and will pay special attention to use colour-blind friendly colour scales.

USER ACCOUNT REQUIREMENTS: The application will be freely available. Registration is necessary to evaluate Key Performance Indicators of the usage of the application, analyse the type of users and ensuring that we can contact the most active users to provide further feedback to the application or eventually to the CDS. In the initial consultation, potential users expressed reluctance to register into websites before trying them out. Hence, there might be a demo mode to explore and create without registering.

INFORMATION SELECTION REQUIREMENTS: Information progressive disclosure and structure are key aspects to be co-designed with journalists. But given the different levels of time availability and capacities we expect the application to have at least two different levels of complexity. Regardless of the structure, information selection could be done by topic (e.g. heat waves, droughts), time range (e.g. past, present, near-term future, long-term future), the region (e.g. zooming in the region of interest), and the climate variable (e.g. temperature, precipitation, clouds). The C3S products, geographical extent and variables that will be included in the application are better detailed in section 2.9.

VISUALISATION REQUIREMENTS: The application has a twofold objective of providing climate change information from the CDS and of doing so with innovative visualisation solutions with an appealing look and feel. For this, we will work to understand which are the key messages that journalists want to present and the typical visual literacy of their audiences. Then we will design and adjust our data visualisations to match these requirements and produce visuals that foster efficient communication. We shall also work to provide styling options (colours, backgrounds, typography) to help journalists adapt the visualisations to their target journal (which in case of freelancers could be more than one).

[6] http://www.globalcarbonatlas.org/en/CO2-emissions

[7] https://www.w3.org/WAI/standards-guidelines/wcag/

EXPORT OPTIONS: The application will take into account the preferences of the journalists and will provide a range of possibilities, which we will determine from users' feedback and feasibility. These possibilities include direct embedding in websites, media sharing options, download of bitmap files or vectorial files that can be edited in specialised design software such as Adobe Illustrator. The export options are the opportunity to give visibility to the CDS to wider audiences through the integration of the C3S logo or direct citations.

AVOIDED OVERLAP WITH CDS: The graphic system that we propose might indeed overlap in some respects with the CDS, with the distinction coming from its functionalities and work methodology. The two overall principles that differentiate the Climate Media Portal from the CDS will be the following. First, the application targets journalist-like profiles who might not know anything about coding. Thus, the interface must be graphical and intuitive and it should not allow users to interact with data through code (unlike the CDS Toolbox). Second, the application will not be able to provide access to the full CDS datasets but a subset of data relevant for creating climate change stories. The usability and responsiveness of the application will thus target an audience currently not served by the CDS. The links, branding, and connections to CDS within the application should be enough to guide more advanced users to the more powerful functionalities afforded by the programmable interface of the CDS.

2.7 Technical requirements to link with CDS Toolbox

The application will aim to integrate API calls to the Toolbox in order to retrieve the data needed for the visualisations. This will be the preferred system to include the CDS data in the application.

In order to fit the purpose of journalists, the application has to adapt to the fast-paced routines of newsrooms. Current response time of the toolbox that may take more than 15 minutes or hours depending on the request, doesn't fit the work pace of journalists. To overcome this issue, the data requests to the toolbox should be defined in advance and run systematically with a script. This will ensure that the toolbox has those requests saved in the Toolbox cache so the response time for data access of the toolbox is considerably reduced.

The contract will first analyse the feasibility of this systematic approach to cover all data requests of the application. As the CDS requests are not able to subset regions from already cached global data, we will both do global requests (covering all the globe) and regional ones to have fast access to all of them. We will then assess the performance of the application using cached queries to the toolbox. The application must provide journalists more immediacy in the results, and a queue time for the CDS toolbox results compatible with their timeframes and deadlines. We will evaluate with the Co-design group if the result is adequate and fit for purpose for the target users.

In case the performance doesn't meet the minimum time requirements of journalists, the application will alternatively use pre-downloaded datasets ready to be queried. Input data for the application will be downloaded from the C3S CDS with the Python CDS API and stored in the most appropriate format (e.g grib1, grib2, NetCDF4, json, etc.) following different community standards. The data will be automatically downloaded, quality controlled and pre-processed to a format ready to be integrated in the application. When possible, the stored datasets should not be the source datasets but post-processed data or final products in order to reduce the application response time and minimise the storage needed. These datasets will be hosted at C3S infrastructure.

If pre-downloaded data is finally used for the application, the performance assessment will be reported together with the list of requirements that need to be met by the toolbox for the application to stop using pre-downloaded data and switch to the use of direct queries to the toolbox.

2.8 Visual requirements to link with C3S websites

The application aims to have a reactive and fluid interface. A CMS like Drupal is usually built to render dynamic content on templates using records from a database of content. On the other hand, a single page application is a solution for a highly interactive website, that allows for a fluid experience as if the application were local. Taking this into account the Climate Media Portal will be implemented as a single-page application installed directly on a web server.

The goal of the Climate Media Portal is to be perceived by users as an integral part of the C3S services and websites. To reach this goal, the single page application will replicate the design and key interface elements of all other C3S pages and will follow the visual identity rules so the key body of the application is also in line with the look and feel of the C3S websites. The contractor will liaise with the C3S communication team to ensure the application fulfils the requirements while maintaining a good usability according to the tests with the co-design group.

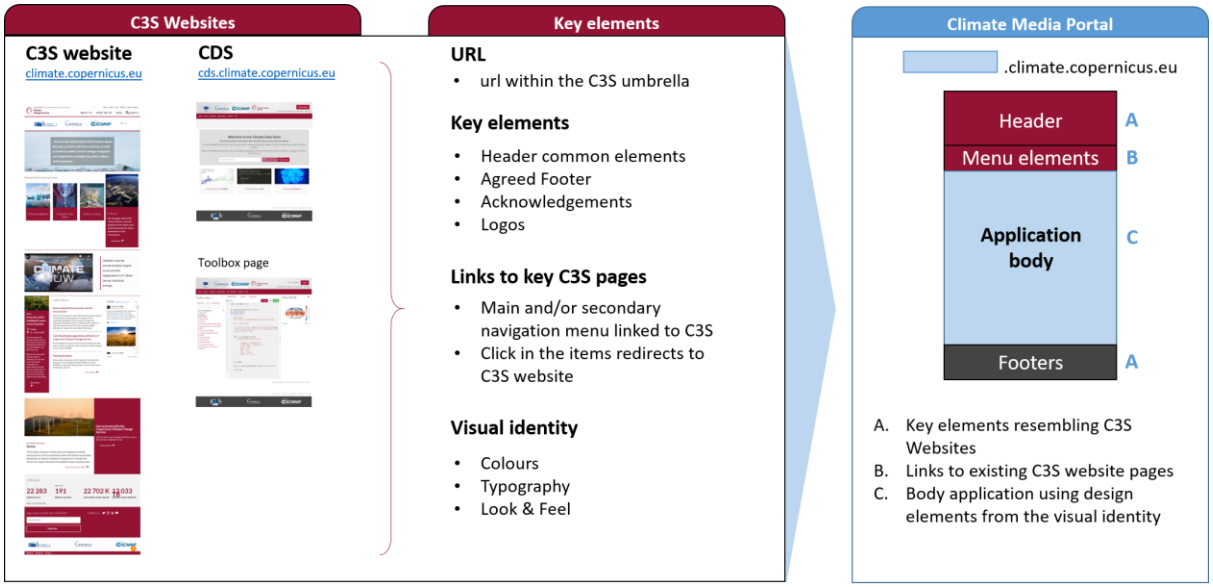

Figure 1: Overview of the visual link of the application to the C3S Websites

2.9 C3S products

The CDS has a large range of available products that can be of the interest of a very wide variety of user profiles. In order to focus the offer and be able to develop an application according to the budget of the ITT, the application will use only a selection of C3S products. The products that will be provided by the Climate Media Portal will be **ERA5 reanalysis**, **ECMWF S5 seasonal forecasts** and **CMIP5 projections** providing both the historical runs and the future projections for the different RCP scenarios. This will cover the requests of climate information for the past, the near-term future and the long-term future.

All three types of products provide information at a global scale. Therefore, the target **geographical area covers all over the world**. Potentially, journalists worldwide could make use of the application and we will seek the engagement of non-European journalists in the co-design group. Proximity is the first criteria of newsworthiness, therefore journalists need to frame their stories to the geographical

area relevant for their readers. This will be done by providing the information at different domain levels defined in the requirements-gathering phase.

2.10 Application architecture and Summary of equipment

LOGICAL ARCHITECTURE: The logical architecture of an application defines how the elements are structured to provide the functional requirements needed.

The Climate Media Portal logical architecture is composed of three layers:

- Infrastructure: this layer is composed of the necessary IT resources
  - The server for the front-end to host the application
  - Computing facilities to host all the data post-processing services (If pre-downloaded data is needed)
  - A file system hosting the data to be displayed in the application (If pre-downloaded data is needed)
- Back-end layer: this layer is in charge of three main processes
  - Data acquisition and processing
  - Data ingestion in the database to display in the interface
  - User management
- Front-end layer: this layer hosts the graphical user interface giving access to the back-end services, and it is responsible for rendering the interface and the data visualisations on the client.

The following schema gives an overview of the logical architecture of the Climate Media Portal application with its layers, components and the equipment/software needed in each layer

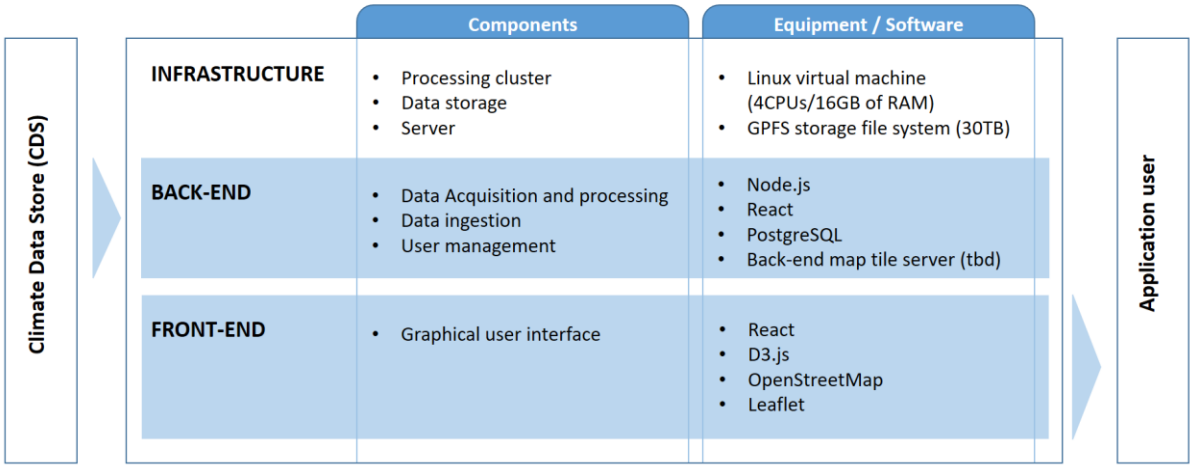

Figure 2: Overview of the logical architecture of the Climate Media Portal

INFRASTRUCTURE DESCRIPTION: In the case that pre-downloaded data is needed, we will use the storage capacity provided by C3S with a maximum estimated size of around 30TB in a gpfs file system. The wiki website, GitLab and the application will be hosted in the BSC infrastructure, within some Virtual Machines specially dedicated to the application. This choice will require some level of interaction and support by C3S operations team to provide access rights to BSC developers to set up, test and deploy the application in the dedicated Virtual Machine. However, for future growth, cloud services specialized in web scalability (worldwide distribution, elastic on-demand deployment of servers, intelligent hot/cold storage, etc.) could be more optimal but requiring a recurrent cost. After launching the application, we will have real usage numbers, which we will present in a report that will

allow a finely tuned analysis of the actual hosting and storage resources needed to serve the application in the future.

BACK-END AND FRONT-END DESCRIPTION: The proposed architecture does not require a content management system (CMS). Instead, it is a traditional single-page application installed directly on a web server. On the server, the application will run Node.js for its back-end services (e.g. user login, managing users' projects), and React.js to ensure that interactivity is fluid.

The application aims to have a reactive and fluid interface. Integrating an interface optimised for visualisations into a CMS like Drupal is possible, but it is not trivial. Recreating this experience inside Drupal requires installing external plugins and libraries (some of them community created) whose update frequency is arbitrary, if any. This approach would impose certain limits on the application functionalities, and most likely would also impact its performance. Furthermore, it would seriously hinder the system maintenance by C3S. On the other hand, the single page application can easily replicate the design and interface elements of the look and feel of all other C3S pages, so it can be made to look as if it were integrated into the CMS.

DOCUMENTS REPOSITORY: BSC has all means in place for the repository and archiving of the deliverables during and after the contract implementation (at least six years). The master copies of the Deliverables will be stored and archived in places only where the Copernicus Regulation and related delegation legislation such as the Copernicus Data Policy can be enforced (EU Member States and Norway) during the full duration of the Contract.

Table 1: Equipment (including hardware and software) to be used for provision of the Service

Equipment	Describe Relevant Function	List each work package for which equipment will be used	Owned / To be Purchased / To be Leased
Linux Virtual Machine, (4 CPUs / 16 GB of RAM)	Data formatting and pre-processing for visualisation	WP1 and WP2	Owned
30TB of storage in GPFS file system	Storing climate information to be queried instantly by the application	WP1 and WP2	Owned
Node.js	Server-side functionality for web app	WP2	Open source (MIT License)
React	Server and client side functionality	WP2	Open source (MIT License)
PostgreSQL	Relational Database system	WP2	Open source
D3.js	Web charting library	WP2	Open Source (BSD 3-Clause License)
To be defined	Back-end map tile server	WP2	Open source
OpenStreetMap	Tiles for maps	WP2	Open Database License
Leaflet	Integration of map tiles into interactive charts	WP2	Open Source (BSD-2-Clause License)

Adobe Creative Suite (Illustrator, Photoshop)	Graphic Design	WP1	Owned
Adobe XD	User Experience Design	WP1	Owned

2.11 Maximum impact product and future roadmap

Our user-centred design approach will allow us to obtain a long list of features desired by the end-users. Furthermore, we will be able to prioritize the features in such a way that we allocate the project resources to those features with maximum impact on the users[8]. We call this a maximum impact product under fixed time and budget constraints. An advantage of this approach is that those features that do not get to be implemented can be used as the future roadmap for the product, improving the application gradually into more complex (but used less often) use cases and needs.

The following are self-imposed limitations coming from the timeframe and resources available to this project, but are not strict in the sense that future versions of the application could include these features:

- The Climate Media Portal will focus on data and content related to climate change.
- The Climate Media Portal will not include an internal social media component. It will not include means for journalists to connect with scientists (our preliminary interviews brought this need up), or with community-generated efforts. We do plan, though, to include a section with examples and tutorials to help people get started.
- Other than the examples in the tutorials, the Climate Media Portal largely will not include major amounts of content explaining the science behind climate change. If strongly requested, links to related external resources could be placed instead.

2.12 Publicity and communication of the application

A communication and dissemination strategy will provide a general description of the dissemination activities planned along the lifetime of the contract and will offer an overview of the key messages, planned activities and communication channels. It will also detail the dissemination actions for the launch of the application to maximise the impact which will include also one press release in the occasion of the launch in order to publicise it.

From our preliminary round of contact and our previous knowledge, Twitter is still the main social network among journalists. It is their way to engage with their communities of interest, locate sources and break news almost instantly. Twitter is also the main application to keep the pulse of their professional community–what other journalists are commenting, writing or saying. The inclusion of social media share buttons in the application will facilitate that users share the visualisation generated by the application on Twitter. After the launch, we will start a twitter action targeting a list of renowned journalists and top climate influencers seeking that some of them test the application and feel interested enough to share it so the application cascades down through their followers.

Similar but much slower effect is what we expect from journalists using the visualisations in their articles. The visualisations shared through the social media share buttons, embedded or downloaded will have an integrated reference to C3S signalling that the information displayed in the visualisation has been powered by data from the CDS. For advanced journalists or designers willing to edit the visualisation provided, there will be a clear indication of how to attribute C3S and the CDS as the source of information, so they can later include the credit in the figure caption. This will help us track

[8] According to Lisa Charlotte Rost (VisInPractice Workshop, Berlin 2018), from the related application DataWrapper, datavis for journalists follows a typical 80/20 rule: 80% of the users need only 20% of the features.

where and how often the visualisations from the Climate Media Portal have been used. And could, in the medium term, indicate if the application gains traction among journalists (although this analysis is out of the time scope of this contract).

BSC acknowledges the following terms on Communication and Publicity:

1. Unless ECMWF requests or agrees otherwise, any communication or publication related to this Agreement, made by BSC, including at conferences, seminars or in any information or promotional materials (such as brochures, leaflets, posters, presentations, etc.), shall acknowledge that the relevant Copernicus service (C3S) was or is being “Funded by the European Union" and “Implemented by ECMWF” and shall display the Copernicus and ECMWF logos in an appropriate way. The size and prominence of the acknowledgements and logos shall be clearly visible in a manner that will not create any confusion regarding the involvement of BSC, ECMWF and the Union in the relevant activity.
2. If BSC communicates or publishes any of the Deliverables to any person other than ECMWF, the communication or publication must explicitly state that:
    a) the information/material contained is being communicated/published in the name of the Commission;
    b) the information/material contained has been produced “with funding by the European Union”; and
    c) the Commission is not responsible for any use that may be made of the information/material contained;
3. During the Development Phase, the app/website developed under this Contract will be referred as a Copernicus C3S app. During the Implementation Phase, it will be decided in accordance with C3S the eventual use of a commercial name.
4. BSC acknowledges that Copernicus C3S branding and data usage acknowledgement is a requirement and must be implemented in the website. BSC will submit for approval a proposal on how to implement it.

Exceptions to the above may be considered by ECMWF, but need to be approved on a case by case basis.

3 Demo case

3.1 Primary users

The app targets the media sector (written media, TV, online media, generalised and specialised). To reach the media it has to be addressed to journalists, but journalists are not a homogenous community and there are different specialisations and profiles. Below there are the main groups that we will target with an assessment of their information needs regarding climate.

DATA JOURNALISTS: European public bodies generate and store huge amounts of data and in the framework of the Open Data movement, it is made available to the citizens for the sake of transparency and democracy. Powerful stories lay behind the datasets and careful processing can extract impactful facts not apparent at first sight. Data journalists work with designers and data analysts to reveal those stories and put them under the spotlight. The Climate Media Portal could attract the attention of data journalists to the Climate Data Store and help them build data-driven stories on climate sciences and climate change.

FREELANCE JOURNALISTS: Freelancers are journalists selling content produced on their own to the media industry. They are usually aware of multiple information sources in the search of a good story. The success of freelance journalists depends on the quality and newsworthiness of their stories as much as on its appeal. On top of this, freelancers need to produce their stories fast and cannot afford

to spend too much time accessing and validating data from data providers. The Climate Media Portal would provide solid and reliable data in a ready-to-use and appealing format.

SCIENCE JOURNALISTS and COMMUNICATORS: Apart from working with freelancers, some mass media and communication groups have specialised science journalists in-house, covering science-related news on a regular basis. Either in generalist newspapers (e.g. The Guardian science correspondents), climate-focused publications (e.g. Carbon Brief) or monthly magazines on popular science (e.g. Scientific European, National Geographic), these science journalists need access to reliable and reputable data visualisations to help them illustrate their stories on climate and climate change. Other science communicators from other disciplines may need climate-related materials as well.

WEATHER INFORMATION SPECIALISTS: It is a common practice for TV stations and other media, to comment on climate information in the weather forecast section, or by the weather specialists in the news about unusual events (rainy seasons, heat waves, cold spells, hurricanes or tornadoes). These specialists are usually meteorologists with a background in physics and, thus, highly educated in technical aspects. In a way, they represent science in the audience's mind very often. However, the urge to produce daily or even hourly forecasts, hinders them from spending the time to access high-level datasets and producing their own data-driven visuals.

MEDIA INFOGRAPHISTS: When journalists or communicators need to produce more sophisticated visualisations than charts or simple graphics, they hire the services of media infographists. These are graphic design specialists capable of integrating different sources of information into a comprehensive visualisation showing an issue from multiple angles. these visualisations, sometimes with an artistic touch, help grasp the complexity of science matters while catching the eye of the audience. Infographists are not necessarily technically-savvy about data sources and their quality and the authoritative origin of the CDS datasets could be reassuring for the media infographists.

3.2 Secondary users

Besides the primary target of the Climate Media Portal (the users), there are secondary audiences that, if properly addressed, can help reach a larger audience through earned publicity or acting as direct users of the application.

CLIMATE INFLUENCERS: Social media offers a window for virtually anyone to share their messages. In the global networks, some people catch more attention than others, regardless of their professional background (scientists, activists, journalists). They are generally called "influencers" and in the climate and environmental community many can be found: Glen Peters (@Peters_Glen), Greta Thunberg (@GretaThunberg), Al Gore (@algore) and more. The Climate Media Portal can offer them high-quality data driven graphics to add in their campaigns.

ENVIRONMENTAL NGOs (ENGO): Many non-profit organisations have been active in raising awareness about climate protection for a long time. Some have a strong reputation, followers worldwide and manage a mobilised community of activists on social networks. Examples are Greenpeace, WWF, Oxfam and more. ENGOs' campaigns get a lot of media attention sometimes and can help visualise the Climate Media Portal if they find data or visualisations in line with their needs.

3.3 Gap assessment

Below there is a brief description of three applications that target journalists and that have some aspects similar to the solution presented in this contract:

Flourish (https://flourish.studio)	
Overall: It is a powerful visualisation tool that has put emphasis not only on showing charts or maps but also on the need of creating interactive Data stories[9].	
Relevant Info: It is a JavaScript visualisation framework running in the cloud (SaaS). The export features include figure download, interactive figures for presentations and website embed option. In the free account option, all figures have Flourish branding, and all the data uploaded and the visualisations created are public. A more advanced free option for journalists and newsrooms is supported by Google News Lab.	
Data: The tool does not provide any data. The user has to upload a dataset, which is not intuitive for beginners. Problems in data upload and visualisation are due to low usability and issues with information architecture.	**Visualisation:** The user can customise templates by changing colours and styles. The graphics created are interactive and responsive to any device.
Datawrapper (https://www.datawrapper.de)	
Overall: It is an application created by journalists for journalists to solve the pain points of creating figures fast. It creates charts and maps with some interactivity (readers can hover over lines, bars o map areas to see underlying values), and can easily connect to external data sources like Google Spreadsheets.	
Relevant Info: It is a JavaScript visualisation framework running in the cloud (SaaS). In the free subscription mode all data and figures created are public and they can be embedded but they can't be exported in other formats or be styled beyond the colours. They have created a community around the tool and have a blog where they share weekly well-developed and attractive visualisations using their tool.	
Data: The tool does not provide any data. As Flourish, it is not easy for the users to upload large or complex data unless it is a very simple table of numbers. However, the navigation hierarchy and usability are efficient and support functionality.	**Visualisation:** Their focus is on medium to large newsrooms paying for full styling of the layout of the visualisation according to their brand style guide.
Gapminder (https://www.gapminder.org)	
Overall: The objective of the website is to dismantle socio-economical misconceptions by providing data-based facts. They do it through the visualisation tool but mainly through training material which is not necessarily targeted to journalists.	
Relevant Info: It is a software platform using D3.js as a JavaScript visualisation framework online but it can also be downloaded. It provides animated bubble charts, trends, and other chart options. They started focusing mainly in the communication of statistics but now they have a photography project to add emotion to the facts, the Dollar Street project[10]	
Data: It aggregates multiple datasets on human-centered indicators and socio-economic data. Few datasets are labelled as directly related to climate. The navigation and usability for filtering parameters are poor.	**Visualisation:** The tool is easy and fast to use but now it is visually outdated. It was innovative by 2006 when they presented their animated bubble graph in a TED talk[11]

[9] Example produced by Flourish about global warming: https://vimeo.com/258063676

[10] https://www.gapminder.org/dollar-street/matrix

[11] Hans Rosling talk at TED2006: https://bit.ly/2VNPVYq

In summary, Gapminder has a concept closer to our application, but Flourish and Datawrapper have the right approach in terms of the weight that has to be given to visualisation. This is a preliminary benchmark as there are many online applications with some overlapping functionalities but not specifically targeting journalists. In general, the applications are aimed at either chart creation or tools with ready-made charts such as Global Carbon Atlas and others. In our preliminary contact with journalists, the difficulty of existing tools and the disaggregation between data sources and tools was a recurring topic, indicating that there is indeed a space for a tool like the Climate Media Portal. One specific task in the implementation phase of the contract will be to make a proper benchmarking of available tools and identifying useful features to cover.

The Climate Media Portal differs from the tools mentioned above in the topic specialisation, dealing specifically with climate information, relying on datasets that are largely inaccessible to the target audience, and a focus on the balance between aesthetics, functionality and source robustness.

3.4 Outreach and engagement strategies

The search and engagement of journalists for the co-design group and the two-way communication with them for the design of the application will help them to create a bound with the application facilitating later their uptake of it as an additional source of visuals for their stories. If satisfied with the application, we expect a few of these journalists to naturally become ambassadors of the portal through their conversations about the application with other colleagues.

Our aim is to achieve a growing use of the application by journalists that is sustained through time. For the sought increase in the number of users, we also rely on a medium-to-long-term effect where journalists—seeing news from other colleagues that already use the information provided by the application—become interested in checking it out. Initially, the application can become part of the various tools that they may take into account when preparing a piece of news, and ideally, get into their news-creation strategy gradually through the so-called snowball effect.

These are slow-paced but secure strategies for getting more journalists engaged with the application and gaining traction. Besides, we will aim to boost the visibility of the application during the contract duration with some engagement activities.

A part of reaching out to renowned journalists and climate change influencers to introduce the application, encourage them to try it and tweet about it if they like it and find it useful (see section 2.12); we will also make some research on current journalists associations with a focus on science or climate change to inform them about the application so they can communicate among their associates the Climate Media Portal. One of the actions targeted to these associations would be the organisation of an online webinar to present the functionalities of the application. Currently, only in Europe there are at least 19 science journalists associations such as the Association of British Science Writers (ABSW) or the regional and national science journalism associations in Catalonia and Spain (ACCC, AECC). There are also overarching associations such as the European Union of Science Journalism Associations (EUSJA) or the World Federation of Science Journalists (WFSJ) which aggregates science journalists associations from the five continents[12].

From the preliminary feedback, very few journalists have time to attend conferences of their field. However, being present in a few key conferences to present the application could help engaging with some segments of our target audience. Malofiej is, for instance, the annual meeting point for international experts on infography. During the contract, we will be at Malofiej to present the high

[12] https://www.google.com/maps/d/viewer?mid=1-gkWZ4Jle7Cx2BJ9-4vZDR5U6RH6k-R-&usp=sharing

fidelity prototype of the application and we will aim at holding a side event or workshop at the conference. Besides Malofiej, we will present the application in a C3S event. We will also prioritise the attendance to one US conference to give visibility to the application and the CDS outside Europe. The Contractor foresees the possibility of attending other strategic conferences listed in Table 2 for engaging with journalists. This will be subject to the C3S_429g_BSC budget availability.

Table 2: Conferences and meetings relevant for the contract

Key conferences and meetings	Dates and place	Attendees	Estimated cost per attendee
28th Infographics World Summit (Malofiej)	March 2020 Pamplona, Spain	2	EUR 1,000 (5 days)
Travel to end of co-design phase meeting in Reading	March 2020 (TBC) Reading, UK	3	EUR 1,000 (1 day)
Travel to C3S event or the C3S User Day	TBC	1	EUR 1,200 (3 days)
Society of Environmental Journalists, 30th annual conference	October 2020 (TBC) Colorado, USA	1	EUR 2,500 (4 days)
Other relevant conferences	**Dates and place**		
International Journalism Festival	1-5 April 2020, Perugia, Italy		
7th European Conference of Science Journalists (ECSJ)	July 2020		

3.5 Expected impact

The way the media frame climate change stories has substantive consequences on the perception of climate risks by the general public. Former research has shown the impact that both print media and television have on the conformation of the opinions and views of European citizens[13]. Because the number of well-informed citizens that read specialized climate media is still limited, it is of utmost importance that journalists are able to build their stories from quality climate data. In this sense, we envision the Climate Media Portal as a means of facilitating and inspiring journalists in their creation of climate change narratives that can both overcome the challenges of climate change communication and bring their audience a step closer to climate action.

Recently, we have seen how successful visualisations of climate information (such as the climate spirals from Ed Hawkins[14] or the Earth Temperature Timeline by Randall Munroe[15]) have rapidly become viral, regardless of the origin of the information they use. As we envision it, the Climate Media Portal could become the reference for the climate information to use when creating such

[13] Smith (2005), https://www.ncbi.nlm.nih.gov/pubmed/16506976

[14] https://www.climate-lab-book.ac.uk/spirals/

[15] https://xkcd.com/1732/

visualisations as well as other climate change communication formats. Additionally, the Portal would provide a certification of data origin, placing Copernicus as the main source of data for journalists seeking information for climate change reporting. This certification would be indicated by the C3S and CDS logos appearing on any of the generated materials, and ensuring journalists and their readers the robustness and authoritative character of the data used. Given that media outlets are often international, this would also help position the European Copernicus CDS together with other well-established climate information sources worldwide, such as the National Oceanic and Atmospheric Administration (NOAA) or the National Aeronautics and Space Administration (NASA) from the United States.

We expect journalists involved in the co-production process to benefit from the Climate Media Portal by enhancing their contacts agenda within the climate science community. They will be the early adopters of the new visuals, which may result in an increase in the production and quality of their articles, given that the portal will be tailored to their needs. We also expect new users to adopt the Climate Media Portal, including not only journalists but also environmental activists, freelancers and infographists. For that, we rely on the reputation of the Copernicus CDS, the user-friendly interface, and the demonstrated impact on early adopters, that may generate a snowball effect on new adopters. However, this impact may be twofold, since through media, readers from different business sectors (such as agriculture, tourism, energy, etc.) may learn about the Copernicus CDS and the existence of the Sectoral Information Systems (SIS).

The most eye-catching climate visualisations today are the result of partnerships between scientists and data visualisation experts. They are often designed keeping in mind a wide target audience and conveying general messages (such as temperature increase over time, or sea level rise). The impact on general audiences will depend on the ability of the outcomes generated using the tool to inform, engage and empower these audiences to take action. For that, powerful, emotional and creative visualisations of climate change impacts, the risk they pose for society and the economy, and the relation between people's behaviour and greenhouse gas emissions are in high need, and can be further supported by the Climate Media Portal.

3.6 Impact evaluation

We will evaluate the impacts achieved by the contract by monitoring key performance indicators (KPIs) during both the co-design phase of the application with journalists (engagement impacts) and the operational phase (media impacts). Please note that these KPIs are independent from the contractual KPIs defined in section 5.6. For both phases we will consider sending a short satisfaction survey or will put in place other feedback-gathering actions or solutions. As detailed in the work plan, a final impact evaluation report will review the overall impact that the application has had in media and will provide some insights on the type of users and how they have been using the tool.

Table 3: Non-contractual KPIs

Phase	Key Performance Indicator	Expected value
1	Number of journalists engaged in interviews and virtual meetings	12
	Number of participants in prototypes testing	20
	User engagement satisfaction survey	over 70% positive
2	Total number of registered users	50

	Proportion of journalists within registered users	over 60%
	Total downloads from the site (any kind of visual)	100
	Total visuals embedded in websites	20
	Twitter mentions	100
	Proportion of positive Twitter mentions	over 70%
	Number of articles crediting the Climate Media Portal (press clipping)	7
	Number of registered users that start following @CopernicusECMWF on twitter	10% of registered users
	Number of users of the application that register to the CDS	2% of registered users
	Final user satisfaction survey	over 70% positive

4 Quality of resources to be deployed

4.1 Description of resources

The team of people participating in this contract (Table 4) is a multidisciplinary combination of experts on data visualisation, human-computer interaction, science communication, and climate services together with software engineers specialised in climate data management, front- and back-end website development. Belonging to the same institution and being located on the same premises is a warranty of close and effective collaboration. Moreover, the key personnel belong to different groups and teams at BSC that have successfully demonstrated the capacity to execute the type of tasks of the contract and excel in terms of reaching impact for the application. The four main reasons are that a) there is a Knowledge Transfer team that has a well-established reputation in user engagement and dissemination for the creation of climate services; b) the Scientific Visualisation Group is fully devoted to the creation of visualisation products ranging from complex highly technical products to mainstream applications; c) All this knowledge is fully supported by the Data and Diagnostic team that is formed by computer scientists specialised in the management of climate information and the accessibility to the Climate Prediction Group that ensure that climate scientists will provide advice, explanations and validations to any climate-related issue; and last but not least d) the Earth Science Department has ten years of operational service experience in the field of atmospheric composition.

Below we list some of the previous activities similar or related to the contract that demonstrate the suitability of the team to carry out the offer.

a) User engagement and dissemination in climate services

The team has wide experience in the engagement and creation of tailored contents and dissemination material for users from agriculture, renewable energy or insurance sectors among others. This will be helpful in both the engagement with journalists and the capacity to adapt contents to the information needs and level of journalists and their readers. Regarding the creation of online services, the team was involved in the user engagement, content creation and scientific advice of Project Ukko[16]. A semi-

[16] http://www.project-ukko.net/

operational prototype for the energy sector developed within EUPORIAS that featured in general media such as the Guardian, the BBC or the Wired. In 2016 the team was involved in the creation of a website (www.seasonalhurricanepredictions.org) conceived for broad audiences that centralises in a single interface all the freely available Atlantic seasonal hurricane forecasts. This is an ongoing operational service in collaboration with the private sector that is fully functional during the hurricanes season from June to November.

b) Mainstream science visualisation

The group has a track record of compelling projects that have been featured in media and received multiple international awards. The latest project, in collaboration with journalists and available at http://www.proyectocuentalo.org/, is an example of data visualisation for the general public giving visibility to the Twitter #metoo movement in Spain (#cuentalo). In the last few years, the team has also participated in different editions of the Sonar music festival in Barcelona with interactive data visualisation projects helping disseminate research on artificial intelligence, smart cities, internet of things and other areas where BSC works (full portfolio on their website[17]). The group also uses animated data visualisation for creating short documentaries, tailoring the message and the visualisation to the audience level (see Virtual Humans[18] or Simulados[19]). The documentaries have been picked up by many film festivals around the world, bringing a lot of visibility to the research projects and creating opportunities like appearances of the researchers at TED talks.

c) Climate data management

The team brings comprehensive knowledge on the structure and managing of climate data with more than ten years of experience in related projects. In the last years, these projects include the C3S_51 Lot3 and the ongoing service contract C3S_512, that are directly related to the CDS infrastructure and quality assessment of its data, which ensures the proper understanding of the complexity and variety of available datasets in the CDS, the CDS toolbox and the CDS infrastructure.

d) Current operational services on air quality

The BSC hosts (together with AEMET) two WMO regional centers of sand and dust storms: the Sand and Dust Storm Warning Advisory and Assessment System for North Africa, Europe and Middle East (WMO SDS-WAS Regional Center[20]) and the Barcelona Dust Forecast Center (BDFC[21]). In the field of air quality services, the BSC runs the CALIOPE operational service[22] that provides daily air quality forecasts for Europe and Spain. Currently, BSC is a subcontractor of CAMS_50 with the aim of including the CALIOPE air quality system within the CAMS regional Ensemble. This demonstrates the capacity of the center to operationalise and maintain daily operational services.

Table 4: HR Profiles

Title	Broad description of work in relation to Service	List of personnel who fit the profile and whose CVs	Qualifications	Effort / engageme

[17] http://www.bsc.es/viz/

[18] https://youtu.be/z0CH1TcXHio

[19] https://www.bsc.es/viz/simulados/index.html

[20] https://sds-was.aemet.es/forecast-products/dust-forecasts

[21] https://dust.aemet.es/

[22] www.caliope.bsc.es

		were submitted with C3S_429 tender		nt in months
Project coordinator	Ensure the correct execution of the contract	Isadora Jiménez	PhD in Biodiversity; Master in Science communication	1.45
Research project manager	Cover administrative and management requirements	Dorota Jouet	Project manager at Earth Science department	0.39
Research scientist/ Team leader	Contribute to the overall design and architecture of the application	Fernando Cucchietti	PhD in Physics and data analytics; Visualisation group leader	0.75
User Experience researcher	User Experience design and testing	Luz Calvo	Master in user experience; Master in big data analytics and visualisation	1.33
User Experience researcher	User Experience research, user interviews and conceptualization	María Soledad Bucalo	Master in Sustainable Industrial and Product Design	1.75
Front-end developer	Develop and implement the client-side interface	Juan Felipe Gómez	Master in interactive media design	3.5
Back-end developer	Develop and implement the server-side interface	David García	Master in game design	3.5
Information Designer	Design visualisations and the look and feel of the application	Diana Velez	Master in interactive media design; Master in data journalism	1.1
Science Communication expert	Adapt contents and prepare dissemination material	Marta Terrado	PhD in earth sciences	3.05
Senior Software Engineer	Handle the data management (download, format, DMP)	Pierre-Antoine Bretonnière	Master in IT engineering	2.4
Research scientist	Provide expert advice about climate information	Louis-Philippe Caron	PhD in Atmospheric Sciences and Climate Prediction Interim Group leader	0.26

4.2 Key personnel CVs

The following table lists the names of key personnel involved in the contract. All CVs are available in Annex I.

Table 5: List of CV included in the Annex I

Department	Group/Team	Key personnel
Earth Sciences	Earth System Services/Knowledge transfer	Isadora Jiménez, Marta Terrado

department (ES)	Computational Earth Sciences/Data and Diagnostics Team	Pierre-Antoine Bretonnière
	Climate Prediction Group	Louis-Philippe Caron
Computer Applications in Science and Engineering department (CASE)	Scientific Visualisation	Fernando Cucchietti, Luz Calvo, Juan Felipe Gomez, David García, Diana Velez, María Soledad Bucalo
Research Support, Transfer and Dissemination (RSTD)	Project Management Office (PMO)	Dorota Jouet

5 Management and implementation plan

5.1 General organisation

BSC will coordinate this offer and will be the sole contractor involved in the C3S_429g contract. This is possible thanks to the comprehensive collaboration of two different departments and four teams from BSC that have complementary expertise to cover the profiles needed to successfully create, manage and advance the application.

The project coordinator will be Dr Isadora Jiménez, the Knowledge Transfer team leader within the Earth Sciences department (BSC-ES). Isadora Jiménez is a scientist specialised in science communication with four years of experience in the field of climate services. During this time, she has demonstrated effective applied practice, facilitating user engagement and tailoring climate information to the needs of relevant sectors of society. She has management experience as Work Package leader in EU-funded projects for dissemination and user engagement WPs, and currently, she is part of the coordination team of the S2S4E project (H2020-SC5-01-2017-776787). Before specialising on climate services, she was the communication manager in an Alzheimer research center, where she acquired extensive experience interacting with journalists from TVs, radios, and general and specialised written media.

The BSC-ES department is a research unit that gathers together climate scientists, climate services experts, technical groups, and science communication specialists. The department's goal is to respond to the growing demand for climate expertise and services from a variety of stakeholders and public institutions. Three different teams from BSC-ES will be involved in the offer. The Knowledge Transfer team will bring experience on the field of climate services, user engagement and science dissemination. In particular, their experience with user engagement for agriculture, energy and other sectors. The offer will also benefit from the knowledge gained in user engagement in relation to C3S contracts such as C3S_52 Lot2, C3S_441 Lot2, C3S_51 Lot3 and the ongoing C3S_512 service contract. The Data and Diagnostics Team is formed by computer and data scientists that collect, standardise and distribute Earth sciences data (climate, seasonal to decadal forecasts, air quality, etc.) for users inside and outside the BSC-ES department, and deploys the infrastructure needed for data services. This team has been strongly involved for over ten years in many European and national projects, including projects directly related to the CDS infrastructure and the quality assessment of its data (C3S_512, C3S_51 Lot3) as well as to the scientific content of the data (SPECS for seasonal, CMIP). The Data and Diagnostics Team will therefore ensure expert knowledge on the available products from the CDS and the optimal data workflows for the application. Finally, the Climate Prediction group will

also contribute as advisors to ensure that the information displayed and the datasets available are explained correctly.

The Computer Applications in Science and Engineering department (BSC-CASE) is a research unit devoted to finding new computational strategies to simulate and solve complex problems in industry and academia. Within BSC-CASE, the Scientific visualisation group will be involved in the offer. The group is a multidisciplinary team formed by physicists, computer and data scientists, graphic artists, and interaction designers. This mixture allows the production of beautiful and appealing, as well as scientifically correct and relevant visualisations. The team has ample experience in designing and implementing data-heavy user interfaces in the projects PELE-GUI, S2S4E (ongoing), CYBELE (ongoing), and projects for private companies in the energy and utilities sectors. Even more, the team also has strong experience in science dissemination and communication to general and specialized audiences with interactive data visualisations for the Sonar music festival, and with multiply awarded documentaries for projects such as COMPBIOMED, EOCOE, CONSOLIDER (Spanish Ministry), EPNet, and others.

Overall, the collaboration of members of all these teams will bring to the offer a multidisciplinary approach that will ensure the creation of a visually powerful application that conveys complex climate information.

Monthly teleconferences and regular review meetings will be organised with the ECMWF to ensure appropriate monitoring of the contract takes place. A series of progress reports will be provided to C3S in accordance with the schedule and using the C3S reporting templates provided by ECMWF. Feedback to those reports will be sought from C3S to take preventive measures. Quarterly reports will be delivered at least 15 days following the closing of the previous quarter.

5.2 Organigram

Figure 1 illustrates the role and interaction of the different BSC teams to deliver the application presented in this offer.

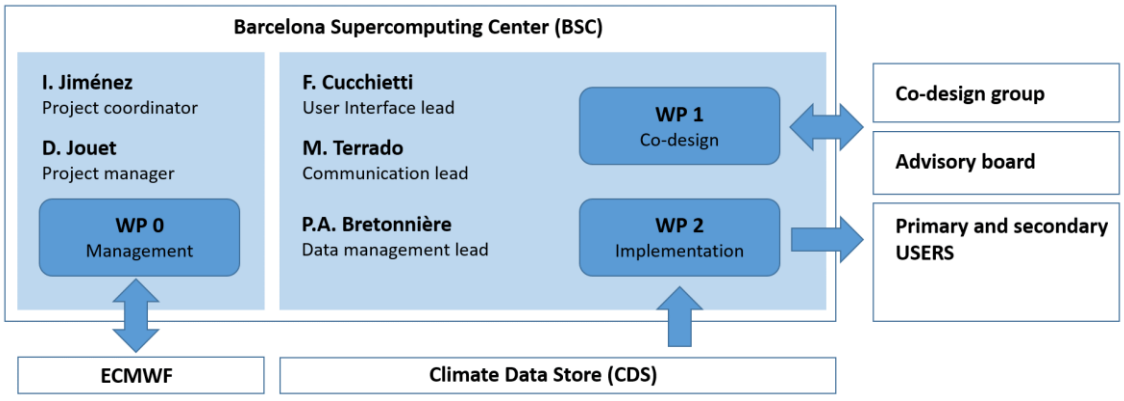

Figure 3: Organigram with the links between the main actors of this offer

5.3 Gantt chart and PERT chart

The contract is offered for 12 months, with an estimated start date of 1st November 2019. Table 6 shows the schedule of the different tasks and the deliverables at the time they are expected to be handled to C3S and Figure 2 describes the workflow of tasks directly related to the delivery of the Climate Media Portal application, with their dependencies and interactions.

Table 6: Gantt chart of scheduled tasks and Deliverables in section 5.5

				2019		2020											
				NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
WORK PACKAGE	TASKS	START	END	1	2	3	4	5	6	7	8	9	10	11	12	M12+60 days	
WP0	T0.1	M1	M12	M	D M		M		M		M		M		M		
	T0.2	M1	M12			D									D		
	T0.3	M1	M12							M							
	T0.4	M1	M12+60 days			D M	D		D			D			D	D	
WP1	T1.1	M1	M2		D												
	T1.2	M1	M6			M			D								
	T1.3	M3	M4				M										
	T1.4	M3	M6					M									
	T1.5	M5	M6						M								
	T1.6	M3	M6					D	D								
	T1.7	M1	M12	M							D						
WP2	T2.1	M7	M12								M				D		
	T2.2	M7	M12								M				D		
	T2.3	M7	M9							M		D					
	T2.4	M8	M12									D			D		
	T2.5	M9	M12												D		

D: Deliverable M: Milestone

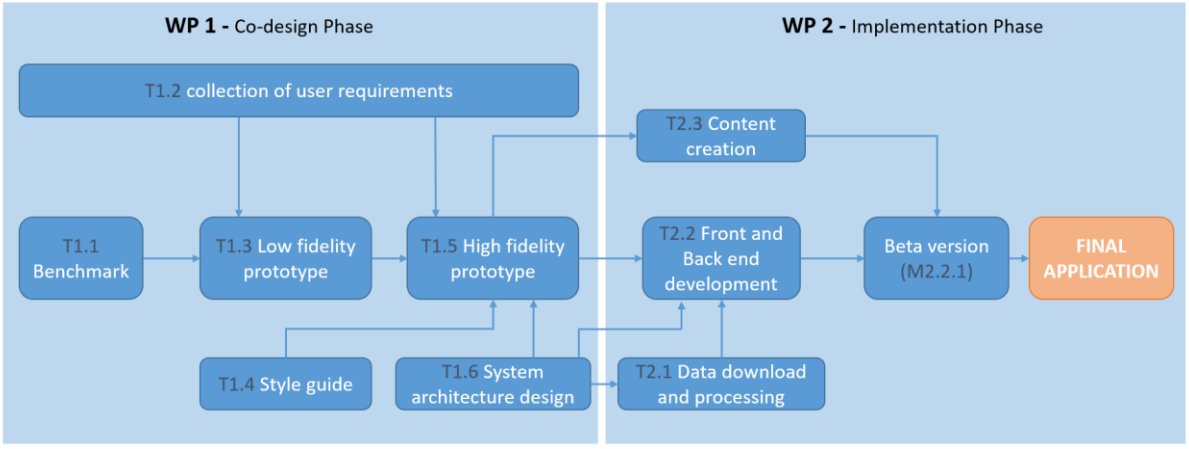

Figure 4: PERT chart of the key tasks to deliver the final application and their dependencies

5.4 Summary of work packages and Deliverables

The following table displays a summary of WPs, the deliverables and their effort in person months.

Table 7: Summary of Work packages and Deliverables

Work package	Deliverable Reference	Effort in person-months
WP0 (Management, communication and user engagement coordination)	D0.1.1 Wiki and GitLab	0.2
	D0.2.1 Data Management plan	0.12
	D0.4.1-2019Q4 Quarterly report	0.2
	D0.4.2-2012Q1 Quarterly report	0.2
	D0.4.3 Preliminary financial information	0.05
	D0.4.4-2019 Annual report	0.3
	D0.4.3-2020Q2 Quarterly report	0.2
	D0.5.4-2020Q3 Quarterly report	0.2
	D0.2.2 Updated Data Management Plan	0.12
	D0.4.7-2019/2020 Final and Annual report	0.4
Total WP0 Effort		**1.99**
WP1 (Co-design phase)	D1.1.1 Benchmark and positioning of the application	1.5
	D1.2.1 User requirements for the application	2
	D1.6.1 System architecture requirements	2
	D1.6.2 Assessment of performance of the application using queries to the Toolbox	0.9
	D1.7.1 Communication, dissemination and user uptake strategy	0.30
Total WP1 Effort		**6.7**
WP2 (Implementation phase)	D2.3.1 Final application available online	4.03
	D2.4.1 Two pages brochure available	1

	D2.1.1 Analysis of future infrastructure requirements for scaling up the application	2
	D2.2.1 Final application code available in GitLab	1.
	D2.2.2 Summary documentation of the application to accompany the code	1
	D2.4.2 Presentation of the application at a C3S event	0.26
	D2.5.1 Impact evaluation and recommendations for continued operation	1.5
Total WP2 Effort		**10.79**
TOTAL		**19.48**

5.5 Work package description

Work package #	WP0	Start/End date	M1-M12
Work package title	Management		
Participants (person months)	BSC (1.99 PM)		
Other main direct cost elements	N/A		

Main objectives

This work package is focused on ensuring the correct and timely development of the contract. The goals are to ensure internal coordination of the contributions of the different teams within the BSC, to report to ECMWF and facilitate the links with other relevant C3S teams and service contracts, and to give coherence to the strategies for user engagement and dissemination in the design and implementation phases.

Description of activities

Task 0.1 Contract management (M1-M12): This task will ensure the correct and timely development of the different tasks in the contract. It will ensure that all human resources are in place to carry out the contract and that any new hiring, if necessary, will be communicated to C3S. It will monitor periodically the contractual Key Performance Indicators, assess risks in the implementation of the contract and apply contingency and mitigation measures if necessary. Bi-monthly teleconferences will be organised with the ECMWF to ensure appropriate monitoring of the contract takes place.

A wiki website will be deployed to collect all contract-related information such as meeting minutes, documentation, periodic reports, events organisation or software development. The wiki together with a mailing list will facilitate internal communication among the teams involved in the contract and proper monitoring. A GitLab facility with restricted access will be created to favour a joint development of the front- and back-end of the application.

- M0.1.1 - Contract kick-off meeting (M1)
- D0.1.1 - Wiki and GitLab (M2)
- M0.1.2-4 - Bi-monthly teleconferences (M2, M4; M6)
- M0.1.5 - Remote review meeting Payment Milestone No 2(M6)
- M0.1.6-8 - Bi-monthly teleconferences (M8, M10; M12)
- M0.1.9 - Remote review meeting Payment Milestone No 3 (M12)
- M0.1.10 - Contract final meeting (M12)

Task 0.2 Data management plan (M1-M12): As part of the Open Research Data Pilot this offer will aim “to make the research data accessible with as few restrictions as possible and protecting sensitive data from inappropriate access”. Following this principle, the research data lifecycle will be managed according to a Data Management Plan (DMP) that will describe the measures to collect, standardise, share, curate and preserve research and personal data. We will use the “Guidelines on FAIR Data Management in Horizon 2020” and the web-based tool DMPonline which provides examples of DMP and guidelines from different funders (e.g. the European Commission for the Horizon 2020 projects). The DMP will consist in two deliverables: a first one at the beginning of the offer, in which we will describe the plans for the data usage during the project and a second one at the end showing what was actually done, the data that was produced and how it was actually used.
The design of the application will require a close interaction with journalists to ensure that the final outcomes are relevant to their needs. This will entail handling with basic personal data (name, job description, media company, email and phone number). The offer will pay special attention to GDPR compliance regarding the personal data used during the co-design phase and the dissemination of the final application. All participants

will be asked to provide their explicit consent for using their professional data and will be informed by a full privacy policy.

- D0.2.1 - Data Management plan (M1)
- D0.2.2 - Updated Data Management plan (M12)

Task 0.3. Coordination with other C3S teams (M1-M12): C3S has a number of teams and contracts devoted to outreach: communication, events organisation, and public relations. Coordination with these teams will be important to maximise the number of journalists reached at the preparation and launch of the application as well as for optimising the presence in media conferences. At the same time, the active engagement with journalists in the design phase will provide contacts with journalists with different profiles. Some data journalists might reach an expertise level advanced enough to directly access the CDS infrastructure through the toolbox. For this sort of profiles, the coordination with the ULS or EQC contracts can build useful synergies and become helpful at providing them with feedback from users with new profiles. The workflow for the interactions and collaborations with the C3S communication team and ULS or EQC contracts will be described as a section in the Draft communication, dissemination and user engagement strategy (M1.7.1). Given the links with other C3S contracts of the team involved in this offer, we expect a smooth exchange of information if the interaction with journalists brings useful feedback to the CDS infrastructure, the CDS toolbox or the data products. At the end of the co-design phase, all useful user requirements will be communicated to C3S with a short report so they can be included, if useful, in the URDB by the adequate service contract.

- M0.3.1 - Communication to C3S any CDS-related user requirements from Task 1.2 (M7)

Task 0.4 Reporting to ECMWF (M1-M12 (+60 days)): Four quarterly reports and one annual report will be provided to C3S in addition to a final report at the end of the contract. Quarterly reports will be delivered at least 15 days following the closing of the previous quarter (M4+15 days, M7+15 days, M10+15, M13+15); the annual report will be sent on or before the 28th of February 2020; and the final report will be delivered 60 days after the end of the contract (M12+60 days). Contractual KPIs may be standardised for all C3S_429 contracts, the list of KPIs in Section 5.6 will be updated accordingly (M0.4.1).

- M0.4.1 - Update of Contractual Key Performance Indicators list (M3)
- D0.4.1-2019Q4/D0.4.2-2012Q1/D0.4.5-2020Q2/D0.4.6-2020Q3 - Quarterly reports (M4, M7, M10, M12+15 days)
- D0.4.4-2019 - Annual report (M5)
- D0.4.7 - Final and Annual report (M12+60 days)
- D0.4.3/D0.4.8-2019/2020/ - Financial related Deliverables (M7, M12)

Deliverables

#	*Responsible*	*Nature*	*Title*	*Due*
D0.1.1	BSC	Website	Wiki and GitLab	M2
D0.2.1	BSC	Report	Data Management plan	M3
D0.4.1-2019Q4	BSC	Report	Quarterly report	M3
D0.4.2-2012Q1	BSC	Report	Quarterly report	M7
D0.4.3	BSC	Report	Preliminary financial information	M4
D0.4.4-2019	BSC	Report	Annual report	M4

D0.4.5-2020Q2	BSC	Report	Quarterly report	M10
D0.4.6-2020Q3	BSC	Report	Quarterly report	M12+15 days
D0.2.2	BSC	Report	Updated Data Management Plan	M12
D0.4.7-2019/2020	BSC	Report	Final and Annual (2020) report	M12+60 days

Milestones				
#	*Respon sible*	*Title*	*Means of verification*	*Due*
M0.1.1	BSC	Kick-off meeting	Minutes	M1
M0.1.2-4	BSC	Bi-monthly teleconference	Minutes of the meeting	M2; M4; M6
M0.4.1	BSC	Update of Contractual Key Performance Indicators list	List available in the wiki	M3
M0.1.5	BSC	Remote review meeting Payment Milestone No 2	Minutes of the meeting	M6
M0.3.1	BSC	Communication to C3S any CDS-related user requirements from Task 1.2	Report	M7
M0.1.6-8	BSC	Bi-monthly teleconference	Minutes of the meeting	M8, M10, M12
M0.1.9	BSC	Remote review meeting Payment Milestone No 3	Minutes of the meeting	M12
M0.1.10	BSC	Contract final meeting	Meeting summary report	M12

Work package #	**WP1**	**Start/End date**	**M1-M8**
Work package title	**Co-design Phase, communication and user engagement coordination**		
Participants (person months)	BSC (6.70 PM)		
Other main direct cost elements	Travel (EUR 3,000)		

Main objectives

This work package is focused on designing the application in such a way that it is both useful and usable for its target audience–journalists. The goals are to engage sufficient journalists to co-design the application and ensure a wide representation (properly weighted) of potential users, find and define their requirements and needs, and create a functional design prototype (together with graphic design) so that it can be implemented in WP2.

Description of activities

Task 1.1. Benchmark other available tools (M1-M2): Besides the tools presented in the Gap assessment section, in this task we will map out existing applications and technologies that journalists use as well as the ones they could use to communicate climate data visually. We will evaluate their strong and weak points, and prepare a report with actionable items to be taken into consideration for the Climate Media Portal.

- D1.1.1 - Benchmark and positioning of the application (M2)

Task 1.2. Collect user's requirements (M1-M6): Guided by the user engagement framework in M1.7.1, the efforts in this task will focus on reaching to as many recognized data and science journalists as possible to enrol them in the co-design group. This will be done through our current contact networks as well as cold calling. We do not expect a stable number of participants nor continuity of all the members from the start to the end of the co-design process. Journalists in the group will be asked for feedback. We will conduct as many personal interviews as possible (through teleconferencing and phone), and request journalists help to pass along form interviews to expand our reach. When possible, we will gather journalists and perform short (2-3hs) design sprints to gather functional as well as conceptual requirements. They will also be asked to participate in testing the low and high fidelity prototypes. The Advisory board will be formed during the first month. Virtual meetings will be organised in key steps of the co-design phase and before the launch of the application and the minutes of the Advisory board meetings will be available in the wiki.

- M1.2.1 - List of confirmed Advisory board members in the wiki (M3)
- D1.2.1 - User requirements for the application (M6)

Task 1.3. Low fidelity prototype (definition + testing) (M3-M4): A low fidelity prototype (or wireframe) is the way to design an application at a structural level before any visual design or content is included. The UX (User Experience) team will cast down the initial requirements into a coherent information architecture for the application, identifying the hierarchy of functionality as a function of value and impact for the users. With this, we will design an initial low fidelity prototype, and test it out with a selected group of potential users to identify if the requirements are correctly met or unexpected issues arise.

- M1.3.1 - Low fidelity prototype and user test report in the wiki (M4)

Task 1.4. Visual identity and Style guide (M3-M6): A unique and recognisable visual identity will be defined for the application and for the publicity materials to promote the application launch ensuring the application is seen as a part of the services provided by C3S. Deliverables, reports and other communication materials will be created using the Copernicus visual identity rules. The Style guide will define crucial User Interface components such as buttons, typography, colour, navigation menus, etc. The function of this guide is to bring cohesion to the application and inform the front-end development. During this task we will decide in accordance with C3S the use of the current (Climate Media Portal) or a different commercial name.

- M1.4.1 - Style guide file available in the wiki (M5)

Task 1.5. High fidelity prototype (definition + testing + final UI) (M5-M6): With the feedback from the tests with the low fidelity prototype, we will re-design the application to remedy potential issues and improve and refine the defined functionality. In this step, we will evaluate with journalists and general population state-of-the-art and novel visualisation techniques versus traditional and more easy to understand charts. The objective is to find a balance between visual appeal and novelty and straightforward communication for the application. The style guide created in Task 1.4 will be used to design a high fidelity prototype, including almost-final graphic design style and interactivity. This interactive prototype will be once more tested with users to find issues or provide a final validation to pass to development. If the timing of this task coincides with a journalism event

that we can attend, we will organise a short side event for a final validation before closing the design of the application. However, this will be conditional to the coincidence in time of an adequate event.

- M1.5.1 - High fidelity prototype and user test report in the wiki (M6)
- M1.5.2 - Meeting to present the high fidelity prototype in ECMWF (M6)

Task 1.6. System architecture design (M3-M6)

Once we have collected the first user requirements, we can design the system architecture: How the client-side of the application (front-end) connects to the server-side (back-end), including what technologies and protocols will be used in each and to connect them (databases for users, security, mapping, charting, etc.). The application back-end must connect to the core databases with CDS data, and make sure queries are performed in a quick and efficient manner. The application will prioritise the use of direct queries to the CDS toolbox, but an assessment of technical feasibility and performance will define if the application must temporarily use pre-downloaded data. The precise definition of all these aspects will ensure that the infrastructure deployed at C3S to host the application is compatible with the functionalities integrated into the high fidelity prototype or will signal the technical challenges marking feasibility limits to the implementation.

- D1.6.1 - System architecture requirements (M5)
- D1.6.2 - Assessment of performance of the application using queries to the Toolbox (M6)

Task 1.7 Communication and user uptake strategy (M1-M12)

A draft of the communication, dissemination and user engagement strategy will be prepared at the beginning of the contract and updated one month before the launch of the application (M8). The first draft will provide a general description of the dissemination activities planned along the lifetime of the contract and will offer an overview of key messages, communication platforms and activities. It will also describe the framework for user engagement activities with journalists in the co-design phase, including for instance the steps for the creation of the Advisory board and the strategy to attract journalists to participate in the co-design group. The table of engagement and media impact Key Performance Indicators (see Section 3.6) will be listed and tracked periodically in the report as this will be a living document that can be updated over the contract. One month before the launch, a second version of the strategy will expand the publicity and communication section detailing the communication actions for the launch of the application.

- M1.7.1 - Draft communication, dissemination and user engagement strategy (M1)
- D1.7.1 - Communication, dissemination and user engagement strategy (M8)

Deliverables				
#	*Responsible*	*Nature*	*Title*	*Due*
D1.1.1	BSC	Report	Benchmark and positioning of the application	M2
D1.6.1	BSC	Report	System architecture requirements	M5
D1.6.2	BSC	Report	Assessment of performance of the application using queries to the Toolbox	M6
D1.2.1	BSC	Report	User Requirements for the application	M6
D1.7.1	BSC	Report	Communication, dissemination and user uptake strategy	M8

Milestones				
#	*Responsible*	*Title*	*Means of verification*	*Due*
M1.2.1	BSC	List of confirmed Advisory board members in the wiki	Report	M3
M1.3.1	BSC	Low fidelity prototype and user test report in the wiki	Prototype	M4
M1.4.1	BSC	Style guide file available in the wiki	Report	M5
M1.5.1	BSC	High fidelity prototype and user test report in the wiki	Prototype	M6
M1.5.2	BSC	End of co-design phase meeting in Reading	Meeting summary	M6
M1.7.1	BSC	Draft communication, dissemination and engagement strategy	Report available in the wiki	M1

Work package #	WP2	**Start/End date**	**M7-M12**
Work package title	**Implementation Phase**		
Participants (person months)	BSC (10.79 PM)		
Other main direct cost elements	Travel (EUR 5.700)		

Main objectives

This work package has four objectives: i) the implementation and delivery of the final application, ii) the preparation of any dissemination material as well as the execution of the activities to maximise the engagement of journalists as users of the application, iv) the tracking and reporting of the actual impact of the application, and v) reflecting on future improvements and exploitation recommendations.

Description of activities

Task 2.1. Toolbox connection and data downloading and pre-processing (M7-M12)

This task focuses on the preparation of the system and processing infrastructure. Following the initial assessment in D1.6.2, we will prepare the cached queries to the toolbox or we will download the selected data products from the CDS and develop and deploy automated pipelines to process the data so that it is ready for the application (e.g. simplifications or indexing to allow fast response times). After the launch of the

application, based on the three months of operationality, a report on the actual user statistics will be prepared in order to analyse which are the infrastructure requirements to make the system fully scalable or to analyse the viability of using cloud services to make the tool faster. This report will also evaluate the performance of the application if it has been using the toolbox, or it will inform clear requirements so the application can switch from using pre-downloaded data to online queries. Finally, it will provide the documentation required in the CDS for applications using the toolbox (e.g. input and output of the functions, main purpose, documentation reference, etc.).

- M2.1.1 - Data available in storage for the application (M8)
- D2.1.1 - Analysis of future infrastructure requirements for scaling up the application (M12)

Task 2.2. Front and Back-end development (M7-M12)

We will develop the front- and back-end services of the application jointly following all the specifications created in WP1. All the development will be tracked in GitLab. Once all the development is done, there will be a final test evaluation to detect bugs or any unexpected issue to have a functional application by M9. In the last three months, we will correct detected bugs and (if there are few user feedback with bugs, and they do not require too much attention) we may continue adding some functionality. At the end of the contract, and after fixing bugs that may appear after the launch, the code of the final application will be consolidated in GitLab to be shared with ECMWF.

- M2.2.1 - Beta version of the application ready for inclusion of content (M8)
- D2.2.1 - Final application code available in GitLab (M12)
- D2.2.2 - Summary documentation of the application to accompany the code (M12)

Task 2.3. Content generation (M7-M9)

After the co-design phase, all the contents to be included within the application will be created. This will encompass general information about the application, the link of the application to C3S and the CDS, detailed information about the data products used, any background information useful for journalists, help documentation, or climate-related information by topics if needed for the final structure. All the contents will be tailored to the level of the average users of the application although some advanced contents may be addressed to more technically-advanced users. The application developed in T2.2 together with all the contents needed to populate it will define the final application that will be launched in M9.

- M2.3.1 - Working documents available in the wiki (M7)
- D2.3.1 - Final application available online (M9)

Task 2.4. Dissemination of the final application (M8-M12)

Different communication materials will be prepared to disseminate the application to potential users. These materials will include: a 2-page brochure presenting the application, twitter visuals to promote the application after the launch, online dissemination material presenting different user personas and the visualisations they could create with the application. These elements will be better defined before the launch of the application according to the communication strategy (D1.7.1). At least one press release will be published on the occasion of the launch of the application in order to publicise it.

This task will also include the research of journalists contacts through science journalists associations and the preparation of at least one webinar to explain the application to interested users within those associations. Besides we will present the application or its concept in at least one conference of interest for a segment of our potential users (See section 3.4) and at one C3S Event.

- D2.4.1 - Two pages brochure available (M9)
- D2.4.2 - Presentation of the app at a C3S event (M12)

Task 2.5. Impact Evaluation (M9-M12)

During the last three months of the contract, the application will be available online for the users. We will track the usage of the application using the media impact Key Performance Indicators defined in section 3.6. These KPIs will be reported together with a broader evaluation of the impact of the application since the launch. To gain insight on the user's satisfaction with the application we might consider either sending a survey to the registered users or implementing within the application a simple system for rating their satisfaction. A second part of the report will suggest options for maintaining a continued operation and improvement of the

application within the CDS umbrella. These recommendations will be linked to D2.1.1 on future infrastructure requirements for scaling up the application.

- D2.5.1 - Impact evaluation and recommendations for continued operation (M12)

Deliverables				
#	*Responsible*	*Nature*	*Title*	*Due*
D2.3.1	BSC	Report	Final application available online	M9
D2.4.1	BSC	Other	Two pages brochure available	M9
D2.1.1	BSC	Report	Analysis of future infrastructure requirements for scaling up the application	M12
D2.2.1	BSC	Code	Final application code available in GitLab	M12
D2.2.2	BSC	Report	Summary documentation of the application to accompany the code	M12
D2.4.2	BSC	Report	Presentation of the application at a C3S event	M12
D2.5.1	BSC	Report	Impact evaluation and recommendations for continued operation	M12

Milestones				
#	*Responsible*	*Title*	*Means of verification*	*Due*
M2.3.1	BSC	Working documents available in the wiki	Report	M7
M.2.1.1	BSC	Data available in storage for the application	Report	M8
M.2.2.1	BSC	Beta version of the application ready for inclusion of content	Website availability	M8

5.6 Contractual Key Performance Indicators

The table below lists the contractual Key Performance Indicators that are proposed for an appropriate monitoring of the contract's implementation. The KPI's will be standardised by C3S across all the C3S_429 contracts and during the first phase of the contract the KPI's will be discussed and may eventually be updated. Milestone M0.4.1 will reflect any change in the KPI's.

Table 8: Contractual Key Performance Indicators

KPI #	KPI Title	Performance Target and Unit of Measure	Frequency of Delivery	Explanations / Comments
1	Contract management	Number of management meetings (with respect to the ones initially planned).	Quarterly	To be included in the quarterly reports
2	Journalists engaged	Number of journalists engaged in co-design tasks of the contract	Quarterly	To be included in the quarterly reports
3	New users engaged	Cumulative number of new potential users engaged with the contract	Quarterly	To be included in the quarterly reports
4	Registered users	Number of registered users to the application	Quarterly	To be included in the quarterly reports
5	User satisfaction survey	Percentage of satisfaction response (target: over 70% of positive responses)	Quarterly	To be included in the quarterly reports
6	Usage of the application visuals	Total of downloads and embedded visualisations by users	Quarterly	To be included in the quarterly reports

5.7 Risk management

The table below summarises the different risks that in our opinion might lead to delays in the contract implementation using the scales listed in Table 10 for the likelihood and Impact columns.

Table 9: Risk Register for each Work package

Risk Name	Description	Likelihood	Impact	Response Strategy	Period
R1: Underperformance of the application due to toolbox	Risk of very low use of the application due to users' disappointment with performance issues (e.g. application response time is too long) due to the use of cached queries to the CDS toolbox.	3	4	Avoid: Implement an alternative to the toolbox queries based on pre-downloaded data. Reduce: Inform the CDS on the minimum requirements of performance of the toolbox according to users' feedback so the toolbox queries can be	M6-M12

response time				used in the application when it meets the requirements.	
R2: Underdimensioning of the service infrastructure	Risk of having too many simultaneous requests from users that provoke overload or failure of the system (WP2).	2	4	Reduce: upgrade the service infrastructure Accept: communicate with the registered users to inform on the problem framing the failure as a result of the high interest of the user community on the application and remark that measures are being implemented to solve the problem	M9-M12
R3: UK leaving the European Union	The UK leaving the EU in 2019 might have financial consequences on the availability of funds. ECMWF would in such a case implement the necessary measures but ECMWF would like contractors to acknowledge this risk of budget reduction as a potential risk on their activities planned after 2019.	4	3	Accept: BSC acknowledges that is aware of the risk of budget reduction on activities planned after 2019. Review of possible mitigation with ECMWF when more information is known about the 'Brexit' and if the risk comes to reality.	M1-M12
R4: Delay in submission of deliverables and milestones	Risk of delay on deliverable and milestone achievement that may delay subsequently planned work (WP0)	2	3	Avoid: it will be necessary to closely monitor the progress of the project. Monthly conferences will be organised for this purpose.	M1-M12
R5: Staff availability and disruption	Key staff assigned to the contract will not be available (at the start of their work or being unavailable as much foreseen) resulting in the objectives of the service contract not being delivered or delayed. (WP0)	2	3	Avoid: Reliance on single points of expertise will be reduced whenever possible by encouraging multiple team members to work on similar aspects of the service, by documenting task progress in the wiki and by identifying redundancies.	M1-M12
R6: Low engagement of the co-design group	Risk of minimal user engagement to build the co-design group due to low response that may result in an application not well tailored to the users needs (WP1)	3	2	Avoid: in case that initial users contacted are not available to participate in the co-design group, ask them to advise other contacts that might be suitable for such task.	M1-M6
R7: Delay in the launch of the application	Risk of delay in the development and subsequent launch of the application that may result	2	2	Avoid: work in the minimisation of other risks affecting the co-design (R6, R8) and closely monitoring of the implementation on a weekly basis	M1-M9

	in insufficient time for further user engagement and will lower the expected impact during the contract (WP2)				
R8: Low impact on users	Risk of a low impact of the application on the user community due to insufficient engagement or saliency that may result in a limited use (WP2)	2	2	Reduce: work more actively in reaching out to users and ask new users to 'spread the word' (snowball effect). Ask the co-design group and the Advisory board for additional relevant events where the application can be showcased. Work in the production of dissemination material that clearly explains the advantages of the application to encourage new users to try it.	M9-M12
R9: Risk of being unable to reclaim the ineligible VAT.	VAT being claimed by the contractor (WP0)	1	2	Avoid: The contractor is aware about Article 51 of the Annex II (https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32011R0282).. The invoices will be raised in accordance with the Agreement and national/international financial regulations.	M1-M12
R10: Low engagement of Advisory board	Risk of low recruitment of Advisory board members due to low response that may result in a less salient application (WP1)	2	1	Avoid: in case that initial candidates for the Advisory board are not available, consider inviting suitable participants from the co-design group to take part.	M1-M3
R11: User complaint about personal data processing	Risk of user claiming that their personal data have not been handled correctly (WP0)	1	1	Avoid: a Data Management Plan describing the procedures for personal data management in accordance with GDPR; registration to the application requesting explicit consent and privacy policy page available in the application with clear instructions for consent withdrawal.	M1-M12

Table 10: Guidance Table for Risk Register

Entry	Guidance
Risk Name	Title to identify the risk
Risk Description	High level description of the risk scenario and consequences Please use the following structure: Risk of [event]…due to [cause]…that may result in [consequence]
Risk Likelihood	A numeric value denoting the estimate of the probability that the residual risk will occur. The possible values are: 5 – very likely (> 70% prob of occurrence)

	4 – likely (between 50% and 70% prob of occurrence) 3 – possible (between 20% and 50% prob of occurrence) 2 – unlikely (between 5% and 20% prob of occurrence) 1 – remote (< 5% prob of occurrence)
Risk Impact	A numeric value denoting the severity of the impact of the residual risk (should it occur). The possible values are: 5 – catastrophic (Critical impact impeding the achievement of the strategic objectives) 4 – damaging (Damaging impact impeding the achievement of the strategic objectives) 3 – significant (Significant impact affecting achievement of operational objectives) 2 – moderate (Moderate impact on the achievement of an operational objective) 1 – low (Minor impact on the global performance)
Risk Response Strategy	The available strategies to deal with the identified risks are: Avoid: risk avoidance, working around those conditions or activities which introduce the risks; Reduce: risk mitigation or reduction through the proactive implementation of risk reduction activities; Accept: acceptance of the risk; in these cases, contingency plans can also be defined in case the risk occurs; Transfer/share: transfer or share a risk with other entities e.g. through subcontracting, insurances etc.

5.8 Expression of Interest

5.9 Attachment I – Key personnel CVs