ECMWF Copernicus Procurement

Invitation to Tender

Copernicus Climate Change Service
Volume II

Maintenance and Development to Support the C3S – EEA Interface: European Climate Data Explorer

ITT Ref: C3S2_430a
ISSUED BY: ECMWF Administration Department Procurement Section
Date: 29 September 2021
Version: Final

Funded by the European Union

Implemented by ECMWF

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1 Introduction

ECMWF, as the entrusted entity for the Copernicus Climate Change Service (C3S), invites tenders for services focused on the continuation and the extension of the C3S – European Environment Agency's Climate-ADAPT interface that builds upon an already existing framework brokering climate indicators published in the Climate Data Store (CDS).

Within its first phase (2015 – 2020), Cop1, the Service consolidated many years of preparatory research and development to deliver a range of operational services. In its second phase (2021 – 2027), Cop2, these services are further consolidated, improved and expanded to address all the existing and emerging societal needs related to climate services.

C3S provides information to support the development of a climate resilient society. Through the Sectoral Information System (SIS) activities, C3S is addressing the needs of multiple sectoral users including water, energy, insurance, agriculture, biodiversity, infrastructure, tourism, fisheries and health sectors in Europe and globally. SIS activities have developed sector specific datasets and applications based on the Climate Data Store (CDS) infrastructure.

Many SIS outputs are highly relevant to the European adaptation community, including pan-European and regional Sectoral Climate Impact Indicators (SCII), Essential Climate Variables (ECVs) and tools/ scripts (workflows) that run on the CDS Toolbox - to develop user driven, sector specific applications.

Launched in May 2021, the Climate-ADAPT – C3S Interface, named 'European Climate Data Explorer' (hereinafter ECDE), https://climate-adapt.eea.europa.eu/knowledge/european-climate-data-explorer, seeks to broker selected SCII from the C3S Climate Data Store that are considered highly relevant for adaptation planning across Europe. The brokered SCII, together with the re-use of application workflows, will underpin the publication of the entries in the ECDE. The brokered SCII are to be used by the European Environment Agency (EEA)'s Member States and by the wider adaptation community in the assessment of a diverse set of climate hazards, for example those related to public water supply, domestic food production, human health, or biodiversity. This will be done at EU, national, transnational and local levels, fulfilling the vision of the Horizon Europe's Mission on adaptation including societal transformation[1].

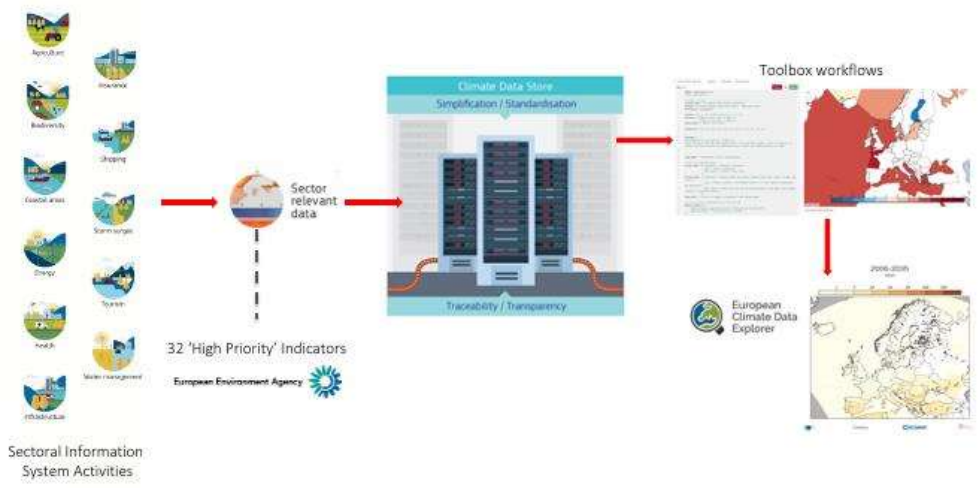

Figure 1. Conceptual overview of the ECDE.

[1] https://op.europa.eu/en/web/eu-law-and-publications/publication-detail/-/publication/2bac8dae-fc85-11ea-b44f-01aa75ed71a1

The existing interface provides climate SCII at the pan-European scale (for historical and future periods) within a single framework to support climate adaptation in Europe. Adaptation, in this context, comprises actions to adjust to actual or expected climate change in order to moderate or avoid harm or exploit beneficial opportunities.

By the time the contract for this ITT will be awarded, pan-European data on past trends and future projections for most of these high-priority indices will be either already available or expected to become available in the ECDE.

As its core, the ECDE will present at least 32 high priority SCII derived from C3S datasets (ref. Annex 1). The present (June 2021) version of the ECDE focuses on 17 SCII that are published in the CDS and are brokered to the ECDE via an embedded web application, in turn published within the CDS Catalogue.

This ITT covers those activities that further develop the ECDE. This ITT will achieve this in two ways:

1. Through the synthesis of user requirements from the adaptation community, create and publish applications that visualise and allow for the exploration of SCII that are that are available in the Climate Data Store (published datasets) that are currently NOT available in the ECDE. Or,
2. Use the Toolbox scripting environment to create workflows that define new SCII. Such workflows should be based on published peer reviewed literature and be fully documented. The new SCII will be calculated on datasets available in the Climate Data Store.

Specific objectives and technical requirements are described in Section 3 of this document. General performance requirements are presented in Section 4 and information about the tender format and content is in Section 5.

2 The Climate Data Store and Toolbox

The purpose of this section is to clarify the context of this tender and to briefly describe the relevant outcomes of current activities to implement the CDS and Toolbox initiated by C3S.

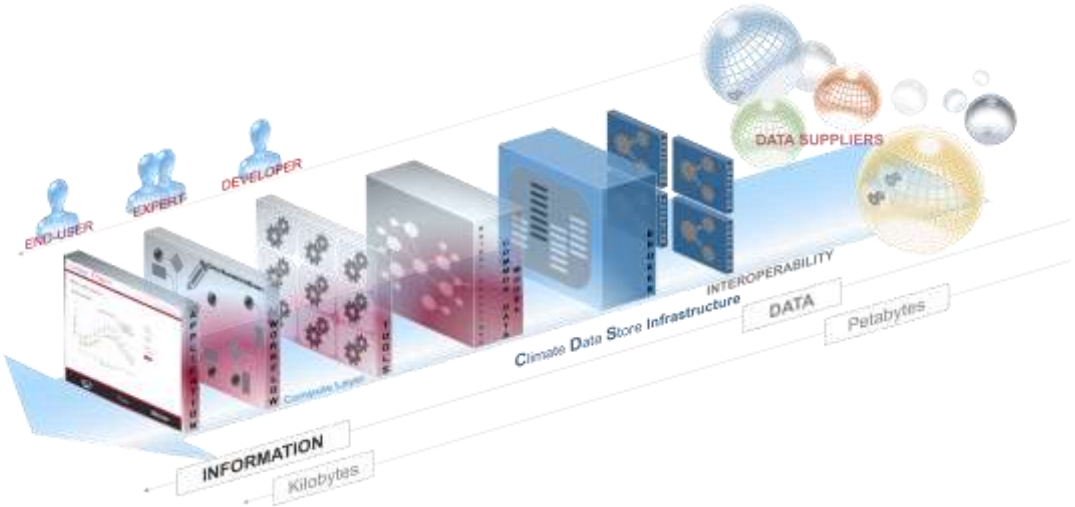

Figure 2. Conceptual overview of the Climate Data Store (CDS) / Toolbox environment. The CDS facilitates access to climate data from multiple providers via one unified access point. The CDS toolbox is an applications environment providing C3S expert users) access to a suite of tools to explore, postprocess climate data and, potentially, develop user relevant applications. The CDS environment permits the processing next to the data to increase computational efficiencies and uses 'orchestrated python workflows', making use of library of tools whilst the JavaScript framework facilitates the contractors to implement customized applications.

The backbone of the C3S is a cloud-based CDS that provides users with a single point of access to quality-assured data on climate. The datasets may be physically located at various data centres around the world, or they may be distributed in the cloud, but this will be transparent to users of the CDS. All data will be open and free, properly documented and evaluated by the EQC (Evaluation & Quality Control) and can be used by anyone for any purpose. To facilitate the transformation of data into tailored information products, the CDS features a toolbox for creating workflows and applications on-line. All CDS data and tools will be accessible from the C3S website as well as via open Application Programming Interfaces (APIs).

CDS DATA CATALOGUE. The CDS provides access to climate datasets via a searchable catalogue. Categories of data include: Climate Data Records (CDRs) and Interim Climate Data Records (ICDRs), quality-controlled archives of in-situ climate observations, reprocessed satellite data records, data from climate reanalyses, seasonal forecast data, output from climate model simulations, and a variety of derived climate impact indicators. Multiple datasets will be available in each category, e.g., for the majority of GCOS Essential Climate Variables (ECVs), on global or regional domains, with varying spatial resolutions and temporal coverage, from different data providers, based on different methodologies, etc.

CDS TOOLBOX. The CDS Toolbox provides users with the ability to create interactive web applications tailored to their needs using CDS datasets. The Toolbox contains a variety of software tools for combining CDS datasets and performing basic operations on the data, including functions for interpolation and re-gridding, simple statistical calculations, visualisation, text manipulation, etc. The Toolbox is designed to be extendable. The Toolbox uses a Common Data Model to represent different types of datasets available in the CDS catalogue. This allows data and tools to be combined into workflows that can be executed on-line. An Application Editor is available to parametrise workflows using widgets to create interactive web applications on the CDS. The Toolbox includes a mechanism for tracking the provenance of information products created in workflows and applications. Since the 2018 release, the toolbox environment has evolved to enable the development of a wealth of applications to support the C3S's activities. An example is the application on mountain tourism meteorological and snow indicators for Europe from 1986 to 2100 derived from reanalysis and climate projections.

3 Technical requirements

3.1 Scope of service

This ITT aims to maintain and further develop the ECDE service to provide the Climate-ADAPT user community access to additional relevant climate information, whilst addressing the needs of key users in the assessment of climate change impacts across Europe. As a starting point this will be achieved by ensuring the ECDE will provide access to high priority indicators and sectors covered by the 32 SCII listed in Annex 1.

The contractor will continue to develop the ECDE service that is based on the C3S Climate Data Store (CDS) and toolbox infrastructure and hosted on the EEA's Climate-ADAPT platform.

3.1.1 Maintenance and evolution of the ECDE

This activity will focus on the management and development of the ECDE front end and the brokering of the SCII that are available from CDS public catalogue, including those published in the CDS dataset catalogue, or from those derived from Toolbox workflows implemented by other C3S activities and this contract. This contract will continue the development of the service as was initiated by its precursor contract (C3S 434), though the following activities:

1) The contractor shall adapt proactively to the emerging user requirements from the EEA, ECMWF and the EC that inform ECDE service evolution. Note that the EEA is responsible for the representation of their Member States, and therefore the requirements should be consolidated via EEA and represent the pan-

European needs and aspirations for the development, implementation and monitoring of climate adaptation policies and actions.

2) The contractor will ensure quality of all workflows used to publish C3S datasets in the ECDE. The proposal must clearly demonstrate the envisaged internal quality control procedure that will be implemented to maintain the (highest) quality of the workflows and documentation published within the ECDE.

3) The contractor will ensure that ECDE users are able to access relevant Quality Assurance Reports (QAR) that were developed in the C3S Evaluation and Quality Control (EQC) activities. An example of a CDS dataset with published QAR can be found here (note that this is not a priority dataset for inclusion in the ECDE but serves as an example of QAR).

4) The contractor will work with the existing support mechanisms in place, specifically Copernicus User Support and Climate-ADAPT teams to ensure seamless user support function for the growing ECDE user community (such as local communities and regions included in various EU programmes and actions, notably the Horizon Europe's Mission on adaptation including societal transformation). The tenderer will be required to:

   a) Provide Level-2 support through the Copernicus User Support (operating a Jira ticketing system) with agreed Key Performance Indicators (KPIs; for example, 85% of Level-2 tickets should be resolved within 15-working days). The contractor shall provide an email address which acts as the single contact point.
   b) Transfer knowledge to user support by making contributions to the knowledge base. This will include creating and updating user documentation and FAQs (based on user feedback and queries). Such documentation should be available in HTML format.
   c) Provide support to users through the user forum upon requests.
   d) Pass relevant user support queries on to EEA as appropriate utilising the Jira channel.

5) All applications developed by the contractors will need to be compliant with the standards of the CDS. In order to be published, an application needs to be scientifically robust, meaningful, UX" (user experience) optimised, usable, working and bug free.

6) All applications are to be delivered through the ECMWF's Jira system specifying the project CDSAPP (link) in the first field of the form, with the prime contractor or an assigned person in charge of making the publication request and acting as the responsible part to ensure that the material provided is fit for the purpose. The delivery of an application or set of applications does not grant the publication itself. Applications which are aimed to be published via the ECDE interface should have undergone extensive internal review by the contractors to ensure delivery of quality applications which are optimised in terms of performance prior to final review and publication by technical teams at ECMWF. This review process will cover many aspects including evaluation of adequateness of the application in terms of usability, accuracy, description of input and output variables, appearance, coding standards and style, functionality, and scientific quality. The bidder shall ensure that a sufficient provision is made to cover this activity.

7) De-bugging and updating existing published toolbox workflows, implemented as python scripts, calling libraries developed within the Climate Data Store Toolbox environment and data within the CDS.

8) The contract is required to systematically monitor published workflows (existing and newly implemented) that underpin the SCII entries into the ECDE. Ensuring that service is not impaired by system changes, and update software to new libraries and environments as appropriate.

9) The contractor is required to keep abreast of new functionality in the C3S Toolbox in order to implement improvements to ECDE workflows and meet priority user requirements; for example, migration of all workflows to utilise Live Maps, or implementing 'screen shot' functionality (that was implemented 2021).

The contractor shall periodically liaise with the C3S technical teams to plan and implement priority updates over the duration of the contract.

10) Within the initial two months of the contract, the contractor will perform a user requirements analysis. The contract will deliver a technical report at contract kick-off (KO) +2 months, which consolidates the new requirements from C3S, the EEA and their stakeholders. The report shall clearly articulate new data, service and system requirements and provide a considered synthesis of the gathered requirements – leading to a set of functional requirements and finalised work plan for the duration of the contract.

11) The contractor is required to make an assessment of the requirements for the integration of socio-economic data into the ECDE (e.g., population, land use). The requirements gathering process shall determine the priorities of EEA Member States to assess and report on climate change and its impacts, and the value added of incorporation of information via the brokering of Eurostat (e.g., related to land use and the distribution of population or infrastructure).

12) In addition, the contractor shall be responsible for the synthesis of user requirements in order to provide C3S recommendations for the evolution of the service, which could include:

    a) Definition of common reference periods for the past, current and future climate.
    b) Evaluate the importance to utilise the ERA 5 back extension for existing SCII.
    c) Assessment of the requirement for bias corrected climate projections - including anomalies and absolute values.
    d) Assess the requirements for the integration of socio-economic data into the ECDE – for example population, land use etc.
    e) Assess priorities of the EEA Member States, including climate-related risk assessments and regular reporting on adaption policies and actions, and the value added of incorporating information via the brokering of Eurostat or other proprietary socio-economic data.

13) The Tenderer should plan for two updates / year or incremental updates of the ECDE hosted by the EEA. The releases should include introduction of new SCII, brokering of new C3S EQC material, updated user support resources, documentation and workflows. The bidder will be responsible for migration from the test / development environment to the operational infrastructure hosted by the EEA.

14) The contractor is responsible for implementing version control and a source code content management system, including management of the repository. This will ensure code is available to C3S during and after the contract.

15) For each SCII published in the ECDE, the contractor must ensure suitable user guidance (according to agreed templates) is provided, including overviews, links to the C3S CDS catalogue entry (or underpinning application workflow) as well any published EQC materials. This process may involve harvesting of machine-readable metadata from associated CDS entries.

    An example workflow can be found here:
    a) Overview: https://cds.climate.copernicus.eu/cdsapp#!/software/hidden-app-meanradianttemperature-overview-web?tab=app
    b) Detail: https://cds.climate.copernicus.eu/cdsapp#!/software/hidden-app-meanradianttemperature-detail-web?tab=app
    c) The ECDE mean radiant temperate indicator page: https://climate-adapt.eea.europa.eu/metadata/indicators/thermal-comfort-indices-mean-radiant-temperature-1979-2019

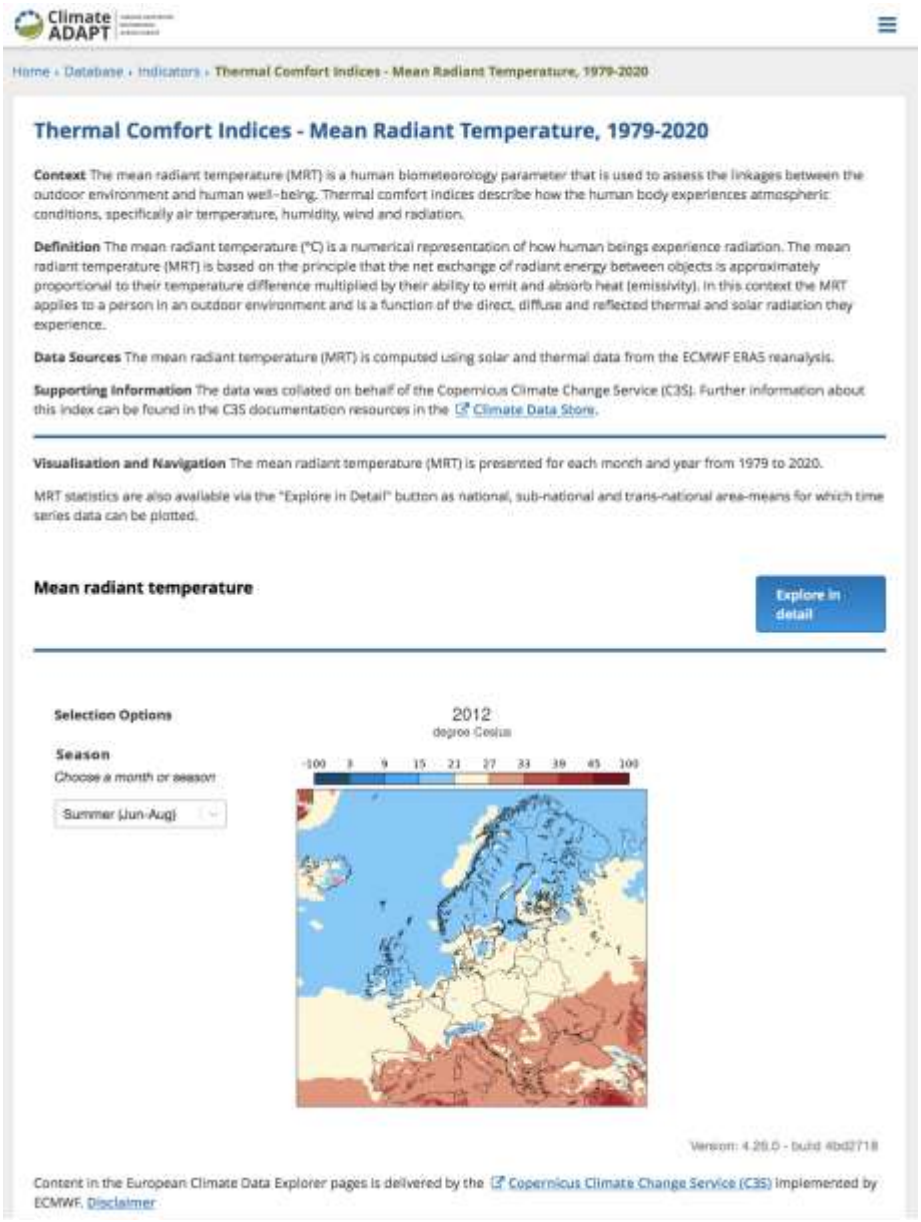

Figure 3. The indicator page for the mean radiant temperate indicator in the ECDE.

16) The contractor is required to support Copernicus User Engagement activities on training and 'Use Cases' (procured separately of this ITT – refer to section 4.3.7). These activities are aimed to develop, together with the EEA and relevant stakeholders, training materials / modules and use cases to demonstrate the added value of C3S data and the ECDE for the development and implementation of national adaption strategies and plans. It is a requirement that the contractor will such support the external activities with visualisations, access to code etc.

3.1.2 Provision of new indicators to support the ECDE

This activity will focus on the provision of additional SCII, which will be implemented as toolbox workflows and applications; producing additional SCII that were previously missing from the C3S offering. Such SCII have been identified from a gap assessment following the publication of the European Topic Centre on climate change impacts, vulnerability and adaptation (ETC/CCA) Technical Paper 'Climate-related hazard indices for Europe' (https://www.eionet.europa.eu/etcs/etc-cca/products/etc-cca-reports/climate-related-hazard-indices-for-europe), which identified 32 priority indicators for inclusion in the ECDE. This contract maximises the SCII available and allows C3S to better support the adaption community through via the ECDE.

A list of priority indicators is presented in Annex 1. This list is based on current requirements from the EEA. Annex 1 should serve as a starting point for the requirements gathering process. The outcomes of the requirements analysis, and associated work plan, which will be available at KO +2, shall consider EEA priority SCII (and associated requirements) and those from C3S Climate Intelligence activities (supporting the State of the Climate reporting). The technical feasibility or implementing the SCII in the toolbox will be considered and inform the final selection of SCII that will be implemented in the contract.

The contractor will enable the creation of new SCII in the Toolbox environment. To facilitate this the contractor will have comprehensive knowledge of climate data to interpret user requirements. The contractor will, in co-ordination with ECMWF, define suitable data (ensemble of models), reference periods and the appropriate scientific algorithm to ensure the SCII made available either as published applications, datasets in the CDS catalogue and ultimately brokered to the ECDE, are based on best practice, are scientifically robust and are supported by high quality product user guides and QARs. An understanding of developing high-quality applications in the CDS toolbox is essential.

The indicators should be implemented in a way that allow C3S users to re-use the workflows, allowing them to be extensible to other reanalysis and projections; therefore, all finalised workflows shall be accompanied by user guides and documentation to fulfil this requirement. All implemented workflows need to be optimised to be run on the CDS toolbox and be underpinned by best scientific practice, peer reviewed methodologies and aligned EEA requirements (including indicators used by the EEA in past assessment reports) and accessible in the ECDE.

In order to meet the objectives, the contractor is expected to lead all aspects of this activity, with support from the C3S technical teams. Regular progress meetings with C3S are expected, but it is the contractor's responsibility to manage the work plan to prioritise development of SCII based on technical feasibility of the toolbox, rather than ECMWF.

It is expected that the toolbox workflows that produce new SCII will be implemented as applications and published within the Climate Data Store Catalogue (or as public applications, or as datasets – published artefacts). The contractor will ensure that any published artefacts are accompanies with full product user guides and the completed QAR. The bidder must make provision for this in their planning.

The tasks associated with publishing SCII as application can be summarised as:

1) The contractor has the responsibility to implement workflows to derive sectoral climate impact indicators (SCII) to support the ECDE.
2) Where some more complex SCII cannot be implemented as workflows, the contractor may need to write functions using the docker image should the need arise (i.e., for complex functions) or create intermediate datasets.
3) Need to create and manage own libraries within the toolbox environment.
4) Any generated workflows, tools and applications will require harmonization with the C3S EQC activities, which is achieved via a defined process. The contractor must include the resources to support the provision of EQC materials, specifically the completion of Quality Assurance Reports.
5) Any tools developed within this contract shall be delivered along with example workflows. Publishing is supported by established procedures. Please refer to: Tool publication
6) The finalised application will also be published within the CDS according to an established process. This is summarised: Integrate public application

Once published, the tools and applications will need to be supported. The contractor will provide support to Copernicus User Support in the form of:

i) Level-2 support through the Jira ticketing system with agreed KPIs (for example, 85% of Level-2 tickets should be resolved within 15-working days). The contractor will provide an email address which acts as the single contact point.

ii) Transfer knowledge to user support by making contributions to the knowledge base. This may include user documentation and FAQs. Such documentation should be available in HTML format.
iii) Support to users through the user forum (upon request).

Note, that in Copernicus 2.0, there will be a redesign of the CDS Toolbox to maximise the user experience. New toolbox functionalities and technologies will be introduced in 2023, with a toolbox design document available in advance. We would like to invite contractors to partake in activities that 'future-proof' the applications and workflows that underpin the ECDE and ensure that they are compatible with the updated toolbox. Please note that these activities cannot be scoped at present, but bidders shall acknowledge the re-scoping of the toolbox at the proposal stage and clearly state whether they will undertake an additional work package that migrates the workflows, tools and applications to the new toolbox environment. Such activities will be negotiated separately to this ITT.

3.2 Specification of work

Work package 0: management and coordination activities

This work package will focus on contract management, including internal controls and coordination of subcontractors, risk management and tracking of the key performance indicators.

The Tenderer shall provide a detailed implementation plan of proposed activities for the duration of the framework agreement. Deliverables should be consistent with the technical requirements specified in section 3.

The Tenderer is requested to include management and implementation activities within a dedicated work package (WP0). The number of milestones is not restricted, but they should be designed as markers of demonstrable progress in service development and/or quality of service delivery. Adjustments to the proposed implementation plan can be made on an annual basis depending on needs for service evolution, changed user requirements, or other requirements as agreed between the European Commission and ECMWF.

As part of the general contract management description the Tenderer shall consider the following elements (this is not an exhaustive list):

- Contractual obligations as described in the Framework Agreement Clause 2.3 and Annex 5 on reporting and planning.
- Meetings schedule (ref. Section 4.2).
- Communication management (ECMWF, stakeholders, internal communication).
- Resources planning and tracking using the appropriate tools.
- Implementation of checks, controls and risk management tools for both the prime contractor and subcontractors.
- Subcontractor management, including conflict resolution, e.g., the prime contractor is responsible for settling disagreements, although advice/approval from ECMWF may be sought on the subject.
- A list of subcontractors describing their contribution and key personnel shall be provided, as well as back-up names for all key positions in the contract. The Tenderer shall describe how the Framework Agreement, in particular Clause 2.9, has been communicated down to all their sub-contractors.
- Management of personal data and how this meets the requirements of Clause 2.8 and Annex 6 of the Volume V Framework Agreement.
- Set of KPI's to monitor contract performance

Tenderers shall complete the relevant table in Volume IIIA as part of their bid, which shall include the deliverables and milestones for this work package already indicated in the tables below. Volume IIIA will be used by the Tenderer to describe the complete list of deliverables, milestones and schedules for each work

package. All milestones and deliverables shall be numbered as indicated. All document deliverables shall be periodically updated and versioned as described in the table.

WP0 Deliverables				
#	*Responsible*	*Nature*	*Title*	*Due*
D0.y.z-YYYYQQ	Tenderer	Report	Quarterly Implementation Report QQ YYYY *QQ YYYY being the previous quarter*	Quarterly on 15/04, 15/07 and 15/10
D0.y.z-YYYY	Tenderer	Report	Annual Implementation Report Part 1 YYYY *YYYY being the Year n-1*	Annually on 15/01
D0.y.z-YYYY	Tenderer	Report	Annual Implementation Report Part 2 YYYY *YYYY being the Year n-1*	Annually on 28/02
D0.y.z	Tenderer	Report	Final report	60 days after end of the Framework Agreement
D0.y.z-YYYY	Tenderer	Report	Annual Implementation Plan YYYY *YYYY being the Year n+1*	Annually on 30/09
D0.y.z-YYYY	Tenderer	Other	Copy of prime contractor's general financial statements and audit report YYYY *YYYY being the Year n-1*	Annually

WP0 Milestones				
#	*Responsible*	*Title*	*Means of verification*	*Due*
M0.y.z	Tenderer	Kick-Off meeting	Minutes of meeting	Month 1
M0.y.z-Px	Tenderer	Progress review meetings with ECMWF / Payment milestones	Minutes of meeting	~ Every 6 months
M0.y.z	Tenderer	Plan for service evolution	Minutes of meeting	Month 18

Work package 1: Data gap analysis and definition of the scope

The contractor will engage with the adaptation community co-ordinated via EEA, and C3S, to define the requirements for the evolution of the service. The contractor will undertake a thorough assessment of the data and tools available via the CDS and Toolbox and document how they will lead to value-added services addressing the key requirements of the user community.

The contractor will perform activities that will lead to a requirement analysis report. This report shall provide a detailed description of the requirements that shall be considered in this contract; clearly articulating the gap filling potential. This work package will clearly document how the identified gaps will be bridged within the timeframe of the contract.

Deliverables required:

- A summary report providing an assessment of user requirements from the user engagement activities with ECMWF, EEA and their stakeholders. This report will include an analysis of the requirements to define the system and service requirements. The report will clearly define the gaps in current service provision. The contractor will also record all gathered requirements in a User Requirement Database (URDB) template (note that the contractor is responsible for the recording and analysis of the requirements gathered within this contract). A separate activity (procured outside this tender) is responsible for the management of the URDB. This first version of this report will be completed KO+2, with quarterly updates provided thereafter to monitor evolving user requirements.
- At K0+2 the contractor will deliver the first version of a detailed workplan that clearly outlines the implementation schedule covering the duration of the contract. The workplan will include an assessment

of the associated resources, development schedule, reviews, deliverables (which will include SCII and associated workflows), documentation and user guides, risk identification and management, and acceptance criteria. Where elements of the service require ongoing support (i.e., production of new workflow to implement additional SCII), the contractor will need to determine the feasibility of adding new SCII and include this in the implementation schedule. The workplan should justify which user requirements will be addressed within the duration of the contract and those that can be met by (potential) future developments (post contract, for example those which are subject to new variables from projections or subject to toolbox evolution). The workplan will be an addendum to the contract and it will eventually trigger a contractual amendment, if necessary. To achieve this the contractor will need to assess the impact, cost / effort and time required to address the requirements. As with the requirements document, quarterly updates are expected to reflect the incorporation of new high priority functionality or SCII into the ECDE.

Work package 2: Service Maintenance and Service Development

This work package deals with the maintenance and development of the ECDE front end, including the development of workflows to broker the SCII available from CDS public catalogue into the ECDE, (including those developed in WP3).

An overview of the technical requirements is detailed in 3.1.1. The contractor is to require to maintain performance, functionality and useability of the ECDE, including monitoring the ECDE to pro-actively identify discover issues and user experience.

Using the WP1 'workplan' deliverable, the contractor will develop workflows, and associated documentation, to provide relevant SCII from the CDS to the ECDE.

Deliverables required:

- At KO + 2, the contractor will deliver a Quality assurance procedure that details the internal quality control procedure to ensure all material and information presented in the ECDE is of scientific merit and fit for purpose having been reviewed and checked internally.
- 'Action and issues' log must be maintained over the duration of the contract to inform all stakeholders of progress, required developments and monitor progress.
- Completion of user material, overviews, and user guides associated with the SCII and published in the ECDE with new functionality introduced (according to WP1 work plan).

Milestones:

- QAR links published in ECDE.
- User Support framework implemented.
- Bi-monthly design and implementation review meetings with teams ECMWF / EEA to define issues, support and ongoing priorities.

Work Package 3: Prototyping & Indicator Development

According to the work plan (WP1 output), the contractor will implement and publish scientifically sound and high-quality toolbox applications as well as perform those activities defined in section 3.1.1. and 3.1.2.

The contractor will also contribute to the development of the ECDE through the publication of identified SCII that were previously unavailable in the C3S offering. Any SCII implemented using the CDS toolbox workflows should be implemented without the need of using proprietary software or inaccessible datasets. Such SCII will be developed using the CDS toolbox and must be underpinned by peer reviewed methodology and scientific best practice.

Such a process may involve contributing to the CDS toolbox. Any software code should be implemented in the CDS toolbox and published via an established procedure:

https://confluence.ecmwf.int/display/COPSRV/How+to+contribute+to+the+toolbox

In such instances, the contractor should also provide example workflows with any new toolbox functionality in addition to doc string (tool.yaml). Additional details will be provided at contract kick-off.

Each SCII will be supported by documentation, including a detailed product user guide (PUG) and EQC material. The PUG should be 'fully traceable', allowing any capable user of the CDS to understand the processing steps included in the workflow. Completed PUG can be found associated with published artefacts in the CDS (e.g., PUG SIS Tourism Fire application). PUG templates will be provided at contract kick off.

The published applications will be embedded in the ECDE and shall be accompanied by abstracts, user guides and other relevant information (i.e., Quality Assurance Reports from EQC assessments).

Periodical releases (or updates) are expected over the duration of the contract as the number of available SCII increases. Applications should be implemented in the CDS toolbox and published via an established procedure. Details of this process can be found using the following link (note this link is for those applications published within the CDS catalogue):

https://confluence.ecmwf.int/display/COPSRV/How+to+integrate+a+public+application+into+the+CDS+catalogue#HowtointegrateapublicapplicationintotheCDScatalogue-preloading.yamlpreloading.yaml

Deliverables required:

- High quality toolbox applications.
- Product user guides for each application and tool.
- Example workflows.

Work package 4: Evaluation and Quality Control

Published SCII derived from toolbox applications will need to be evaluated by the EQC activity (Evaluation & Quality Control). The Copernicus Climate Change Service offers an Evaluation & Quality Control Function, which provides quality assurance and fitness for purpose information all of data, tools and applications published by C3S (https://climate.copernicus.eu/quality-assurance-copernicus-climate-change-service).

The objective of this work package is to ensure the technical quality and robustness of the workflows delivering new SCII to the CDS and published in the ECDE.

The Evaluation and Quality Control (EQC): The C3S Evaluation and Quality Control (EQC) function has been designed to provide assessments of the technical and scientific quality of all C3S products and services, including their value to users. This function is being performed by independent evaluators within a separate contract, in close coordination with the service providers.

The contractor will produce products that are in line with the quality assurance criteria set out by the EQC function and will also liaise with EQC (both C3S and its contractors) as appropriate. This includes, in particular, the completion and updating of the respective quality assurance templates (QAT) hosted in a Content Management System (CMS) in order to produce standardised quality assurance reports (QARs). These are presented to users via a synthesis table in the EQC tab of the respective CDS catalogue page. Apart from the independent assessment (where applicable), all fields in the QAT are designed to be populated by the contractor. The table below shows the main categories as displayed in the CDS catalogue. Appendix 2 shows the full QAT criteria for a published toolbox application.

A consultation process is foreseen between EQC evaluators and the contractor before the start of the EQC workflow to define the respective QARs to be produced including their level of granularity. It is envisaged to keep the number of QARs to a manageable level and focus effort on those artefacts that are public and published applications (and datasets) within the CDS.

The bidders shall propose means to document, wherever possible, information about relevant checks being performed on the tools / workflows prior to delivery in support of the EQC evaluation (e.g., activities to

ensure SCII are developed based on best practice and adequate QA has been carried out). Lastly, contractors are given the opportunity to review the scientific assessments ahead of publication. The bidder shall include in both their budget and their plans a sufficient provision to ensure an adequate responsiveness to requests of the EQC function (both C3S and its contractors).

EQC contribution: The contractor shall coordinate with and support the work of the EQC by a) completing and updating the respective quality assurance templates (QAT) hosted in a Content Management System (CMS) in order to produce standardised quality assurance reports (QARs); b) performing and documenting recommended checks and tests ahead of publication; and c) reviewing EQC material produced independently, guidance to users.

Annex 2 and 3 detail the EQC QAT for applications and the criteria for the assessment of tools respectively.

For clarification, tools and applications that create additional SCII will be supported by QAR. It is **not expected** that the contractor will produce QAR for applications that visualise and explore **data already present in the CDS catalogue**. In these instances, QAR will already be completed, and it will be the role of the contractor to provide links (and therefore access) to the QAR in the ECDE.

Therefore, the bidder needs to allocate sufficient effort to support the C3S EQC function – including completion of the Quality Assurance Templates and the delivery of high-quality user guides.

Deliverables required:

- QAR for each published application (public and searchable in the CDS).
- QAR for each tool developed for the CDS toolbox.

Work package 5: Support and Help Development

The service ECDE interface needs to be supported with excellent quality documentation and support. This work package will ensure ECDE users are provided with all the user guide, guidance and relevant technical information.

Deliverables required:

- Periodical but regular updates of the ECDE user manual and general training materials.
- Provide high quality user guides, tutorials and FAQs to support the application published in the CDS and those in the ECDE.
- User oriented material are to be consistent with requirements of the Copernicus user support team, C3S product user guides providing tools and applications.

3.3 Contract Schedule

Phase 1 will be completed within 2 months and will define the requirements and workplan for the remainder of the contract.

The second phase (*Prototyping & service development)* will commence after satisfactory completion of the first phase following a Baseline Design Review (BDR) milestone meeting.

Stakeholder feedback mechanisms should also be included within Phase 2 planning.

ECMWF intends to award a single framework agreement for a period of 24 months, with the right to extend for a further 24 months at ECMWF's discretion, which shall be implemented via a multi-annual Service Contract expected to commence in Q1 2022.

4 General requirements

4.1 Implementation Schedule

The contractor is expected to provide a detailed time plan and schedule as part of the tender response. The proposed time plan and schedule shall address the main tasks, inputs, outputs, intermediate review steps, milestones, deliverables and dates. Regular progress meetings will be held with ECMWF during the contract to assess contract status, risks and actions.

4.2 Meetings

ECMWF will organise annual meetings to bring together all C3S service providers. The contractor is required to attend these meetings. The contractor shall also attend monthly teleconference meetings to discuss C3S service provision, service evolution and other topics that cut across different aspects of C3S. The cost of attending any necessary physical meeting shall be covered by the contractor and shall be included in Volume IIIA and detailed as specified in the template.

In addition, the contractors shall participate in technical working meetings with the CDS development team – which will also include C3S and relevant collaborators. These discussions will be convened at semi-regular intervals, and most of them will take place by remote participation. In-person meetings organised for this sole purpose are not anticipated to take place more than once a year.

4.3 Deliverables

The aim of this ITT is to lead the evolution of the ECDE and the SCII offered by the CDS toolbox. As this a service-oriented contract, thought and consideration to maximise the use and value of the submitted deliverable is required. The contractors are requested to focus on delivery of service-oriented deliverables (e.g., applications and associated product user guides, completed software tests) rather than those expected in a research contract. A deliverable is a substantial, tangible or intangible good or service produced as a result of a project. In other words, a deliverable is an outcome produced in response to the specific objectives of the contract and is subject to acceptance by the technical contract officers at ECMWF. When defining deliverables please consolidate their numbers against a specific single deadline where possible. The required top-level deliverables are outlined in section 3. These can be in the form of documents or reports, data sets or databases, services and user support. Requirements for each type are described in the following subsections.

4.3.1 Documents and reports

All contract reports shall be produced in English. The quality of reports and deliverables shall be equivalent to the standard of peer-reviewed publications and practice. The final quality check of the deliverables should be made by the prime contractor (content, use of ECMWF reporting templates, format, deliverable numbering and naming, typos, etc.). Unless otherwise specified in the specific contract, deliverables shall be made available to ECMWF in electronic format (PDF/Microsoft Word/Microsoft Excel or HTML) via the Copernicus Deliverables Repository portal.

4.3.2 Tools and Applications

Applications should be implemented in the CDS toolbox and published via an established procedure which closely follows the following (note this link is for those applications published within the CDS catalogue): https://confluence.ecmwf.int/display/COPSRV/How+to+integrate+a+public+application+into+the+CDS+catalogue#HowtointegrateapublicapplicationintotheCDScatalogue-preloading.yamlpreloading.yaml

In those instances where SCII are implemented as tools, any software code should be implemented in the CDS toolbox and published via an established procedure:

https://confluence.ecmwf.int/display/COPSRV/How+to+contribute+to+the+toolbox

This procedure also includes how the contractor is expected to provide information and documentation for each tool. The guidance provides details on what is expected in terms of Technical description (and doc string), scientific basis (including relevant references) and 'how to' use the tool (example workflows).

4.3.3 Datasets

It is **not** foreseen that any datasets will be delivered within this contract except in exceptional circumstances (for example high priority requirements cannot be met due to the toolbox unable to efficiently derive SCII). If this is the case, any dataset production will need to be agreed with ECMWF.

4.3.4 Data and IPR

It is a condition of EU funding for C3S that ownership of any datasets, code, software developed with C3S funding passes from the suppliers to the European Union, via ECMWF. Ownership will pass from the date of creation of the datasets, code, software (deliverable). In return, the suppliers will be granted a non-exclusive licence to use the deliverable which they have provided to C3S for any purpose except any which conflicts with the aims of C3S.

All software and products used by the contractor will remain the property of the contractor, except for those components which are acquired or created specifically for C3S purposes, with C3S funding, and which are separable and useable in isolation from the rest of the contractors' production system. The identity and ownership of such exceptional components will be passed to the European Union via ECMWF annually, but in return the contractor will be granted a non-exclusive licence to use them for any purpose except any which conflicts with the aims of C3S.

4.3.5 Web services & Communications

All communication activity must be agreed with the ECMWF Copernicus Communication team in advance. This includes, but not exhaustively, communication planning, branding and visual style, media outreach, website and social media activity, externally facing written and graphic content and events. Agreed activity would also need to be evaluated and reported on once completed so that success measures and KPIs could be provided to the European Commission.

In addition to the development of the ECDE, the Tenderers will be required to develop for each SCII a C3S landing page (static content hosted at www.climate.copernicus.eu). The guidelines for the C3S static landing page are as follows:

Activity	*Guidance*
Design	The existing templates and styles for the main C3S service website (https://climate.copernicus.eu) must be used. The ECMWF Copernicus web officer will provide these on request. Likewise, the ECDE will follow those templates provided by the EEA
User journey	The user journey must start on the main C3S website and the contract web-presence will be fully integrated in the main C3S content management system.
Content	All contract content will be following templates and guidelines provided by ECMWF and published on the main service website
Navigation	A home button should take users to the main websites' homepage.
Logos	There will be a page on the service main website that reflects the contribution of suppliers.

Table 1: Web services

4.3.6 User support

ECMWF has established a centralised Service Desk to provide multi-tiered technical support to all users of C3S data, products, tools and services. The C3S Service Desk is used for ticketing user requests and distributing these requests to specialists as needed. Dedicated staff at ECMWF provides basic support in the form of self-help facilities (FAQs, knowledge bases, tutorials etc.) as well as individualised support on technical queries related to the CDS, data formats, data access etc. In addition, ECMWF staff will provide specialised scientific support to address questions related to its industrial contributions to C3S, e.g., in the areas of global reanalysis and seasonal forecasting.

Contractors contribute to the delivery of multi-tiered technical support for the data and/or services they provide. Such specialised user support shall take the form of direct response to individual user queries via the C3S Service Desk facility or, in the case additional route - Climate-ADAPT, as well as contributions to FAQs, user guides and knowledge bases.

As part of the bid, Tenderers shall describe the level of user support service on C3S Service Desk tickets (for example, 90% of Tier-2 requests answered within 5 working days), with sufficient flexibility to be improved depending on user requirements. Tenderers shall also address development of user guides and any other form of user support, such as tutorials, etc.

4.3.7 User Engagement and Training Activities

Activities related to the use of data from the ECDE in adaptation planning and dedicated training will be implement by Copernicus User Engagement (CUS) are not part of the scope of this ITT (and will be procured separately), the bidder shall accommodate for eventual needs in providing technical and scientific expertise in support of these activities. The bidder shall specify in the bid the resources intended to be allocated to provide this support.

Requests to support activities may be raised on for example:

- Contribute with content specific input to training, education and capacity building material: development of learning resources in the domain of the contract, participation in train-the-trainer events and MOOCs (massive open online course).
- Provide technical advice on the use of indicators and how the workflows can be re-used.
- Adapt workflows for specific audiences and use-cases.
- Input to the URDB with user requirements (cf. template as provided during the negotiation process) as well sharing needs and aspirations as raised by potential new user communities.
- Provide input to conceptional assessments and developments of specific user engagement plans and actions as launched by ECMWF.

An indicative maximum of 5% of the overall budget shall be allocated in the pricing table to accommodate for these needs. This shall be paid as a fixed price. Details on the expected activities and the budget shall be refined at the end of phase 1 activities and accounted for in the work plan.

4.4 Key Performance Indicators

As part of the bid, the Tenderer shall specify a proposed set of Key Performance Indicators (KPIs) appropriate for the service. The KPIs shall be designed to quantify different aspects of quality of service against the requirements described in this document. These initial specifications shall be refined together with ECMWF during the negotiation of the contract, but the bidder in expected to propose a set of KPI's at the bidding stage covering the categories below.

Contractors shall report to ECMWF on a set of SMART (specific, measurable, actionable, realistic and time bound) KPIs suitable for monitoring various aspect of service performance, including (but not limited to):

- Code quality (performance, output etc. linked to bidders QA process and C3S EQC)

- Operational service implementation and management
- Requirements management
- Issue and action tracking
- Contract management
- User support (see sections 4.3.6, 4)
- Copernicus User Engagement interactions

The KPIs will be reported in the Quarterly and Annual reports. At the end of each year, a service readiness review shall take place that will include assessment of performance against the set of KPIs.

5 Tender format and content

General guidelines for the tender are described in Volume IIIB. Specific requirements to prepare the proposal for this particular tender are described in the next sub-sections.

5.1 Page limits

As a guideline, it is expected that individual sections of the Tenderer's response do not exceed the page limits listed below. These are advisory limits and should be followed wherever possible, to avoid excessive or wordy responses.

Section	*Page Limit*
Executive Summary	2
Track Record	2 (for general) and 2 (per entity)
Quality of resources to be Deployed	2 (excluding Table 1 in Volume IIIB and CVs with a maximum length of 2 pages each)
Technical Solution Proposed	30 (Table 2 in Volume IIIB, the section on references, publications, patents and any pre-existing IPR are excluded from the page limit and have no page limit)
Management and Implementation	10 (excluding Table 4, and Table 5 in Volume IIIB) + 2 per each Work package description (Table 3 in Volume IIIB)
Pricing Table and Deliverable List	No limitation

Table 2: *Page limits*

5.2 Specific additional instructions for the Tenderer's response

The following is a guide to the minimum content expected to be included in each section, additional to the content described in the general guidelines of Volume IIIB. This is not an exhaustive description and additional information may be necessary depending on the Tenderer's response.

5.2.1 Executive Summary

The Tenderer shall provide an executive summary of the proposal, describing the objectives, team and service level.

5.2.2 Track record

The Tenderer shall demonstrate for itself and for any proposed subcontractors that they have experience with relevant projects in the public or private sector at national or international level. ECMWF may ask for evidence of performance in the form of certificates issued or countersigned by the competent authority.

5.2.3 Quality of resources to be deployed

The Tenderer shall propose an experienced team to support an operational service according to the technical requirements set out in section 3.

The contractor will ensure that this team has technical staff who have a track record in the maintenance of an operational reference climate service, together with demonstrable experience of developing tools and applications in Python in complex libraries such as, or similar to, the CDS toolbox; implementing scientific best practice and peer reviewed methodologies, whilst ensuring the delivered applications are optimised in terms of user experience; implementing scientific best practice and peer reviewed methodologies, whilst ensuring the delivered applications are optimised in terms of user experience.

The team shall include a Service Manager with at least 5 years of experience in management of large-scale projects. The Tenderer shall describe the experience of the Service Manager and the technical project team in performing activities related to the various aspects of this tender.

5.2.4 Technical solution proposed

The Tenderer shall describe in detail the mechanisms that have been adopted to ensure the user requirements are fully accounted for in the implementation of the service.

The Tenderer shall give a short background to the proposed solution to demonstrate understanding of that solution and of the C3S context. This section shall also include information on any other third-party suppliers that are used as part of the technical solution, and a statement of compliance for each requirement formulated throughout this document, describing how the proposed solution maps to the requirements.

Annex 1 – Gap analysis for ECDE SCII based on requirements from EEA ETC and CDS data

Priority climate related hazard Indices as identified in the ETC CCA technical paper link.

Those indicators highlighted in Yellow are currently absent from the CDS catalogue. These have been identified as high priority 'GAPS' and should include in the CDS and ECDE within the timeframe of this contract - developed using toolbox workflows within this ITT. Indicators that are not currently in the ECDE but present in the CDS should also be included in activities included in this contract.

Hazard category	Hazard type	#	Index name	EEA Priority	Page No. in ETC Paper	In the CDS		CDS URL / Comments
						Yes	No	
Heat and cold	Mean temperature	1	Mean temperature	High		x		Included in ECDE
		2	Growing degree days	High		x		Included in ECDE
		3	Heating degree days	High	p.32		x	This SCII will not be required to be implemented
		4	Cooling degree days	High	p.33		x	This SCII will not be required to be implemented
	Extreme heat	5	Tropical nights	High		x		Included in ECDE
		6	Hot days	High	p.35		x	
		7	Warmest three-day period	High	p.36		x	
		8	Heatwave days based on apparent temperature	High		x		Included in ECDE
		9	Climatological heatwave days	Medium		x		Included in ECDE
		10	Days with UTCI above a threshold	Medium		x		UTCI from climate projections is not currently included in the ECDE
	Cold spell and frost *	11	Frost days	High		x		Included in ECDE
Wet and dry	Mean precipitation	12	Total precipitation	High		x		Included in ECDE
	Extreme precipitation *	13	Maximum consecutive five-day precipitation	High		x		
		14	Extreme precipitation total	High		x		
		15	Frequency of extreme precipitation	Medium		x		
	River flooding	16	River discharge	High		x		
	Aridity	17	Aridity actual	High		x		
		18	Consecutive dry days	Medium		x		Longest dry spells in CDS
	Drought	19	Duration of meteorological droughts	High	p.48		x	EEA methodology is based SPI – which is not in not in CDS but can be derived. Droughts represents the total number of months in a year that experience drought conditions as determined by anomalously low precipitation values. Or broker number of dry spells from Agroclimatic Indicators for Agri SIS contract (dry day = rainfall <1mm)

								https://www.eea.europa.eu/data-and-maps/data/external/european-drought-climatologies-and-trends-1
		20	Magnitude of meteorological droughts	Medium	p.51		x	https://www.eea.europa.eu/data-and-maps/data/external/european-drought-climatologies-and-trends-1
		21	Duration of soil moisture droughts	High	p.53	x		
	Wildfire	22	Days with fire danger exceeding a threshold	High		x		Included in ECDE
Wind	**Mean wind speed**	23	Mean wind speed	High		x		
	Severe windstorm	24	Extreme wind speed days	Medium		x		
Snow and ice	**Snow and land ice**	25	Snowfall amount	High		x		Included in ECDE
		26	Period with snow water equivalent above threshold	Medium		x		
Coastal	**Relative sea level**	27	Relative sea level rise	High		x		Included in ECDE
	Coastal flooding	28	Extreme sea level	High		x		Included in ECDE
Oceanic	**Ocean temperature ***	29	Oceanic Sea surface temperature	High		x		
		30	Duration of marine heatwaves	Medium	p.64		x	No daily SST variable to derive index – GAP in CDS CMIP variables (as of June 2021)
	Biochemical ocean properties *	31	Dissolved oxygen level	Medium		x		
		32	Ocean pH level	Medium		x		

Table 3: *Overview of the EEA ETC - C3S gap analysis against priority indicators*

Annex 2 – Quality Assurance Template for Applications

Dedicated Quality Assurance Templates (QATs) will evaluate the application against the applicable criteria, with each criterion ranked on the completeness in terms of provision of information for that criterion. The goal of the EQC process is not to "score" each artefact, but rather to ensure that C3S users have the information they need in order to make their own decision as to whether an application is suitable for their intended purpose. This should be in as an accessible and understandable format as possible, in accordance with best practice guidelines. As such, it is not about the amount of information provided, but the relevance, usability and credibility of that information. These requirements should be looked at from the perspective of the diverse array of users that are and could be, using the product or service being assessed.

Guidance on the process for completing the QATs will be provided in the form of detailed procedures, which should help the QAR creators to understand what is needed for each step; with the aim of facilitating the achievement of high quality, thoroughly completed QATs. In addition, the process can iteratively involve engagement with the contractor.

The QAT requirements are listed in Table 4 below. The priority of the requirement is indicated by use of keywords, e.g., "shall", "should".

Current QAT for Applications

Introduction
A1 Artefact Overview
A1.1 Artefact name
A1.2 Summary description of the artefact (max 200 words limit)
A1.3 How to cite this artefact?
A1.4 Has this product been generated for a specific usage?
A1.5 Key limitations of the artefact
A1.6 License
A1.7 Keywords
A3 Providers
A3.1 Organisation
A3.2 Point of contact
A4 Artefact Version
A4.1 Version
A4.2 Artefact DOI
A4.3 Artefact status
A4.4 Date artefact last update
A4.5 Date artefact made available
A4.6 Is there a future update planned?

User Documentation
B1 User Guide
B1.1 Are all references for data sources provided?
B1.2 Is metadata provided for all submitted artefacts?
B1.3 What are the limits of the provided information and are these disclosed and discussed in documentation?
B1.4 Are all processing steps well documented and reproducible?
B1.5 Has guidance on the artefact been provided? What are the pros and cons for the intended use (adaptation/mitigation)?
B1.6 What information services are available for answering requests and clarifications?
B1.7 Is consolidated guidance on the usage and description of the available documentation provided?
B1.8 How well does the information provided enable users to perform their own development?

B1.9 How were input/output data specifications chosen, and is the choice well explained and justified within the documentation?
B3 Uncertainty Quantification
B3.1 How has uncertainty been assessed and is statistical information provided to determine the confidence level of the outputs?
B4 Validation
B4.1 How are the source data, intermediate results, and outputs assessed and validated?
B4.2 Have the results been compared with other sources to ensure validity?

Access
C1 Workflows
C1.1 What is the dissemination policy and are the procedures in place and made public? Is the policy based on user feedback?
C1.2 What are the rights of dissemination? Where can full terms and conditions be found?
C1.3 Is the artefact available to the users on the Climate Data Store? Is information on data access provided?
C2 Application Visualisation
C2.1 Is the service intuitively presented and freely accessible?
C2.2 Do applications and related web content conform to universal web content accessibility guidelines?
C2.3 Have various forms of dissemination been considered?
C2.4 Is there easy technical access to services including documentation?
C2.5 Is the presentation clear and does it follow visualisation standards e.g., WCAG 2.0 guidelines on web content?
C2.6 Has all documentation been reviewed to ensure graphics and tables match the captions and explanations?

Assessment
D1 Compliance with Community Standards
D1.1 How has the relevance of the metadata been ensured and are international/community standards followed?
D1.2 How were appropriate methods chosen? Are they well documented and follow scientific and industry standards?
D1.3 Do quality reports comply with existing standards and guidelines?
D3 User Relevance
D3.1 How have end-user priorities and data usage statistics been identified?
D3.2 How have procedures been implemented to prioritise different user needs?
D3.3 How was user satisfaction assessed and were subsequent improvements undertaken?
D3.4 How has relevance for the client and user needs been ensured?
D3.5 Does the artefact offer crucial information for the intended user community to solve climate specific problems?
D3.6 How were parameters chosen? (e.g., spatial/temporal resolution and coverage, time series, time slices, RCP coverage)

Table 4: *Overview of the EQC for applications QAT specifications*

Annex 3 - Quality Assurance Template for Tools

This annex details the QAT used to produce the QARs of the Toolbox tools. Note that this is the QAT as defined in the C3S 512 EQC contract. It is expected that the QAT will be modified as part of the C3S EQC activities that are subject to ongoing procurement (ITT Ref: C3S_5100).

Tools & New Tools		
Documentation		
Category	**Field 1**	**Description field**
Tool use **(mandatory)**	Free text	Syntax to use the tool e.g. cdstoolbox.stats.count(*args, **kwargs)
Summary - concise text (**mandatory**) As defined in the docstring standards[2]	Free text	Description of the tool and its functionality e.g., Returns the number of not-NaN values in data along dimension dim. Result can be normalized to the total number of samples in dim.
Tool description **(mandatory)**	Free text	Description of the function arguments, keywords and their respective types **Example Parameters:** source – xr.DataArray DataArray where to count not-NaN values. dim – str Dimension along which to perform the counting. normalized – bool If True, normalize the result to the total number of samples in dim. Default is False. **Example Returns:** xr.DataArray DataArray containing count or normalized count of not-NaN values along dimension dim.
Tool authors **(mandatory)** *[not shown publicly]*	Drop down menu: NA, free text	List of authors, or the associated project Affiliation or project, e.g., C3S_25c. If not known, please add NA.
Contact e-mail address **(mandatory)** *[not shown publicly]*	Free text	Main contact providing support for that tool copernicus-support@ecmwf.int
The licence under which the tool is available **(mandatory)**	Link(s)	Description of the software license https://cds.climate.copernicus.eu/api/v2/terms/static/licence-to-use-copernicus-products.pdf
The version of the tool **(mandatory)**	Free text	Tool versioning. This has to be consistent with the main project or source code the tool is derived from. Internal and external versions might be considered Versioning should follow semantic versioning[3], otherwise the ECMWF git repository commit string can be inserted.
Related Tools	Free text	A list of already existing similar tools within the Toolbox. The goal is to direct users to other functions they may not be aware of, or have easy means of discovering
Tool keywords	Free text	Keywords defining the tool

[2] https://numpydoc.readthedocs.io/en/latest/format.html#docstring-standard

[3] https://semver.org/

Is an extended description needed?		Y/N	
If yes ->	Extended summary	Free text	Extended summary, expanding the concise summary
If yes ->	Scientific references	Link(s)	Scientific references available in literature, if any, including the accessibility of any external documentation Please include links to papers or technical reports.
Example of Use		Free text	A detailed example of use, i.e., the example provided in the documentation
Independent Evaluation on Tool documentation **(mandatory)** *[the developer should not be granted to edit this]*		Drop-down (TBD, [0-3])	Rating of the Tool documentation, based on four levels of increasing detail/justification provided: 0 = Not all mandatory fields are complete and accurate 1 = All mandatory fields are complete and accurate 2 = All mandatory fields are complete and accurate, plus some but not all optional fields are complete and accurate 3 = All mandatory and all optional fields are complete and accurate
Justify **(mandatory)** *[the developer should not be granted to edit this]*		Free text	
Code Testing			
Is the tool container-based? **(mandatory)**		Y/N	
If yes ->	Source Code access **(mandatory)**	Free text	Description of how and where the source code can be accessed Reference the repository of the software project that contains the master version of the source code, including the project url. Source must include the Dockerfile necessary to build the container.
If yes ->	Specific Dependencies	Free text	Description of the dependencies
Software re-using		Free text	Description of software re-using and algorithm re-implementation
Has the Tool passed a unit test? **(mandatory)** *[click '+' to add the unit test source code and results entries]*		Drop-down menu: TBD / Y (passed) / N (not passed or not available)	Whether the tool has passed at least a unit test
If yes ->	Unit test source code **(mandatory)**	Free text	Definition the unit tests delivered with the tool. Unit tests may include asserts on attributes such as compliance on units and standard names Links to source code script

			Test1 definition Test2 name … TestN name
If yes ->	Unit test results **(mandatory)**	pdf(s)	Log file for the unit test execution
Independent Evaluation on Code Testing **(mandatory)** *[the developer should not be granted to edit this]*		Drop-down (TBD, [0-3])	Rating of the Tool code testing, based on four levels of increasing detail/justification provided: 0 = Unit tests not performed 1 = Only mandatory arguments are checked in the unit tests 2 = All mandatory arguments are checked in the unit tests, plus some optional arguments are checked in the unit tests 3 = All arguments (mandatory and optional) are checked in the unit tests
Justify **(mandatory)** *[the developer should not be granted to edit this]*		Free text	
Tool compatibility in the CDS			
Input	Has the tool passed an integration test? *[click '+' to add the unit test source code and results entries]*	Drop-down menu: TBD / Y (passed) / N (not passed or not available)	Whether the tool has passed at least an integration test
	If yes or no -> Integration test source code	Free text	Definition the unit tests delivered with the tool. Unit tests may include asserts on attributes such as compliance on units and standard names Source code script with details, e.g.: @ct.application(title='Toolbox checker fldmean') @ct.input.text("catalogue_entry", default=None) @ct.input.text("params", default=None) @ct.output.download() def application(catalogue_entry, params): data = ct.catalogue.retrieve(catalogue_entry, params) mean = ct.cdo.fldmean(data) return mean
	If yes or no -> Integration test results	pdf(s)	Log file for the integration test execution
Output	Is the output in netCDF format? **(mandatory)**	Y/N	
	If yes -> Is the output CDM compatible, at least for some data types?	Y/N	

	If yes ->	If yes or no ->	Free text	Comments about the tool's output CDM compatibility
	If yes ->	If yes or no ->	pdf(s)	CDM checker log file
Independent Evaluation of CDM compatibility **(mandatory)** *[the developer should not be granted to edit this]*			Drop-down (TBD, [0-3])	Rating of the Tool compatibility in the CDS environment, based on four levels of increasing detail/justification provided: 0 = CDM compatibility of the tool's output has not been checked. This check applies only if the output is in NetCDF 1 = CDM compatibility of the tool's output has been checked. When the output is not in NetCDF, this check does not apply 2 = The integration tests have been performed for some, but not all, possible dataset types (e.g. satellite observations, reanalysis), plus CDM compatibility of the tool's output has been checked. When the output is not in NetCDF, this additional check does not apply 3 = The integration tests have been performed for all possible dataset types (i.e. satellite and in-situ observations, reanalysis, climate projections, seasonal forecasts), plus CDM compatibility of the tool's output has been checked. When the output is not in NetCDF, this additional check does not apply
Justify **(mandatory)** *[the developer should not be granted to edit this]*			Free text	