

# ECMWF Copernicus Procurement

## Invitation to Tender



# Copernicus Atmosphere Monitoring Service

## Volume II

Development and provision of hot-spot  
observation-based emissions of methane

ITT Ref: CAMS2_53a
ISSUED BY: ECMWF Administration Department Procurement Section
Date: 30 August 2023
Version: Final



Funded by the European Union

Implemented by



## Table of Contents

1	Introduction .....	3
2	Contract Summary .....	5
3	Technical Specification.....	6
3.1	General Requirements.....	6
3.2	Work package 1 – Routine detection of methane hotspot emissions .....	7
3.3	Work package 2 – Development support for CAMS global methane monitoring system ....	8
3.4	Work package 3 – User engagement and documentation of service .....	9
3.5	Work package 0 – Management and coordination.....	11
4	General Requirements .....	14
4.1	Implementation schedule.....	14
4.2	Deliverables and milestones.....	14
4.3	The CAMS website.....	14
4.4	Acquisition of necessary data and observations .....	15
4.5	Communication .....	15
4.6	Support for user engagement and training activities.....	15
4.7	Data and IPR .....	16
4.8	Key performance indicators .....	16
5	Tender Format and Content .....	18
5.1	Page Limits.....	18
5.2	Specific additional instructions for the Tenderer’s response.....	18
5.2.1	Executive Summary.....	18
5.2.2	Track Record .....	18
5.2.3	Quality of Resources to be Deployed.....	18
5.2.4	Technical Solution Proposed.....	19
5.2.5	Diversity and inclusion .....	19

## 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 k) above.

## 2 Contract Summary

This ITT, entitled “Development and provision of hot-spot observation-based emissions of methane”, is for providing quantitative estimates of methane emissions from large point sources around the world based on satellite data. The successful Tenderer shall routinely provide these estimates as close to real-time as possible, while maintaining their quality at the highest international standard. The successful Tenderer shall also support ECMWF with the production of web-based graphics to communicate the information to a range of user stakeholders, including the European Commission, EU member states, and Copernicus contributing countries. In addition, the successful Tenderer shall support ECMWF with the further development of CH<sub>4</sub> hotspot detection and emission estimation based on the CAMS global forecasting system (IFS) by providing their expertise in this domain as well as carrying out evaluation of the IFS-based results against their satellite-only results. Finally, the Successful Tenderer shall actively contribute to the engagement with the main CAMS stakeholders and international coordination frameworks for global monitoring of methane emission sources.

### 3 Technical Specification

#### 3.1 General Requirements

The concept for an anthropogenic CO<sub>2</sub> and CH<sub>4</sub> emissions Monitoring and Verification Support (CO2MVS) capacity as part of the CAMS portfolio is based on the recommendations from the European Commission’s CO<sub>2</sub> Monitoring Task Force<sup>1</sup>. As shown in Figure 1, it comprises an integrated system approach capable of inferring emissions from observations (space and in-situ), prior information (such as bottom-up emission estimates from inventories and reporting) and modelling as well as data assimilation capabilities.

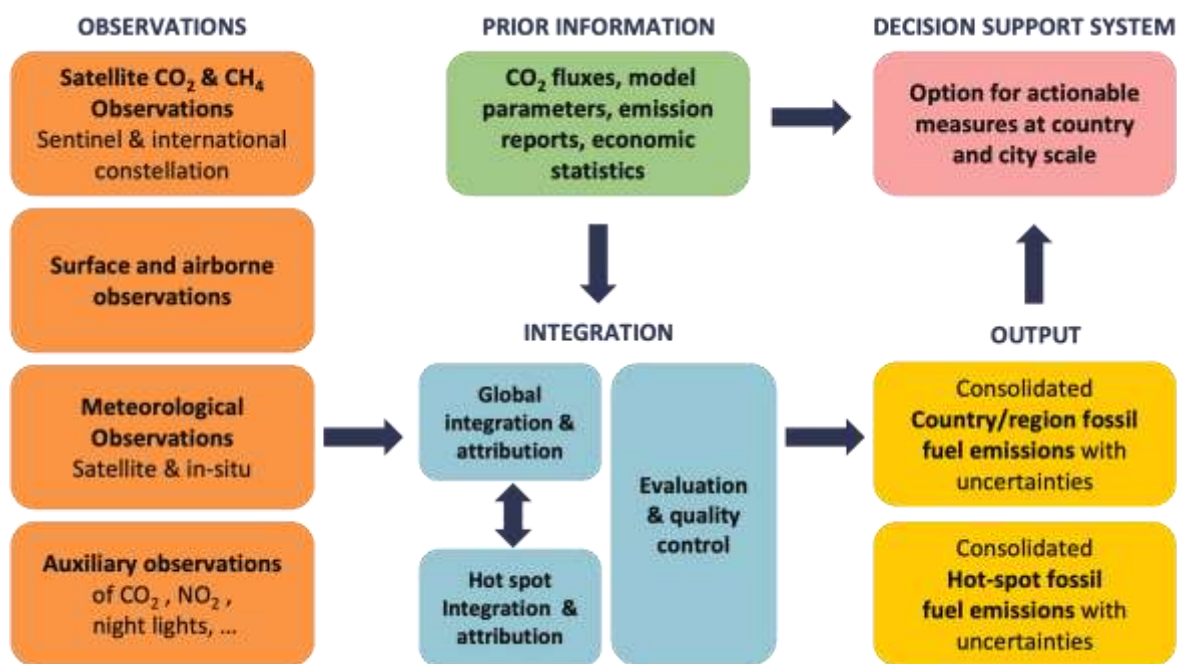


Figure 1 Main building blocks of the functional architecture of a future CO<sub>2</sub> and CH<sub>4</sub> human emissions monitoring system

The top four priorities for the new CO<sub>2</sub> and CH<sub>4</sub> service element during phase 2 of CAMS (2021 – 2028) are:

- Transform the various related research activities into a mature pre-operational (and then operational) system that can deliver the required monitoring and verification support capacity.
- Support the European Commission and EU member states with the global stocktake in 2028 using Earth Observation data and state-of-the-art modelling capabilities in order to provide accurate and globally consistent estimates of emissions, their uncertainties and their reductions.
- Support the European Commission and EU member states with the implementation of the EU Methane Strategy as well as the Global Methane Pledge through a capability for detecting and monitoring global super-emitters.
- Contribute to international coordination frameworks related to the monitoring of greenhouse gas concentrations and fluxes, such as the Global Greenhouse Gas Watch (G3W) of the World

<sup>1</sup> The reports from the CO<sub>2</sub> Task Force can be found on <https://www.copernicus.eu/en/news/news/new-co2-green-report-2019-published>

Meteorological Organisation (WMO) and the International Methane Emissions Observatory (IMEO) of the United Nations Environment Programme (UNEP).

As recommended in the second CO<sub>2</sub> report from the CO<sub>2</sub> Monitoring Task Force, the future CO2MVS capacity will deliver the following high-level products as defined by user requirements:

1. Detection of emitting hot spots such as megacities or power plants,
2. Monitoring of the hot spot emissions to assess emission reductions of the activities,
3. Assessing emission changes against local reduction targets to monitor impacts of the Nationally Determined contributions (NDCs),
4. Assessing the national emissions and changes in 5-year time steps to estimate the global stocktake.

The CO2MVS services shall, in the long term and in some well-identified instances and situations, provide additional evidence on the amount of anthropogenic CO<sub>2</sub> and CH<sub>4</sub> emissions reported by national statistical offices and, in particular, help to identify and assess the uncertainties and gaps associated with their emission inventories. More generally, the CO2MVS will provide the European Union with a comprehensive and consistent picture on the actual level of emissions and their reductions by all countries worldwide. The new service element is targeted for operational status in 2026 in order to provide support to the 2028 Global Stocktake based on observations from the proposed CO2M satellite constellation and other satellite sensors.

As part of the ramp-up activities for the CAMS CO2MVS capacity, ECMWF is extending the CAMS global assimilation and forecasting system with the capabilities to estimate emissions of satellite-observed greenhouse gases and air pollutants. The aim of this global system is to routinely monitor emissions at global scale close to real-time based on observations from operational satellite missions, including the detection of strong hotspot sources (especially for CH<sub>4</sub> and NO<sub>x</sub>). The global system can then inform more specialised high-resolution emission estimation systems to zoom in on specific areas for further identification and quantification of these point sources. This ITT is asking for data provision and development support for such a multiple scale configuration with a focus on CH<sub>4</sub>.

### 3.2 Work package 1 – Routine detection of methane hotspot emissions

As part of this ITT, the successful Tenderer shall routinely provide source rate estimates (including uncertainties) of observed atmospheric methane plumes from hotspots based on Sentinel-5p/TROPOMI observations. The routine provision of these source rate estimates shall be based on a methodology using the latest scientific developments, ideally already documented in the peer-reviewed literature. The Tenderer shall demonstrate their capabilities and performance over a range of point sources, including oil and gas production and transportation facilities, coal mining, and waste facilities. This shall include a specific list of previously detected (known and previously unknown) point sources that will be used to set the expectations for this contract.

The Tenderer shall describe the proposed methodology, indicate the feasible timeliness (latency) of the provided data (as close to real-time as possible within the constraints of providing accurate estimates), and indicate the feasible temporal averaging time (e.g., instantaneous, weekly, or longer). The Tenderer shall also indicate the expected threshold level above which emissions can be detected at the time scales proposed. An automated workflow, including the (initial) quality control, shall be pursued as much as feasible. Finally, the Tenderer shall describe in detail how the data will be provided to ECMWF in terms of data format, metadata, and dissemination mechanism. This includes support to ECMWF for the visualisation of these data on the CAMS website.

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>WP1 Deliverables</b>			
#	Type	Title	Due
D1.Y.Z-yyyyQx <sup>2</sup>	Data/Report	Provision of routine near-real-time <sup>3</sup> emission estimates of local methane sources and quarterly report providing the uptime statistics of the data provision and explanations for issues.	Quarterly
D1.Y.Z-yyyyQx	Report	Quarterly overview of newly detected methane emission hotspots	Quarterly
...			

<b>WP1 Milestones</b>			
#	Title	Means of verification	Due
M1.Y.Z	Meeting with ECMWF to agree on implementation of web-based graphics on CAMS website	Minutes of Meeting	M3
M1.Y.Z	Meeting with ECMWF to discuss potential improvements of web-based graphics on CAMS website	Minutes of Meeting	M12

### 3.3 Work package 2 – Development support for CAMS global methane monitoring system

As outlined above, ECMWF is developing the core global component of the CO2MVS by extending the capabilities of the Integrated Forecasting System (IFS) to include the detection and estimation of CO<sub>2</sub> and CH<sub>4</sub> emissions. The prototype methodologies to detect sources of methane emissions and to estimate the strength of these emissions over time with the IFS are described in Barré et al., 2021<sup>4</sup>, and McNorton et al., 2022<sup>5</sup>, respectively. This monitoring system combines satellite observations with the existing knowledge of emission sources (e.g., from emission inventories or based on land surface modelling) through the use of the IFS Earth system modelling capabilities.

The routine provision of the source rate estimates from Work Package 1 will be used in support of these developments by providing a current state-of-the-art benchmark (e.g., detectability of CH<sub>4</sub> sources, requirements for temporal averaging) for the IFS-based detections and emission estimates.

<sup>2</sup> Deliverables (and Milestones) shall be numbered as per the following format DX.Y.Z (MX.Y.Z), where X is the WP number, Y is the task number and Z is the Deliverable (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, DX.Y.Z-2017). 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 Milestones. Continuous deliverables at higher frequency can be labelled in the same way as quarterly deliverables.

<sup>3</sup> The frequency and timeliness of the data delivery shall be defined by the Tenderer.

<sup>4</sup> <https://acp.copernicus.org/articles/21/5117/2021/acp-21-5117-2021.html>

<sup>5</sup> <https://acp.copernicus.org/articles/22/5961/2022/>



The successful Tenderer shall support the IFS developments by providing their expertise on the detection and emission estimation of CH<sub>4</sub> hotspots. The successful Tenderer shall also provide their expertise in the use and interpretation of Sentinel-5p/TROPOMI methane retrievals.

The successful Tenderer shall therefore be available for regular meetings with ECMWF to discuss the latest developments and results and to provide their expertise. This shall also include routine comparisons between the ECMWF methane detection and emission estimation results and the corresponding results generated by the successful Tenderer.

The successful Tenderer shall also support ECMWF with the assessment of data from emerging satellite missions measuring CH<sub>4</sub>, especially those under the Copernicus Contributing Missions programme<sup>6</sup>. This includes the evaluation of provided mission characteristics and validation results provided by the respective data providers.

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>WP2 Deliverables</b>			
#	Type	Title	Due
D2.Y.Z	Report/graphics /data	Routine comparisons of IFS-based methane hotspot detections and emission estimates <sup>7</sup> against satellite-only results provided as part of this contract.	Quarterly
D2.Y.Z	Report	Evaluation of results from IFS methane hotspot detection algorithm <sup>7</sup> against satellite-only results provided as part of this contract.	6-monthly
...			

<b>WP2 Milestones</b>			
#	Title	Means of verification	Due
M2.Y.Z	Meeting with ECMWF to discuss IFS developments relevant to this contract	Minutes of meeting	Quarterly
...			

### 3.4 Work package 3 – User engagement and documentation of service

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

As outlined in the General Requirements, the concept for an anthropogenic CO<sub>2</sub> and CH<sub>4</sub> emissions Monitoring and Verification Support (CO2MVS) capacity as part of the CAMS portfolio addresses user needs coming from the European Commission, EU member states and Copernicus contributing

<sup>6</sup> [https://www.esa.int/Applications/Observing\\_the\\_Earth/Copernicus/Copernicus\\_Contributing\\_Missions](https://www.esa.int/Applications/Observing_the_Earth/Copernicus/Copernicus_Contributing_Missions)

<sup>7</sup> The IFS-based results will be further developed throughout the duration of this contract moving from detection-only to detection and estimation of hotspot emissions.

countries, and the wider global user community. Key aspects of this are the support for the European Commission and EU member states with the implementation of the EU Methane Strategy as well as the Global Methane Pledge through a capability for detecting and monitoring global super-emitters and the contribute to international coordination frameworks related to the monitoring of greenhouse gas concentrations and fluxes, such as the Global Greenhouse Gas Watch (G3W) of the World Meteorological Organisation (WMO) and the International Methane Emissions Observatory (IMEO) of the United Nations Environment Programme (UNEP). The Successful Tenderer shall be actively involved in the user engagement activities with these different entities with initially a special focus on the IMEO framework. The engagement with IMEO shall focus on the definition and establishment of an operational CAMS contribution to IMEO. The Tenderer shall reserve resources of between 15 to 20% to serve as support to ECMWF in these meetings and carry forward relevant tasks agreed during the meetings. This work will require expertise on satellite-based methane emission estimation and on satellite observations relevant for greenhouse gas emission monitoring. The work will be defined on a 6-monthly basis and agreed between the Successful Tenderer and ECMWF shortly after each meeting with the above-mentioned stakeholders.

In terms of user support, 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 address development of user guides. 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 (see example for the CAMS global reanalysis at <https://ads.atmosphere.copernicus.eu/cdsapp#!/dataset/cams-global-reanalysis-eac4?tab=doc>), and, if more detail is required, in reports that will be available to users through the CAMS website. The successful Tenderer shall therefore produce documentation describing in detail the methodologies and products (including their evaluation) they deliver for this ITT. 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>WP3 Deliverables</b>			
<i>#</i>	<i>Type</i>	<i>Title</i>	<i>Due</i>
D3.y.z-YYYY-Qq	Report	Plan of activities in support of the EC, IMEO, and WMO	6-monthly
D3.y.z-YYYY-Qq	Report	Report about activities in support of EC, IMEO, and WMO	6-monthly
D3.y.z-YYYY	Other	Contribution to CAMS Knowledge Base to document products and services as provided within the scope of this contract	Annually
D3.y.z-YYYY	Report	Contribution to documentation of products and services as provided within the scope of this contract	Annually
...			

<b>WP3 Milestones</b>			
<i>#</i>	<i>Title</i>	<i>Means of verification</i>	<i>Due</i>
M3.y.z	...	...	...
...			

### 3.5 Work package 0 – Management and coordination

The following management aspects shall be briefly described in the bid:

- Contractual obligations as described in the Framework Agreement Clause 2.3 on reporting and planning.
- Meetings (classified as tasks and listed in a separate table as part of the proposal):
  - 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.
  - ECMWF will host monthly teleconference meetings to discuss CAMS service provision, service evolution and other topics. The Prime Investigator appointed by the successful Tenderer will represent the successful Tenderer in such meetings.
  - ECMWF and the successful Tenderer will organise six-monthly Progress Review Meetings (linked to Payment Milestones, unless agreed otherwise).
  - ECMWF and the successful Tenderer will organise a Kick-Off Meeting.
  - 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 quality of reports and Deliverables shall be equivalent to the standard of peer-reviewed publications. The final quality check of the deliverables should be made by the prime contractor (contents, use of ECMWF reporting templates for deliverables and reports (Microsoft Word), format, deliverable numbering and naming, typos...); all reports in this project shall be in English. Unless otherwise specified the specific contract Deliverables shall be made available to ECMWF in electronic format.
- 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 sub-contractors.
- Sub-contractor 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 sub-contractors 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 flowed 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.

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>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) QX YYYY <i>QX YYYY being the previous quarter</i>	Quarterly on 15/04, 15/07 and 15/10 <i>(only at the above dates since QIR for Q4 will be part of the AIR Part 1)</i>
D0.Y.Z-yyyy	Tenderer	Report / Other	Annual Implementation Report (AIR) Part 1 YYYY, including: # Quarterly Implementation Report (QIR) Q4 YYYY <i>Q4 YYYY being the previous quarter</i> # Preliminary financial form YYYY <i>YYYY being the Year n-1</i>	Annually on 15/01
D0.Y.Z-yyyy	Tenderer	Report	Annual Implementation Report (AIR) Part 2 YYYY <i>YYYY being the Year n-1</i>	Annually on 28/02
D0.Y.Z	Tenderer	Report	Final Implementation Report	60 days after end of contract <i>(Tenderer to include date based on Contract Notice)</i>
D0.Y.Z-yyyy	Tenderer	Report	Annual Implementation plan YYYY <i>YYYY being the Year n+1</i>	Annually on 30/09
D0.Y.Z-yyyy	Tenderer	Other	Copy of prime contractor's general financial statements and audit report YYYY <i>YYYY being the Year n-1</i>	Annually, in June
D0.Y.Z	Tenderer	Other	Updated KPIs (list, targets, etc.) after review with ECMWF	One year after start of contract

<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 and associated MoM	Minutes of Meeting	30 days after start of contract
M0.y.z-PRMx	Tenderer	Progress Review Meetings / Payment Milestone SC1-PMx and associated MoM	Minutes of Meeting	~ Every 6 months
M0.y.z-GAxxxx	Tenderer	CAMS General Assembly and associated MoM	Minutes of Meeting	Annually

## 4 General Requirements

### 4.1 Implementation schedule

The Framework Agreement will run from 01/01/2024 to 30/12/2026. The Tenderer shall provide a detailed implementation plan of proposed activities for the full period.

### 4.2 Deliverables and milestones

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 both ECMWF's Technical Officer (TO) and Contract Management Officer (CMO).

The following shall apply to the deliverables:

- Deliverables should be consistent with the technical requirements specified in Section 0.
- When defining deliverables, please consolidate their numbers against a specific deadline where possible.
- 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.
- 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.

Please note that in Volume IIIA "Pricing and deliverables" (cf. Excel sheet "Deliverables List"):

- Each deliverable shall have an associated resource allocation (person-months in column I "Nb of PM allocated", and financial budget - resource type to be considered is payroll only – in column J "Estimated price"). Therefore, the total of these allocated resources shall amount to the requested budget associated with payroll.
- Milestones should not have any associated budget.

Milestones should be designed as markers of demonstrable progress in service development and/or quality of service delivery. They should not duplicate deliverables and shall not attract the budget under Volume IIIA "Pricing and deliverables", Excel sheet "Deliverables List".

The Tenderer 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.

### 4.3 The CAMS website

The CAMS website was initially developed in August 2015, with an additional major re-development and re-launch completed in September 2018 following an extensive usability research and testing phase in 2017. New templates were applied to the website in line with the European Commission's requirements for a common Copernicus look and feel in 2020. Further user experience (UX) testing has taken place to refine the navigation and user experience in Q3 and Q4 2021. The current website can be found via the following link: <http://atmosphere.copernicus.eu>.

The website is built using Drupal 8 with the colours, typeface, logos and domain, all specified by the European Commission DG DEFIS which must be adhered to.

The website contains static content covering news, events and tendering opportunities, resources for press such as brochures and staff photos, as well as multi-media files such as video. It also provides sign-up functionality for the CAMS newsletter, which is issued quarterly.

In addition, the Service's website provides access to its Atmosphere Data Store at <https://ads.atmosphere.copernicus.eu>.

#### 4.4 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 for the exchange of relevant data sets related to this ITT.

#### 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 Massive Open Online Courses (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 User Requirements Database (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 cost-reimbursement against a fixed fee rate/day. Details on the expected activities and the budget shall be refined during the negotiation/contract preparation phase.

As part of the CAMS user interaction, user requirements are continually collected in a 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 URDB regarding user requirements that are directly related to activities covered by this ITT. The successful Tenderer shall also support ECMWF and the contractor of User Interaction activities with the analysis of relevant user requirements in the URDB.

The following deliverables are thus to be added to the WP3 deliverable lists:

<b>WP3 Deliverables</b>			
<i>#</i>	<i>Type</i>	<i>Title</i>	<i>Due</i>
D3.Y.Z-yyyy	Other	Input to CAMS URDB - YYYY	Checked by ECMWF annually in November
D3.Y.Z	Report	Summary of user engagement activities.	Due 1 month before contract end date

#### 4.7 Data and IPR

The successful Tenderer shall make the output of their work available on a server accessible by ECMWF using standard protocols such as FTP or HTTPS. The successful Tenderer will have to agree with ECMWF on the data formats to be used. ECMWF will only accept data in formats that follow internationally recognised standards. Such standards must be open (i.e. non-proprietary), managed by a recognised international standardisation body (e.g. ISO, WMO, OGC, etc.), or any de-facto standard. Open-source software should also exist that can read and write files of these standards. Serialisation formats (e.g. NetCDF) should be supported by standard schemas and conventions.

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.

#### 4.8 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 for which the following KPI categories have been identified:

- KPI1 Service availability
- KPI2 Products usage
- KPI3 Products quality
- KPI4 User support
- KPI5 User statistics



- KPI6 Service audience
- KPI7 User engagement
- KPI8 User satisfaction
- KPI9 Contracts
- KPI10 Deliverables
- KPI11 data usage

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	Delivery of data within agreed timeliness	90%	continuous	
KPI_2	Level of user support service on Service Desk tickets	80% of the assigned specialised user queries being resolved within 15 days after being informed by the CAMS Service Desk.	Annual	
KPI_3	% of deliverables delivered on time or with short delay	100%	Every payment milestone	

## 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
<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 1: 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 sub-contractors 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 one 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 the Copernicus Atmosphere Monitoring Service, the global earth observing system, and the current state of monitoring greenhouse gas emissions.

An exhaustive and detailed description of the proposed technical solution for all work packages described above, including any ramp-up or mobilization phase, shall be given. The Tenderer shall indicate which observational data sets it intends to use and how it will acquire the relevant data. The Tenderer shall describe the proposed method for producing the emission estimates outlining in some detail the proposed methodology. The Tenderer shall indicate the timeliness and frequency of the emission estimates and how their accuracy will be competitive within existing international collaboration frameworks.

#### 5.2.5 Diversity and inclusion

In the event that multiple bidders present equally qualified proposals (discrepancy lower than 1%), ECMWF will take into consideration the diversity and gender balance of each bidder's organisation as a tiebreaker when making the final decision. We recognise that diversity and collaborative environment are essential for advancing scientific discovery and innovation, and we are dedicated to creating a culture that encourages and supports the contributions of individuals from all backgrounds. As part of this commitment, we encourage bids from companies who share our values and demonstrate a commitment to diversity and inclusion in their own organisations. We believe that working with suppliers who support our efforts to create a more inclusive and diverse community is key to achieving our goals and driving progress forward in all our areas of activities. Therefore, the Centre encourages all potential bidders to take these values into consideration when submitting proposals.