

# ECMWF Copernicus Procurement

## Invitation to Tender



# Copernicus Atmosphere Monitoring Service

## Volume II

### Regional evaluation & quality control (EQC)

ITT Ref: CAMS2_83_bis
ISSUED BY: ECMWF Administration Department Procurement Section
Date: 28 October 2024
Version: Final



Funded by the European Union

Implemented by



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## 1 Introduction

Some of today's most important environmental concerns relate to the composition of the atmosphere. Ozone distributions in the stratosphere influence the amount of ultraviolet radiation reaching the surface. In the troposphere, aerosols, ozone and other reactive gases such as nitrogen dioxide determine the quality of the air around us, affecting human health and life expectancy, the health of ecosystems and the fabric of the built environment. The variable abundance of the reactive gases changes the oxidation capacity of the atmosphere and controls therewith also the abundance of long-lived greenhouse gases. The composition of the troposphere and the associated deposition fluxes are major components of the biogeochemical cycles of carbon, nitrogen and sulphur and iron, which affect the land- and marine ecosystems. Dust, smoke and volcanic aerosols affect the safe operation of transport systems and the availability of power from solar generation, the formation of clouds and rainfall, and the remote sensing by satellite of land, ocean and atmosphere.

The increasing concentration of the greenhouse gases and the various aerosol-weather feedbacks are prominent but often uncertain drivers of climate change. In the wake of the agreement signed in Paris at the UNFCCC's 21st Conference of the Parties (COP-21) in December 2015, the need to monitor and to inform about the effectiveness of mitigation efforts for anthropogenic emissions of key greenhouse gases has become more acute and prominent. With its global coverage (or regional in the case of geostationary platforms), Earth Observation has a decisive role to play within such a monitoring system, complementing ground-based observations, "bottom-up" estimates of the emissions (included in official reporting) based on inventory data and biogeochemistry models, and atmospheric transport modelling.

To address these environmental concerns, there is a need for data and processed information. The Copernicus Atmosphere Monitoring Service (CAMS) has been developed to meet these needs, aiming at supporting policymakers, business and citizens with enhanced atmospheric environmental information.

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 – 2028, Cop2), these services are further consolidated, improved and expanded to address all the existing and emerging societal needs related to the atmospheric environment. The CAMS service portfolio consists of the following service elements:

- a) Daily production of real-time analyses and forecasts of global atmospheric composition;
- b) Reanalyses providing consistent multi-annual global datasets of atmospheric composition with a stable model/assimilation system;
- c) Daily production of real-time European air quality analyses and forecasts with a multi-model ensemble system;
- d) Reanalyses providing consistent annual datasets of European air quality with a frozen model/assimilation system, supporting in particular policy applications;
- e) Products to support policy users, adding value to "raw" data products in order to deliver information products in a form adapted to policy applications and policy-relevant work;
- f) Solar and UV radiation products supporting the planning, monitoring, and efficiency improvements of solar energy production and providing quantitative information on UV irradiance for downstream applications related to health and ecosystems;

- g) Greenhouse gas atmospheric inversions for CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O net surface fluxes, allowing the monitoring of the evolution in space and time of these fluxes;
- h) Climate forcing from aerosols and long-lived (CO<sub>2</sub>, CH<sub>4</sub>) and shorter-lived (stratospheric and tropospheric ozone) agents;
- i) Anthropogenic and natural emissions, based on inventory data and modelling, for the global and European domains;
- j) Observation-based emission estimates of atmospheric pollutants for the global and European domains;
- k) Observation-based anthropogenic emission estimates of CO<sub>2</sub> and CH<sub>4</sub> for the global domain and emission hotspots.

This Invitation to Tender (ITT) is mainly targeting the CAMS service element described under item fc) and d) above.

## 2 Contract Summary

This ITT, entitled “Regional evaluation & quality control (EQC)” is for EQC activities of the CAMS regional production systems. The aim of the EQC activities is to provide information on the scientific and operational quality of Regional Products in the form of EQC reports and on-line evaluation graphics. In summary, the successful Tenderer shall deliver:

- Quarterly EQC reports for the CAMS Real-Time Regional Products
- Annual EQC reports for the CAMS regional interim and validated reanalyses
- Evaluation of CAMS Real-Time Regional Products through provision of routine monitoring graphics
- EQC of the interface between CAMS global and regional production systems
- Assessments of the EQC information to support future model developments

## 3 Technical Specification

EQC involves the assessment of the closeness of the data to the geophysical reality and of the sources of uncertainty of the data, over the geographic, vertical and temporal domains of relevance. Uncertainty estimates can include, but are not restricted to, estimates of the bias and precision of the data, and identification of the temporal and spatial domains over which those estimates are valid. Reference measurements used in the comparisons are supposed to represent the atmospheric “truth”. A key aspect of any comparison performed for EQC purposes is the careful selection of this “truth”. The quality, traceability and suitability of the latter are essential to allow proper, unbiased and independent evaluation and quality control. Those reference data must be well-documented, and procedures must exist to ensure adequate quality control in the long term. EQC of CAMS atmospheric data products can rely on comparisons with accurate and well-documented independent observations from ground-, aircraft-, balloon- and satellite-based system.

### 3.1 General Requirements

EQC activities in this ITT correspond to the systematic evaluation of the quality of the Regional Products against independent air quality observations using a set of defined metrics. The CAMS Regional Products are provided by an ensemble of at least 11 air quality models for the European

domain. The successful Tenderer shall set up evaluation procedures for these Regional Products (forecasts, analyses and (interim) reanalyses) for which there are observations available to compare with.

These procedures will at a minimum follow the ones that have been set up in CAMS and for which Table 1 synthesises the main characteristics. The Tenderer shall include additional metrics following the guidance from the FAIRMODE programme<sup>1</sup>.

Metrics	Normalized mean bias, Modified normalized mean bias, Mean bias, Correlation, Spearman correlation, Fractional gross error, Normalized root-mean-square error, Root-mean-square error, Average of modelled values and average of observed values.
Species	At a minimum: O <sub>3</sub> , NO <sub>2</sub> , SO <sub>2</sub> , CO, PM <sub>10</sub> , PM <sub>2.5</sub> and pollen species, as provided by the Regional Service Provider.
Data streams	Individual and ensemble NRT analyses, individual and ensemble forecasts, individual and ensemble interim re-analyses, individual and ensemble validated re-analyses, and forecasts optimized at observation sites.

*Table 1: Main characteristics of the initial regional EQA*

The successful Tenderer shall compute the statistical skill scores by comparing the data streams from the Regional Production, interpolated at each measurement site with corresponding observational data, which are available from the European Environment Agency (EAA) and various in situ observation networks (e.g., ACTRIS, EMEP, GAW, EAN).

CAMS also provides daily European air quality forecasts optimised at observation sites (MOS product) as part of the Regional Products. This part of the service shall also be assessed as part of the EQC activities specified in this ITT. The MOS product shall be evaluated against both the observations and the ENSEMBLE.

The successful Tenderer shall closely interact with ECMWF, the provider of the Regional Air Quality Products contract, the provider of the global EQC contract, and the providers of the relevant in situ support contracts for the exchange of relevant data sets related to this. This interaction shall include the assessment if the observational data are fully independent (not been used in data assimilation) or not.

The successful Tenderer shall develop a strategy to present all these statistical scores in a meaningful, comprehensive and user-friendly way. The successful Tenderer shall also consider evolving user requirements as well as user feedback to further develop the EQC products.

Documentation of the current regional EQC service, regional EQC reports for the daily analyses and forecasts, interim reanalyses, and validated reanalyses, as well as the online monitoring graphics can all be found on the CAMS website<sup>2</sup> and should be used as guidance for the proposal.

### 3.2 Work package 1 (WP1) – EQC of daily Regional Products

The successful Tenderer shall provide quarterly EQC reports for the regional NRT analyses and forecasts covering the periods September-October-November (SON), December-January-February (DJF), March-April-May (MAM), and June-July-August (JJA). They shall be made available not later than two months after the end of each period. The EQC reports will be used by service providers and users

<sup>1</sup> [https://fairmode.jrc.ec.europa.eu/document/fairmode/WG1/Guidance\\_MQO\\_Bench\\_vs3.3\\_20220519.pdf](https://fairmode.jrc.ec.europa.eu/document/fairmode/WG1/Guidance_MQO_Bench_vs3.3_20220519.pdf)

<sup>2</sup> <https://atmosphere.copernicus.eu/regional-services>

and shall therefore comprehensively and clearly document the various EQC comparisons and include a summary of the main findings.

A central element of CAMS is the link between the global production system and the regional production system. The CAMS regional air quality models run on a European geographical domain and therefore need boundary conditions of the relevant aerosol and chemical species for this domain as input to their assimilation and forecast runs. The CAMS global production system provides these boundary conditions. The successful Tenderer shall therefore also monitor and evaluate the boundary conditions for the CAMS regional geographical domain from the CAMS global model as well as the response of the regional models to these boundary conditions. This shall also include comparisons between the global and regional forecasts over the European domain taking into account the different representativity of the observations for the regional systems versus the global system. Inconsistencies between the global and regional systems shall be flagged and communicated directly to ECMWF and the Regional Service Provider for further investigation. Focus shall be on longer-lived species, such as carbon monoxide, ozone and aerosols. The results of the monitoring and evaluation shall be part of the quarterly reports mentioned in the paragraph above.

Tenderers shall complete the relevant table in Volume IIIA as part of their bid, which shall at least 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 tables.

<b>WP1 Deliverables</b>			
<i>#</i>	<i>Type</i>	<i>Title</i>	<i>Due</i>
D1.Y.Z- yyyyQx	Report	Quarterly EQC reports for the NRT forecasts and analyses, for each of the operational systems as well as the ensemble	31 January, 30 April, 31 July, 31 October
...			

<b>WP1 Milestones</b>			
<i>#</i>	<i>Title</i>	<i>Means of verification</i>	<i>Due</i>
M1.Y.Z	...	...	M1

### 3.3 Work package 2 (WP2) – EQC of regional (interim) reanalyses

The successful Tenderer shall provide each year EQC reports covering the interim reanalysis and the validated reanalysis not later than two months after the numerical products have been delivered by the Regional Service Provider. The EQC reports will be used by service providers and users and shall therefore comprehensively and clearly document the various EQC comparisons and include a summary of the main findings.

Tenderers shall complete the relevant table in Volume IIIA as part of their bid, which shall at least 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 tables.

WP2 Deliverables			
#	Type	Title	Due
D2.Y.Z-yyyy	Report	Annual EQC report for the interim reanalysis for Year N, for each of the operational systems as well as the ensemble	At the end of May of Year N+1
D2.Y.Z-yyyy	Report	Annual EQC report for the validated reanalysis for Year N-1, for each of the operational systems as well as the ensemble	During Year N+1, no later than 2 months after the validated reanalysis has been published for Year N-1 by the Regional Service Provider
D2.Y.Z-yyyy		...	Annually

WP2 Milestones			
#	Title	Means of verification	Due
M2.Y.Z	Title		

### 3.4 Work package 3 (WP3) - Provision of web-based evaluation graphics

The successful Tenderer shall develop and maintain specific daily-updated evaluation statistics and graphics for the past day, the past week and the past seasons for the NRT analyses and forecasts, which are provided by the Regional Service Provider. This will be targeted at giving insight into the difference in performance between the individual members and the ensemble, the different European geographical areas as well as a function of the forecast horizon and of local time.

In addition, the successful Tenderer shall develop and maintain a web-based visualisation tool for giving insight on the ensemble and individual Regional Systems' performance over past quarters (at least the 8 last quarters) for all the observed pollutants and for all the sites considered in the corresponding EQC reports. This system should be based on the same statistics as the published quarterly EQC reports. It should be presented in the form of a zoom-able geographical map, allowing users selecting sites and obtaining the statistical data and/or graphics corresponding to their selection.

These graphics shall either be hosted on the CAMS web site or in a single comprehensive web-based system, which can be embedded in the CAMS web site, producing daily verification graphics. The current operational service provision<sup>3</sup> shall be taken as guidance.

The evaluation server shall at least include the following evaluation statistics:

- seasonal evaluation of the analyses and forecasts of the most recent 8 to 12 seasons with daily and monthly temporal resolution;
- evaluation of the analyses and forecasts of the ongoing season (from season start until the most recent day for which observations are available, but covering at least 30 days) with hourly and daily temporal resolution;
- evaluation of the analyses and forecasts issued during the most recent week, for which observations are available with temporal hourly and daily resolution;

<sup>3</sup> <https://regional-evaluation.atmosphere.copernicus.eu/>

- evaluation of the analyses and forecasts issued during the most recent day, for which observations are available with hourly temporal resolution;
- evaluation of the MOS product of the ongoing season (officially called ‘CAMS European air quality forecasts optimised at observation sites’) with hourly and daily temporal resolution.

Tenderers shall complete the relevant table in Volume IIIA as part of their bid, which shall at least 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 tables.

<b>WP3 Deliverables</b>			
#	Type	Title	Due
D3.Y.Z- YYYYQx	Online graphics & report	Daily updated evaluation graphics for the past day, past week, past 3 months, and past 8 quarters of the NRT regional analyses and forecasts, including quarterly report showing examples and documenting the relevant KPIs	Quarterly
...			

<b>WP3 Milestones</b>			
#	Title	Means of verification	Due
M3.Y.Z	Implementation of daily evaluation graphics for the past day, past week, past 3 months, and past 8 quarters of the NRT regional analyses and forecasts	Graphics available via CAMS website	Within 3 months after the start of the contract
...			

### 3.5 Work package 4 (WP4) – Analysis of EQC results

The successful Tenderer shall analyse the results from the evaluation of the near-real-time analyses and forecasts, including the MOS forecasts, on a routine basis. The assessments will support the further development of the regional models as well as the emission datasets provided by ECMWF (fires) and the service provider for the European emission inventories (anthropogenic). As part of this work package, the successful tenderer shall look into the performance as a function of time (e.g., weekdays vs. weekend days, summer vs. winter) as well as into the performance of forecasts in case of large pollution episodes, dust transport, and wildfires. The assessments shall also include differences between forecasts and observations caused by inconsistent definitions of the relevant variables. The findings shall be communicated to and discussed with the relevant service providers. The tenderer is expected to provide a plan for the described activities including specific deliverables.

Tenderers shall complete the relevant table in Volume IIIA as part of their bid, which shall at least 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 tables.

<b>WP4 Deliverables</b>			
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#	Type	Title	Due
D4.Y.Z- yyyyQx	Report	Assessment of EQC results	TBD
...			

WP4 Milestones			
#	Title	Means of verification	Due
M4.Y.Z			
...			

### 3.6 Work package 5 (WP5) – User support and documentation of service

The objective of this work package is to provide support to users of the delivered products and services.

ECMWF has established a centralised Copernicus Service Desk to provide multi-tiered technical support to all users of CAMS data, products, tools and services. The Service Desk handles user queries through a ticketing system and distributes these queries to specialists when needed. Dedicated staff at ECMWF provide basic support in the form of self-help facilities (FAQs, Knowledge Base, online Forum, tutorials etc.) as well as individualised support on technical queries related to the Atmosphere Data Store (ADS), data formats, data access etc. In addition, ECMWF staff provide specialised scientific support to address questions related to its industrial contributions to CAMS, e.g. in the areas of global forecasting of atmospheric composition.

All CAMS contractors are expected to 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 Service Desk facility, as well as contributions to FAQs, Knowledge Base, and user guides. Contractors may also be requested by the CAMS Service Desk to contribute to support questions in the online Forum.

Tenderers shall describe the level of user support service on Service Desk tickets as a specific Key Performance Indicator (KPI) with a target value of 80% of the assigned specialised user queries being resolved within 15 days after being informed by the CAMS Service Desk.

Tenderers shall also contribute to the relevant documentation. Documentation of the CAMS services is an integral part of the service provision and is directly linked to the Atmosphere Data Store. The technical and scientific specification of each service shall be documented in the CAMS Knowledge Base as linked from the Atmosphere Data Store, and, if more detail is required, in reports that will be available to users through the CAMS web site. The successful Tenderer shall therefore support the updates of the relevant documentation based on the latest developments. The documentation in the Knowledge Base shall be targeted at the general external user community, while the additional detailed reports shall address the needs of expert users.

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 tables.

<b>WP5 Deliverables</b>			
#	Type	Title	Due
D5.Y.Z-yyyy	Other	Contribution to CAMS Knowledge Base to ensure up-to-date information about products and services covered under this contract	Annually
D5.Y.Z-yyyy	Report	Documentation of products and services covered under this contract	Annually
...			

<b>WP5 Milestones</b>			
#	Title	Means of verification	Due
M5.Y.Z	...	...	...
...			

### 3.7 Work package 0 (WP0) – Management and coordination

The following management and coordination activities are part of WP0 and shall be briefly described, and completed if necessary, in the bid:

- Management, planning and coordination of the different Work Packages activities and corresponding resources, including the appropriate tools used to monitor them.
- Contractual obligations as described in the Volume V Framework Agreement Clause 2.3 “Reporting and Planning” and its Annex 5 “Report content”.
- Meetings organisation and/or attendance (classified as tasks and listed in a separate table as part of the proposal):
  - ECMWF and the Successful Tenderer will organise a Kick-Off Meeting during the first month of implementation of the contract. Additional interim/ad-hoc progress meetings might be required. All meetings shall be classified as “Milestones” under Volume IIIA “Pricing and deliverables” Excel sheet, tab “Deliverables List”.
  - ECMWF will host monthly teleconference meetings to discuss CAMS service provision, service evolution and other topics (Service Level Board). The Prime Investigator and/or Service Manager appointed by the Successful Tenderer will represent the Successful Tenderer in such meetings.
  - ECMWF and the Successful Tenderer will organise Progress Review Meetings, linked to Payment Milestones, every six months unless otherwise agreed.
  - ECMWF will organise annual CAMS General Assemblies. The Successful Tenderer is required to attend these meetings with team members covering the various topics that are part of this ITT.
  - Successful Tenderer’s internal meetings.
  - Tenderers can propose additional project internal meetings (annual face-to-face meeting and monthly teleconferences) as part of their response.

- Quality assurance and control: the final quality check of the deliverables prior the submission to ECMWF should be made by the prime contractor (contents, use of ECMWF’s templates for deliverables and reports, format, deliverables/milestones numbering and naming, typing errors, etc.).
- Implementation of checks, controls and risk management tools for both the prime contractor.
- Communication management (ECMWF, stakeholders, internal communication).
- Management of personal data and how this meets the requirements of Clause 2.8 and Annex 6 “Personal Data Protection” of the Volume V Framework Agreement.
- Sub-contractor management, including dispute 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 sub-contractors, if any, describing their contribution and key personnel shall be provided, as well as back-up names for all key positions in the contract. The Tenderers shall describe how the Volume V Framework Agreement, in particular its Clause 2.9 “Sub-contracting”, has been flowed down to all their sub-contractors.

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. All milestones and deliverables shall be numbered as indicated (see also guidelines in Section 4.2). All document deliverables shall be periodically updated and versioned as described in the tables below, and the corresponding due date defined in Volume IIIA for each iteration.

<b>WPO Deliverables</b>				
<b>#</b>	<b>Responsible</b>	<b>Nature</b>	<b>Title</b>	<b>Due</b>
D0.Y.Z-yyyyQx	Tenderer	Report	Quarterly Implementation Report (QIR) yyyyQx yyyyQx being the previous quarter (e.g. 2024Q3 due on 15/10/2024)	Quarterly on 15/04, 15/07 and 15/10
D0.Y.Z-yyyy-Part1	Tenderer	Report / Other	Annual Implementation Report (AIR) for year yyyy - Part 1 including: • the Quarterly Implementation Report (QIR) yyyyQ4, and • the preliminary financial information yyyy being the Year n-1	Annually on 15/01
D0.Y.Z-yyyy-Part2	Tenderer	Report	Annual Implementation Report (AIR) for year yyyy - Part 2 yyyy being the Year n-1	Annually on 28/02
D0.Y.Z	Tenderer	Report	Final Report	By the end of contract
D0.Y.Z-yyyy	Tenderer	Report	Annual Implementation Plan for year 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 for year YYYY YYYY being the Year n-1	Annually, not later than on 15/12 <sup>(1)</sup>
D0.Y.Z	Tenderer	Other	Updated KPIs (list, targets, etc.) after review with	1 year after start of

			ECMWF	contract
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<b>WPO Milestones</b>				
<b>#</b>	<b>Responsible</b>	<b>Title</b>	<b>Means of verification</b>	<b>Due</b>
M0.Y.Z-KOM	Tenderer	Kick-Off Meeting	Minutes of Meeting	30 days after start of contract
M0.Y.Z-PMxqqYY	Tenderer	Progress Review Meeting #PMx being the Payment milestone number, #qq - the quarter and #YY - a year during which the Payment Milestone is due <i>xx being the iteration number of the PRM</i>	Minutes of Meeting	~ as a minimum linked to the Payment Milestone.
M0Y.Z-SLB <sup>(2)</sup>	Tenderer	CAMS Service Level Board meeting	Attendance	Every month
M0.y.z-CAMSGA-YYYY	Tenderer	CAMS General Assembly YYYY	Attendance	Annually, not later than on 15/12 <sup>(1)</sup>

<sup>(1)</sup> These due dates are indicated to frame the corresponding deliverables and milestones schedule only, consequently the following shall be considered by the Tenderer:

- the general financial statements shall be sent by the contractor as soon as available,
- the schedule of the Progress Review Meetings shall be aligned with the different Payment Milestones during the contract negotiation,
- depending on the year, the CAMS General Assembly may take place at a different period of the year.

<sup>(2)</sup> All iterations for this recurring SLB meeting do not need to be listed by the Tenderer, i.e., only one row shall be added in Volume IIIA "Pricing and deliverables" Excel sheet "Deliverables List".

## 4 General Requirements

### 4.1 Implementation schedule

The Framework Agreement will run from 1 May 2025 to 30 June 2028. The Tenderer shall provide a detailed implementation plan of proposed activities for the full period.

### 4.2 Deliverables and milestones

The Tenderers shall provide the list of deliverables and milestones (cf. ITT Volume IIIA "Pricing and deliverables", Excel spreadsheet "Deliverables List") for each Work Package. All deliverables and milestones must be consistent with the activities and objectives described in Section 3 of this ITT Volume II:

- A deliverable is a substantial, tangible or intangible good or service produced as a result of a project (see also the deliverable definition in this ITT Volume V Clause 1.2 and Clause 3.2). In other words, a deliverable is an outcome produced in response to the specific objectives of the contract and is subject to acceptance by both ECMWF's Technical Officer (TO) and Contract Management Officer (CMO).
- Milestones should be designed as markers of demonstrable progress in service development and/or quality of service delivery (see also the milestone definition in this ITT Volume V Clause 1.2). They should not duplicate deliverables and shall not attract the budget under Volume IIIA "Pricing and deliverables", Excel sheet "Deliverables List".

The following shall apply to the deliverables and milestones:

- The deliverables and milestones should be consistent with the technical requirements specified in Section 0.
- When defining deliverables, please assign the precise dates (DD/MM/YYYY) to each of them.
- All contract reports and deliverables shall be produced in English.
- The quality of reports and deliverables shall be equivalent to the standard of peer-reviewed publications and practice.
- Unless otherwise specified in the specific contract, deliverables shall be made available to ECMWF in electronic format (PDF/Microsoft Word/Microsoft Excel or compatible) via the Copernicus Deliverables Repository portal. See also Section 4.7 in what regards the data provision.

Volume IIIA "Pricing and deliverables" (cf. Excel sheet "Deliverables List") of this ITT shall be used by the Tenderer to describe the complete list of deliverables, milestones and schedules for each work package (due dates). Please note that:

- All deliverables and milestones shall be numbered as per the following format DX.Y.Z (for deliverables) and MX.Y.Z (for milestones), where X is the WP number, Y is the task number and Z is the deliverable or milestone number in this task. Deliverables delivered annually should be numbered DX.Y.Z-yyyy, where yyyy is the year the deliverable refers to (e.g. DX.Y.Z-2016). Deliverables delivered quarterly should be numbered DX.Y.Z-yyyyQx, where yyyyQx is the quarter of the year the deliverable refers to (e.g. DX.Y.Z-2016Q1, DX.Y.Z-2016Q2). The same numbering format shall be applied for the milestones. Continuous deliverables at higher frequency can be labelled in the same way as quarterly deliverables.

- Each deliverable shall have an associated resource allocation and price (cf. column I “Nb of PM allocated” and column J “Estimated price”), while the only resource type to be considered is “payroll” (the total of these allocated resources and prices shall therefore amount to the total price associated with payroll in Volume IIIA spreadsheet “Costs and Prices”). Milestones should not have such associated resource allocation, unless otherwise agreed.
- The Tenderers shall provide a due date for each proposed deliverable and milestone (in accordance with those indicated in Section 3):
  - o The Tenderers shall ensure that the proposed due dates of deliverables and milestones are realistic and achievable. **Any dependencies on input data (whose origin must be specified) shall be detailed and also accounted for in the risk table.**
  - o It is advised to schedule the submission/completion of the last deliverables and/or milestones associated to a Payment Milestone not later than 15 days before the expected date of completion of the said Payment Milestone (i.e. when all deliverables have been submitted by the contractor and all milestones have been completed by the concerned parties).

### 4.3 Acquisition of necessary data and observations

The Successful Tenderer is responsible for acquiring all the needed observational data sets, but shall closely interact with ECMWF, the provider of the Regional Production contract, the provider of the global EQC contract, and the providers of the relevant in situ support contracts for the exchange of relevant data sets related to this ITT. The Regional Products data will be available via the CAMS Atmosphere Data Store (ADS).

### 4.4 Data and IPR

It is a condition of EU funding for CAMS that ownership of any datasets developed with CAMS funding passes from the suppliers to the European Union via ECMWF. Ownership will pass from the date of creation of the datasets. Suppliers will be granted a non-exclusive licence to use the datasets which they have provided to CAMS for any purpose.

All software and products used by the successful Tenderer to produce the CAMS datasets will remain the property of the successful Tenderer, except for those components which are acquired or created specifically for CAMS purposes, with CAMS funding, and which are separable and useable in isolation from the rest of the successful Tenderers’ production system. The identity and ownership of such exceptional components will be passed to the European Union via ECMWF annually. The successful Tenderer will be granted a non-exclusive licence to use them for any purpose.

### 4.5 Communication

The successful Tenderer shall support ECMWF in its communication activities for the CAMS services, where they are related to the activities described in this ITT. Examples are contributions to the Copernicus State of the Climate report, CAMS web site news items, and CAMS brochures and flyers. 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 complete, so that success measures and KPIs can be provided to the European Commission.

## 4.6 Support for user engagement and training activities

While user engagement and training activities are not part of the scope of this ITT, the Tenderer shall accommodate for eventual needs in providing technical and scientific expertise in support of these activities. The bidder shall specify in the bid the experts 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 and/or review of learning resources in the domain of the contract, participation in train-the-trainer events and MOOCs;
- Contribute with content specific input to user-oriented communication material such as slides, story maps and user testimonials;
- Contribute and attend User Uptake workshops and stakeholder meetings. Presentations in your mother tongue may be asked to be provided;
- 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;

An indicative maximum budget of 5,000.- EUR shall be allocated in the pricing table to accommodate for these needs. This shall be paid as a fixed price. Details on the required activities shall be refined as part of the Annual Implementation Plans.

As part of the CAMS user interaction, user requirements are continually collected in a User Requirements Database (URDB) in a structured and traceable way. This URDB tracks all requirements emanating from a wide variety of user fora, surveys, user support and direct interactions between service providers and their users. The entries of the URDB are analysed on a regular basis in terms of user requirements per domain, importance and feasibility. This analysis constitutes the basis for distilling, filtering and translating user requirements into technical specifications for the Service and its evolution.

The successful Tenderer shall provide input to the User Requirements Database (URDB) regarding user requirements that are directly related to activities covered by this ITT. The successful Tenderer shall also support ECMWF and the contractor for User Interaction activities with the analysis of relevant user requirements in the URDB.

The following deliverables are thus to be added to the WP8340 deliverable lists:

<b>WP5 Deliverables Template</b>			
<i>#</i>	<i>Type</i>	<i>Title</i>	<i>Due</i>
D5.Y.Z-yyyy	Other	Input to CAMS URDB - YYYY	Checked by ECMWF annually in November
D5.Y.Z	Report	Summary of user engagement activities.	Due 1 month before contract end date

## 4.7 Key performance indicators

Contractors shall report to ECMWF on a set of Key Performance Indicators (KPIs) suitable for monitoring various aspect of service performance. These will be used in the overall monitoring of the CAMS programme.

The table below provides the template to be used by the Tenderer to describe the KPIs, relevant for this ITT, together with performance targets, delivery schedules and explanations if needed. Please note that the listed KPIs form part of the overall set of KPIs comprising the full CAMS service portfolio; the successful Tenderer therefore might have to provide KPI values for a KPI in support of services outside this ITT.

All KPIs shall be labelled and numbered as indicated. All KPIs shall be periodically updated as described in the tables. Tenderers shall provide preliminary versions of the completed tables as part of their bid.

The list of KPIs shall be reviewed with ECMWF in the second year of the contract and updated if necessary.

KPI #	KPI Title	Performance Target and Unit of Measure	Frequency of Delivery	Explanations / Comments
KPI_1	On-time delivery of quarterly EQC reports	Reports should always be on time, provided that the CAMS2_40 model results are received on time	quarterly	
KPI_2	On-time delivery of annual IRA reports	Reports should always be on time, provided that the CAMS2_40 model results are received on time	annually	
KPI_3	On-time delivery of annual VRA reports	Reports should always be on time, provided that the CAMS2_40 model results are received on time	annually	
KPI_4	Uptime of daily updated graphics	The web interface should be available on at least 95% of all days	daily	
KPI_5	On-time delivery of web interface reports (uptime statistics)	Reports should always be on time, provided that the CAMS2_40 model results are received on time	quarterly	
KPI_6	User support service on Service Desk tickets with a target value of .	80% of the assigned specialised user queries should be resolved within 15 days after being informed by the CAMS Service Desk	dependent on the number of tickets	



## 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.

<i>Section</i>	<i>Page Limit</i>
<i>Executive Summary</i>	2
<i>Track Record</i>	2 (for general) and 2 (per entity)
<i>Quality of resources to be Deployed</i>	2 (excluding Table 1 in Volume IIIB and CVs with a maximum length of 2 pages each)
<i>Technical Solution Proposed</i>	2 + 3 per Work package (Table 2 in Volume IIIB, the section on references, publications, patents and any pre-existing IPR is excluded from the page limit and has no page limit)
<i>Management and Implementation</i>	6 (excluding Table 3, Table 5, Table 6 and Table 7 in Volume IIIB) + 2 per each Work package description (Table 4 in Volume IIIB)
<i>Pricing Table</i>	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 a team that meets at least the following requirements:

- A senior team member (Prime Investigator) with more than 5 years of experience in managing activities related to this ITT;
- At least two additional senior team members with more than 5 years of experience on performing activities related to the various aspects of this ITT.

These team members shall be involved in the activities of this ITT at a minimum level of 10% of their total working time. The successful Tenderer shall also appoint a Service Manager, which will be its primary contact for contractual delivery and performance aspects.

#### 5.2.4 Technical Solution Proposed

The Tenderer is expected to provide a short background to the proposed technical solution to demonstrate understanding of the solution proposed. This should include background of the Tenderer's understanding of CAMS and more specifically of the CAMS Regional Products, their applications areas and the different categories of users to be served. This should also link to the value of EQC for addressing user requirements.

An exhaustive and detailed description of the proposed technical solution for all work packages described above shall be given. The Tenderer shall describe how service provision will be organised in order to meet the stringent timeliness and completeness requirements of the various EQC reports. The Tenderer shall also provide a detailed description of how it intends to generate the different sets of graphics required and how it is intended to make them available. The description of the proposed technical solution shall be organized in individual tasks following the work package structure indicated above.