

# ECMWF Copernicus Procurement

## Invitation to Tender



# Copernicus Atmosphere Monitoring Service

## Volume II

Provision of near-real-time satellite  
retrievals of CO<sub>2</sub> and CH<sub>4</sub>

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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 eco systems. 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) 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 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 elements described under item a), b), and k).

## 2 Contract Summary

This ITT, entitled “Provision of near-real-time satellite retrievals of CO<sub>2</sub> and CH<sub>4</sub>”, is for providing support for the production of the global production system of CAMS operated at ECMWF, which delivers 3D distributions of greenhouse gases (CO<sub>2</sub> and CH<sub>4</sub>) in the troposphere and stratosphere through the provision of timely satellite observations of CO<sub>2</sub> and CH<sub>4</sub>. The Successful Tenderer shall provide timely CO<sub>2</sub> and CH<sub>4</sub> retrieval products from the Greenhouse gases Observing SATellite (GOSAT) and GOSAT-2 satellites as well as CO<sub>2</sub> and CH<sub>4</sub> retrieval products from the Infrared Atmospheric Sounding Interferometer (IASI) instrument onboard the Metop satellite platform. The ITT targets organisations with considerable experience in the field of greenhouse gas satellite retrievals.

## 3 Technical Specification

### 3.1 Service scope and requirements

Modules for atmospheric greenhouse gases and related physical processes have been integrated in ECMWF’s Integrated Forecasting System (IFS), which forms the basis for the CAMS global data assimilation and forecasting system. The CAMS global data assimilation system is used to provide real-time global forecasts, near real-time global analyses, and global reanalysis. The extension of the IFS makes it possible (i) to use the detailed meteorological simulation of the IFS for the simulation of the atmospheric transport and removal processes of constituents, (ii) to use the IFS data assimilation system to assimilate observations of atmospheric composition, and (iii) to simulate feedback processes between atmospheric composition and weather. A specific configuration of the IFS is currently used to provide daily analyses and forecasts of CO<sub>2</sub> and CH<sub>4</sub><sup>1</sup>.

The data assimilation of the IFS is based on the ECMWF 4-dimensional variational (4D-Var) formulation and assimilates a range of satellite observations of greenhouse gases in addition to the standard meteorological observations<sup>2</sup>. The CAMS data assimilation system for greenhouse gases currently uses observations of CO<sub>2</sub> and CH<sub>4</sub> from the Thermal And Near infrared Sensor for carbon Observation (TANSO) instrument on board of the Japanese GOSAT satellite and from the IASI instrument on board

<sup>1</sup> <https://confluence.ecmwf.int/pages/viewpage.action?pageId=394237962>

<sup>2</sup> see also: Massart et al., *Atmos. Chem. Phys.*, 14, 6139-6158, doi:10.5194/acp-14-6139-2014, 2014 and Barré et al., *Atmos. Chem. Phys. Discuss.*, <https://doi.org/10.5194/acp-2020-550>

of the Metop satellites, and CH<sub>4</sub> from the TROPOspheric Monitoring Instrument (TROPOMI) on board of Sentinel-5p for its production of daily analyses, which form the initial conditions for the daily forecasts.

The central element of this ITT is the provision of XCO<sub>2</sub> and XCH<sub>4</sub> retrieval products from the GOSAT and GOSAT-2 satellites and XCO<sub>2</sub> and XCH<sub>4</sub> retrieval products from the IASI instrument onboard the Metop platform.

### 3.2 Work Package 1 (WP1) – Provision of satellite retrieval data from GOSAT

The GOSAT satellites are research satellites and data are generally not available via the established operational data acquisition channels. Also, retrieval algorithms are still developing to achieve the required high accuracy for greenhouse gas observations. In order to ensure the continuity of the service provision, this ITT asks for Level-2 retrievals of CO<sub>2</sub> and CH<sub>4</sub> from TANSO delivered within 1 day of the availability of Level-1 radiance data from the relevant Space Agencies (JAXA, NIES, ESA, or EUMETSAT). The Successful Tenderer shall provide column-averaged dry air mole fraction (XCO<sub>2</sub> and XCH<sub>4</sub>) values with associated retrieval uncertainties, averaging kernels and the a priori information used in the retrieval for each individual satellite footprint. The quality of the retrieval values shall be competitive with international standards, such as are for instance available from the European Space Agency Climate Change Initiative (ESA-CCI; <http://www.esa-ghg-cci.org>). This quality shall be assessed against independent observations, such as are for instance available from the Total Carbon Column Observing Network (TCCON), and documented in quarterly reports. Observations from either GOSAT-1 or GOSAT-2 shall be provided as part of this contract. The Tenderer shall indicate their choice for either GOSAT-1 or GOSAT-2 to provide the best coverage and lowest uncertainty of the observations. This choice can be different for the two greenhouse gases. The Tenderer shall also outline what mitigation will be in place in case either one of the instruments is taken out of operation. Finally, the Tenderer shall outline how to provide the required L2 products from the GOSAT-1 or GOSAT-2 satellite from the start of the contract.

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>WP1 Deliverables</b>			
<i>#</i>	<i>Type</i>	<i>Title</i>	<i>Due date</i>
D1.Y.Z-yyyyQx	Data & report	Daily data provision and quarterly status report of GOSAT XCO <sub>2</sub> and XCH <sub>4</sub> retrievals including evaluation.	Quarterly
...	...	...	...

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

### 3.3 Work Package 2 (WP2) – Provision of satellite retrieval data from IASI

The IASI instrument onboard the series of Metop satellites measures in the infrared part of the electromagnetic spectrum at a horizontal resolution of 12 km over a swath width of about 2,200 km. With 14 orbits in a sun-synchronous mid-morning orbit (9:30 Local Solar Time equator crossing, descending node) global observations can be provided twice a day. EUMETSAT operationally provides near-real-time (NRT) spectral L1 data and in collaboration with their Atmospheric Composition Monitoring – Satellite Application Facility (AC-SAF) also various L2 products related to atmospheric composition. However, not all L2 products required by CAMS are already available from EUMETSAT or the AC-SAF.

This ITT therefore asks for Level-2 retrievals of CO<sub>2</sub> and CH<sub>4</sub> from IASI onboard the Metop platforms delivered within 1 day of the availability of Level-1 radiance data from EUMETSAT. The Successful Tenderer shall provide column-averaged dry air mole fraction (XCO<sub>2</sub> and XCH<sub>4</sub>) values with associated retrieval uncertainties, averaging kernels and the a priori information used in the retrieval for each individual satellite footprint. The quality of the retrieval values shall be competitive with international standards, such as are for instance available from the European Space Agency Climate Change Initiative (ESA-CCI; <http://www.esa-ghg-cci.org>). This quality shall be assessed against independent observations, where possible, and documented in quarterly reports.

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>WP2 Deliverables</b>			
#	Type	Title	Due date
D2.Y.Z-yyyyQx	Data & report	Daily data provision and quarterly status report of Metop IASI XCO <sub>2</sub> and XCH <sub>4</sub> retrievals including evaluation.	Quarterly
...	...	...	...

<b>WP2 Milestones</b>			
#	Title	Means of verification	Due date
M2.Y.Z	...	...	...

### 3.4 Work Package 3 (WP3) – Support to ECMWF and communication

The objective of this Work Package is to provide support to ECMWF in terms of the correct use of the provided satellite data, the assessment of new satellite sensors, as well as to contribute to communication activities.

This ITT does not ask for comprehensive documentation of the provided satellite data, as this is covered by the Copernicus Climate Change Service (C3S) satellite data records. However, the Successful Tenderer shall support ECMWF with the correct use of the provided satellite data through specific meetings that can be requested by ECMWF.

In addition, the Successful Tenderer shall support ECMWF with the assessment of new related satellite data that will become available during the period of this contract. The MicroCarb<sup>3</sup> mission is currently planned for launch in 2025, as are the GOSAT-GW<sup>4</sup> mission and METOP-SG with the IASI-NG instrument on board<sup>5</sup>. The Successful Tenderer shall provide its expertise to discuss with ECMWF staff the quality and usefulness for CAMS of data products coming out of these missions in order to define the required CAMS resources for the uptake of these new missions. This shall include first assessments of the L2 observations from these new instruments, comparing them with existing satellite data, where possible, once they become publicly available. The Tenderer shall describe its view of this support, including how they will assess the quality of the satellite data, in its proposal. Because of the current uncertainty of the actual launch dates of these missions, the proposal shall be described in terms of options that can be triggered by ECMWF, when needed. However, the Tenderer shall reserve sufficient human resources in its proposal to carry out this work (on the order of 1-2 Person Months (PM) per satellite mission).

The Successful Tenderer shall also 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 European State of the Climate report (<https://climate.copernicus.eu/ESOTC>), the Copernicus Global Climate Highlights (<https://climate.copernicus.eu/global-climate-highlights-2023>), CAMS website news items, and CAMS brochures and flyers. All communication activity must be agreed with the ECMWF Copernicus Communication team in advance. This includes, but is not limited to, communication planning, branding and visual style, media outreach, website, social media activity, and 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.

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>WP3 Deliverables</b>			
<i>#</i>	<i>Type</i>	<i>Title</i>	<i>Due date</i>
D3.Y.Z-yyyy	Data & report	Contribution to Copernicus Global Climate Highlights	Annually in December
D3.Y.Z-yyyy	Data & report	Contribution to Copernicus European State of the Climate	Annually in January
D3.Y.Z-yyyy	Report	Minutes of meeting with ECMWF to discuss correct assimilation of provided satellite retrievals	Annually
D3.Y.Z	Report	Initial assessment of quality and fit-for-purpose of MicroCarb data products	Within 1 year of activating the option
D3.Y.Z	Report	Initial assessment of quality and fit-for-purpose of GOSAT-GW data products	Within 1 year of activating the option

<sup>3</sup> <https://microcarb.aeris-data.fr>

<sup>4</sup> <https://www.satnavi.jaxa.jp/files/project/gosat-gw/en/>

<sup>5</sup> <https://www.eumetsat.int/metop-sg-instruments>

D3.Y.Z	Report	Initial assessment of quality and fit-for-purpose of IASI-NG data products	Within 1 year of activating the option
...	...	...	...

<b>WP3 Milestones</b>			
#	Title	Means of verification	Due date
M3.Y.Z	Activation of option for support actions for MicroCarb data products	N/A	Within one month after data products have become publicly available
M3.Y.Z	Activation of option for support actions for GOSAT-GW data products	N/A	Within one month after data products have become publicly available
M3.Y.Z	Activation of option for support actions for IASI-NG data products	N/A	Within one month after data products have become publicly available
...	...	...	...

### 3.5 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..
  - ECMWF will host monthly teleconference meetings to discuss CAMS service provision, service evolution and other topics (Service Level Board). The Prime Investigator 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 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 and its sub-contractors.
- 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>				
#	Responsible	Nature	Title	Due date
D0.Y.Z-QIR- yyyyQx	Tenderer	Report	Quarterly Implementation Report (QIR) yyyyQx <i>yyyyQx being the previous quarter (e.g. 2024Q3 due on 15/10/2024)</i>	Quarterly on 15/04, 15/07 and 15/10
D0.Y.Z-AIR- Part1- yyyy	Tenderer	Report / Other	Annual Implementation Report (AIR) for year yyyy - Part 1 including: <ul style="list-style-type: none"> <li>• the Quarterly Implementation Report (QIR) yyyyQ4, and</li> <li>• the preliminary financial information yyyy being the Year n-1</li> </ul>	Annually on 15/01
D0.Y.Z-AIR- Part2- yyyy	Tenderer	Report	Annual Implementation Report (AIR) for year yyyy - Part 2 <i>yyyy being the Year n-1</i>	Annually on 28/02
D0.Y.Z-FIR	Tenderer	Report	Final Implementation Report	Not later than 60 days after the end of contract and once all other activities duly performed
D0.Y.Z-AIP- yyyy	Tenderer	Report	Annual Implementation Plan for year yyyy <i>yyyy being the Year n+1</i>	Annually on 30/09
D0.Y.Z-FS- yyyy	Tenderer	Other	Copy of prime contractor's general financial	Annually, not later

			statements and audit report for year YYYY <i>YYYY being the Year n-1</i>	than on 15/12 <sup>(1)</sup>
DO.Y.Z-KPI	Tenderer	Other	Updated KPIs (list, targets, etc.) after review with ECMWF	1 year after start of contract

<b>WPO Milestones</b>				
#	Responsible	Title	Means of verification	Due date
M0.Y.Z-KOM	Tenderer	Kick-Off Meeting	Minutes of Meeting	30 days after start of contract
M0.Y.Z-PRMxx	Tenderer	Progress Review Meeting #xx <i>xx being the iteration number of the PRM</i>	Minutes of Meeting	~ Every 6 months <sup>(1)</sup>
M0.Y.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 September 2024 to 31 December 2027 for a total duration of 40 months. It is intended to agree on a single Service Contract, therefore also with a duration of 40 months.

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 clear due dates 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 shall acquire the relevant observational data sets needed for the provision of the CO<sub>2</sub> and CH<sub>4</sub> retrieval data. ECMWF has regular contact with the main Space Agencies and can offer support for any issues related to data access.

### 4.4 Data provision and IPR

The Successful Tenderer shall make the data 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.

### 4.5 Key performance indicators

Contractors shall report to ECMWF on a set of Key Performance Indicators (KPIs) suitable for monitoring various aspect of service performance. During the contract implementation, all KPIs shall be duly reported by the contractor in the Quarterly Implementation Reports (QIR) in accordance with their frequency of delivery. 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 list and describe the KPIs relevant for this ITT, together with performance targets, frequency of delivery and explanations if needed:

KPI #	KPI Title	Performance Target and Unit of Measure	Frequency of Delivery	Explanations / Comments
KPI_1	GOSAT XCO2 delivery	80% delivery at D*+1 and with the target of Nobs >= 3500 for a given month	quarterly	KPI based on the availability of the L1X data on the ESA server (D* = date when the data are available)
KPI_2	GOSAT XCO2 quality	Quality of delivered obs: standard deviation of all retrievals of a given month <= 4.5 ppm	quarterly	The standard deviation includes retrieval random/ systematic errors but also real spatiotemporal variability

KPI_3	GOSAT XCH4 delivery	80% delivery at D*+1 and with the target of Nobs >= 3500 for a given month	quarterly	KPI based on the availability of the L1X data on the ESA server (D* = date when the data are available)
KPI_4	GOSAT XCH4 quality	Quality of delivered obs: standard deviation of all retrievals of a given month <= 15 ppb	quarterly	The standard deviation includes retrieval random/ systematic errors but also real spatiotemporal variability
KPI_5	IASI MT-CO2 and MT-CH4 delivery	80% delivery at D*+1 and with the target of Nobs >= 9500 for a given month	quarterly	KPI based on the availability of the L1X data on EUMETCast (D* = date when the data are available)
KPI_6	IASI MT-CO2 and MT-CH4 quality	Quality of delivered obs: standard deviation of all retrievals of a given month <= 4 ppm (CO2) and <= 15 ppb (CH4)	quarterly	The standard deviation includes retrieval random/ systematic errors but also real spatiotemporal variability
KPI_7	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.	quarterly	As requested by Section 3.4 of Volume II of the ITT
KPI_8	Deliverables submitted on time for ECMWF's review	100% of deliverables and milestones (excl. payment milestones) due during last quarter submitted / passed on time for ECMWF's review	quarterly	Due dates are the deadlines (inclusive) for the deliverables to be submitted for review by ECMWF and for the milestones to be passed

Please note that the KPIs listed above 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 in the table above. 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.

#### 4.6 Payment Plan

The Tenderers can propose a Payment Plan in ITT Volume IIIA "Pricing and deliverables" (cf. Excel spreadsheet "Payment Plan preparation"):

- The Payment Milestones should relate to the deliverables and milestones delivered during the corresponding Payment Milestone period (e.g. the payment covering the period January-June would only relate to the deliverables and milestones whose due dates are part of the same period).

- The frequency of Progress Review Meetings might be adapted to synchronize with the expected date of completion of each Payment Milestones.
- Please note any request for a payment at contract signature should be duly substantiated (e.g. in terms of necessary investment prior to implementation or during first weeks/months for ensuring the initial set up of the project). It is necessary to relate this payment to the set of activities subject to other Payment Milestone(s) that are deemed to require an early funding.

## 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 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 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 the Copernicus Atmosphere Monitoring Service, and the current state of monitoring and forecasting of global greenhouse gases in the atmosphere.

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 its proposal for providing the Level-2 CO<sub>2</sub> and CH<sub>4</sub> products, including the acquisition of Level-1 data, the proposed retrieval algorithm and its required input, and the expected data provision (e.g., data format, timeliness, delivery mechanisms).