ECMWF Copernicus Procurement

Invitation to Tender

Copernicus Atmosphere Monitoring Service

Visualisation of Greenhouse Gas data products and provision of supporting educational material

Volume II

ITT Ref: CAMS2_54a
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Table of Contents

1   Introduction

Some of today's most important environmental concerns relate to the composition of the atmosphere. Rising concentrations of greenhouse gases (GHGs) are a key driver of climate change, while uncertainties in aerosol – cloud – radiation interactions and feedbacks further influence the climate system. In addition, reactive gases such as ozone and nitrogen dioxide in the troposphere affect air quality, human health, ecosystem integrity, and the built environment. Variations in reactive gas abundances also influence the oxidation capacity of the atmosphere, thereby controlling the lifetimes and concentrations of long-lived GHGs such as carbon dioxide, methane, and nitrous oxide.

Atmospheric composition and associated deposition fluxes are integral to the global biogeochemical cycles of carbon, nitrogen, sulfur, and other elements, shaping both terrestrial and marine ecosystems. Aerosols from dust, biomass burning, and volcanic eruptions additionally impact cloud formation, rainfall patterns, solar power availability, transport safety, and satellite observations of the Earth system.

In the wake of the Paris Agreement (UNFCCC COP-21, 2015), the need to monitor and communicate the effectiveness of mitigation efforts for anthropogenic GHG emissions has become increasingly urgent. Earth Observation, with global (or regional, for geostationary platforms) coverage, is a critical component of such monitoring, complementing ground-based observations, "bottom-up" emissions inventories (included in official reporting), and atmospheric transport modelling.

To respond to these challenges, data and processed information must be made accessible to policymakers, businesses, and citizens. The Copernicus Atmosphere Monitoring Service (CAMS) has been developed to meet this need, with pillar activities providing timely, high-quality information on GHGs and other key atmospheric constituents to support informed decision-making and societal awareness.

Within its first phase (2015 – 2020), the Service consolidated many years of preparatory research and development to deliver a range of operational services. In its second phase (2021 – 2027) 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 more directly 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_2, CH_4 and N_2O net surface fluxes, allowing the monitoring of the evolution in time of these fluxes;

h) Climate forcing from aerosols and long-lived (CO_2, CH_4) 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_2 and CH_4 for the global domain and emission hotspots.

This Invitation to Tender (ITT) targets primarily the CAMS service elements relevant to greenhouse gas monitoring, including an interactive dashboard for advanced users, and explanatory videos and content designed for non-expert audiences, supporting understanding of climate information, mitigation efforts, and emissions policy.

2 Contract Summary

The ITT entitled "Visualisation of Greenhouse Gas data products and provision of supporting educational material" asks for the provision of a coherent suite of user-focused visualization and explanatory products and tools within the Copernicus Atmosphere Monitoring Service (CAMS), aimed at providing scientifically accurate, accessible, and policy-relevant information on greenhouse gases. The contract shall be structured across four main Work Packages: (WP1) a fully operational interactive dashboard for visualizing GHG data, (WP2) a series of explanatory videos to communicate key concepts and findings, (WP3) a Science-Explained section presenting structured text, graphics, and "Big Questions" for non-expert audiences, and (WP0) project management and coordination, including quality assurance and cross-WP oversight. Tenderers are invited to propose additional tasks or work packages if they consider them necessary to achieve the objectives efficiently and enhance the overall quality and impact of the project. The contract will support ECMWF in delivering high-quality information to policymakers, educators, journalists, civil society, and the wider public, facilitating informed decision-making, understanding of GHG emissions, and the assessment of mitigation efforts.

3 Technical Specifications

3.1 Background

The concept for an anthropogenic CO_2 and CH_4 emissions Monitoring and Verification Support (CO2MVS) capacity as part of the CAMS portfolio is based on the recommendations from the European Commission's CO_2 Monitoring Task Force[1]. 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.

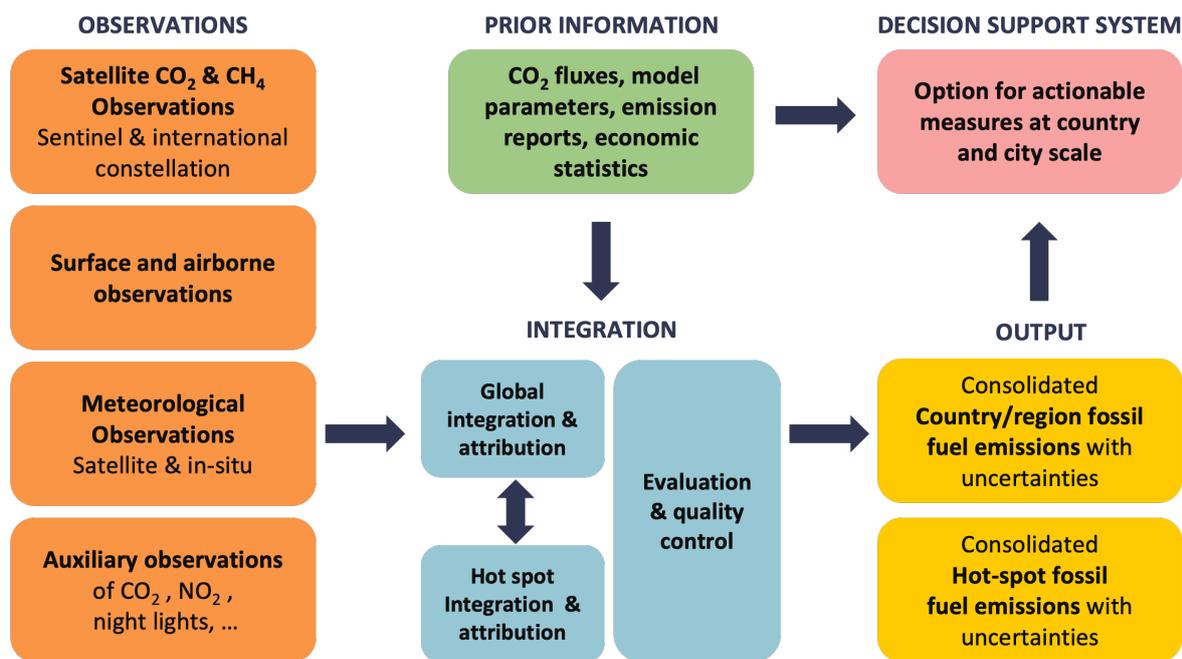[1] The reports from the CO2 Task Force can be found on https://www.copernicus.eu/en/news/news/new-co2-green-report-2019-published

OBSERVATIONS

Satellite CO_2 & CH_4 Observations
Sentinel & international constellation

Surface and airborne observations

Meteorological Observations
Satellite & in-situ

Auxiliary observations of CO_2, NO_2, night lights, …

PRIOR INFORMATION

CO_2 fluxes, model parameters, emission reports, economic statistics

DECISION SUPPORT SYSTEM

Option for actionable measures at country and city scale

INTEGRATION

Global integration & attribution

Hot spot Integration & attribution

Evaluation & quality control

OUTPUT

Consolidated Country/region fossil fuel emissions with uncertainties

Consolidated Hot-spot fossil fuel emissions with uncertainties

Figure 1 *Main building blocks of the functional architecture of a future CO_2 and CH_4 human emissions monitoring system*

The top four priorities for the new CO_2 and CH_4 service element during phase 2 of CAMS (2021 – 2027) 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 Meteorological Organisation (WMO) and the International Methane Emissions Observatory (IMEO) of the United Nations Environment Programme (UNEP).

As recommended in the second CO_2 report from the CO_2 Monitoring Task Force, the 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 will, in the long term and in some well-identified instances and situations, provide additional evidence on the amount of anthropogenic CO_2 and CH_4 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 full operational status in 2028 using observations from the planned CO2M satellite constellation and other satellite sensors.

As part of the ramp-up of the new services, this ITT is focused on improved presentation of data and information products. This includes the visualisation of data products, the production of educational animated videos, and the production of visually attractive background information related to the monitoring of greenhouse gas emissions, natural fluxes, and atmospheric concentrations. Because of the diversity of topics, the Tenderer is encouraged to cover the required expertise with relevant subcontractors, where needed.

3.2   Work packages

The work to be performed under this contract shall be structured around a set of required Work Packages (WPs) and associated deliverables and milestones, designed to support the development and deployment of the ITT components. These WPs cover the interactive dashboard, explanatory animated videos, and Science-Explained content for non-expert audiences, as well as project management and coordination. Tenderers are invited to propose additional tasks, deliverables and milestones if they consider them necessary to enhance the overall quality, usability, or impact of the project. The deliverables listed for each WP are indicative and represent the minimum requirements to be addressed in the tender, while the proposed milestones should demonstrate a clear plan for timely delivery of all outputs.

The Successful Tenderer shall ensure that draft versions of all content assets and relevant deliverables, in all work packages, are produced at a high professional and scientific standard, either through in-house expertise or by engaging qualified external experts, so that ECMWF review and approval can be carried out efficiently and effectively.

Further, in WP1 – WP3, regular interactions with ECMWF for case-by-case content review and approval are expected throughout the implementation of these WPs. These routine, content-focused interactions are distinct from scheduled progress review or contractual meetings (included in WP0) and the Tenderer shall propose a mechanism for conducting them (to be mutually agreed).

ECMWF may use its link with CAMS National Collaboration Programme[2] entities for user testing and feedback. Where such feedback is made available, the Successful Tenderer shall, in coordination with ECMWF, assess its feasibility and use it to inform the validation and refinement of concepts and design.

3.2.1   Work Package 1 (WP1) – Interactive visualisation of CAMS products for greenhouse gas monitoring

The Successful Tenderer shall design, develop, and deliver a comprehensive, user-friendly, and operational visualisation tool that enables users to interactively explore current and forthcoming CO2MVS products. The components of the visualisation platform shall facilitate the assessment of the

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[2] CAMS National Collaboration Programme | Copernicus

greenhouse gas products at multiple spatial and temporal scales, support transparency, and enhance the usability of CO2MVS outputs for decision-makers, scientists, and the general public. An overview of current CAMS greenhouse gas data products can be found here: https://atmosphere.copernicus.eu/ghg-services. Examples of visualisation tools for both CAMS and the Copernicus Climate Change Service (C3S) can be found here: https://apps.climate.copernicus.eu/.

Detailed description

The Successful Tenderer shall provide an interactive, web-based visualisation of CAMS greenhouse gas datasets. The initial focus shall be on the CAMS global and regional inventory-based emission data, the CAMS global inversion-optimised greenhouse gas fluxes, and the CAMS GFAS fire emission data (see also below). The application shall provide a single entry point for non-scientific users to access these diverse datasets and to explore spatial variability, sectoral contributions and temporal trends for the respective time periods these datasets are covering. It shall serve as a high-level overview of how we can use CAMS datasets to quantify GHG emissions and natural fluxes across the world. For this, it shall transform the various gridded input datasets, which are very heterogeneous, into standardised, policy-relevant information by spatial and temporal aggregation. Aggregated data shall be harmonised and stored in a tabular database to be accessible by the frontend to allow the user to customise the visualisation interactively (e.g., dataset, time period, GHG variable, sector, domain).

The Successful Tenderer shall also contribute to the implementation of the interactive dashboard on the CAMS website, including the creation of the necessary web pages and frontend components **within the CAMS web environment**, in collaboration with and using infrastructure and access provided by ECMWF, ensuring compliance with applicable European Commission web accessibility and usability standards.

This work package shall be developed in a modular approach consisting of backend processing, data access API, and frontend visualisation with the following objectives:

Backend:

- Routine acquisition and transformation of the following CAMS datasets that are available on the Atmosphere Data Store (ADS):
  - Global emission inventories (https://ads.atmosphere.copernicus.eu/datasets/cams-global-emission-inventories)
  - Regional emission inventories (will be available on the ADS soon)
  - Global inversion-optimised greenhouse gas fluxes and concentrations (https://ads.atmosphere.copernicus.eu/datasets/cams-global-greenhouse-gas-inversion)
  - Global biomass burning emissions based on fire radiative power (GFAS; https://ads.atmosphere.copernicus.eu/datasets/cams-global-fire-emissions-gfas)
- For each dataset, a subset of GHG emission variables (to be agreed with ECMWF at the start of the contract and extensible in the future) shall be aggregated (e.g., sum/mean/min/max) for a hierarchy of spatial domains (e.g., global, continent, country, subnational).
- The Successful Tenderer shall propose a list of regions (countries and first national subdivisions) for the spatial aggregation and evaluate their suitability for the various data sets (e.g. data coverage, spatial resolution) at the start of the project. Potential options include the International Standard for country codes and their subdivisions (https://www.iso.org/iso-3166-country-codes.html) or the Nomenclature of territorial units for statistics (NUTS;

https://ec.europa.eu/eurostat/web/nuts), with a final selection being made by ECMWF after the start of the project.

- In addition to their original temporal resolution, data should be aggregated monthly to allow visualisation on a consistent time axis.
- The aggregated data (i.e. time series) and associated metadata shall be stored in a tabular database for efficient storage and querying.

Data shall be periodically updated, depending on the given update frequency of each dataset, to mirror ADS dataset updates in the database.

API:

- Appropriate API endpoints shall be defined to allow dynamic access to the database via the frontend user interface based on user queries.
- API endpoints and database organisation shall be designed in a way to optimise data access time for best possible responsiveness of the interactive visualisation.
- API endpoints should be publicly available and documented to allow independent reproduction of any visualisation, ideally as self-contained Jupyter Notebook(s).

Frontend:

- The entry point for the browser-based application shall contain both a map view component and a sidebar for additional charts. An example of such an application can be found here: https://ec.europa.eu/eurostat/cache/RCI/#?vis=nuts1.population&lang=en
- The default map view should show a global choropleth map with colour-coded per-country emissions averaged over a configurable time period. The sidebar should present a brief text introduction and complementary information supporting the map data along additional dimensions. This shall depend on the dataset presented (e.g., time series or pie charts).
- All chart components shall include uncertainty estimates, whenever available. The user shall be able to customise the visualisation from the entry point screen by:
  - selecting the underlying dataset
  - selecting the variable (CO_2, CH_4, or N_2O (and potentially others)),
  - selecting the sector (depending on the dataset)
  - the time period of interest
  - the comparison metric (total emissions, per capita, average or trend)
- Changing any of the above filters shall dynamically refresh the data from the database and update the choropleth map and sidebar charts accordingly.
- Clicking on any country on the map shall trigger the following:
  - Map extent zooms to selected country and choropleth map switches to showing sub-national data (if resolution of dataset allows).
  - Sidebar charts update from global metrics to country-level statistics (e.g. time series, sectoral contributions).
- There shall be an option to switch from the map view to tabular view to visualise and rank the TOP X% of all countries (by total/per capita emissions, total/per capita trends).
- There shall also be an option to switch from the aggregated choropleth map view to a view of the gridded datasets at their respective original resolution. For this, the successful Tenderer

shall evaluate and propose possible technical solutions considering the file sizes of the different datasets and overall responsiveness of the application.

- For all visualisations, it shall be possible to:
    - download the chart in bitmap and vector format with appropriate CAMS branding
    - download the raw CSV data to recreate the chart
    - link to further information about the underlying dataset
    - share a deep link to the chart which will bring users directly to the exact chart with the chosen filters applied

The processing and visualisation workflow shall be modular (i.e., backend data retrieval and processing, database API, and frontend visualisation) and include detailed documentation of the functionality of each component and the deployment procedure. In particular, a clear workflow shall exist to integrate additional (future) datasets into the whole processing chain (i.e., backend, API, and frontend). ECMWF can either provide a suitable template for container design and orchestration (Docker and Kubernetes), or a suitable alternative architectural design and handover strategy can be part of the proposal. ECMWF can either provide the Successful Tenderer with all the Cloud compute and storage resources required for the development and operational implementation of this contract, or the application can be hosted directly by the Successful Tenderer. Technological choices shall be based on existing open-source software, with the preferable programming language being Python and React for the backend and frontend, respectively. The exact details of the software package shall be discussed with ECMWF before the start of the development.

The Tenderer shall provide in its proposal a clear timeline for the development of the required visualisation tool, and its integration in CAMS web settings, within the duration allocated for this contract, using the indicative deliverables listed below.

Indicative list of required deliverables:

- Architecture and Integration & Visualisation Framework Design
- Prototype data integration and visualisation tools
- User experience and testing report
- Fully operational interactive visualisation platform
- Documentation (inc. data integration, algorithm development, accessibility compliance and user support package).
- Final deployment and handover package

3.2.2   Work package 2 (WP2) – Explanatory animated videos

The Successful Tenderer shall produce a suite of high-quality, scientifically accurate, and visually engaging explanatory animated videos that support understanding and uptake of CO2MVS products. These videos will target multiple audiences, including policymakers, national inventory agencies, journalists, educators, and the general public. The main messages shall address the scientific principles, societal relevance, and various aspects of greenhouse gas monitoring developments and applications, split into four main categories:

- Foundations (GHG science & climate)
- Monitoring & Measurement (CO2MVS science)
- Applications (policy, inventories, cities)
- CAMS & CO2MVS Products

The videos shall complement the interactive visualisation tool (developed in WP1), helping users understand key concepts, data interpretation challenges, and policy contexts.

Examples of existing CAMS animations can be found here:

- What is causing climate change?[3]
- Why's the air quality on my phone different from direct air quality measurement stations?[4]
- The new CAMS Catalogue – A new and easy way to access Atmosphere monitoring data[5].

The proposed work shall include the following components:

1) Content definition and scientific review: The Successful Tenderer shall select video topics in consultation with ECMWF and develop scripts, storyboards, and visual content outlines ensuring the messages reflect current advancements and limitations of GHG monitoring. Integration of references to WP1 visualisation tools, where relevant, is strongly recommended.

2) Video production, review, quality assurance, and final delivery: Videos will be reviewed and iterated based on ECMWF feedback from scientific and communications teams. The final video files will be delivered optimised for web (CAMS website, YouTube etc), presentations (high quality mp4), and events and stakeholder workshops, as well as accompanied by short clip versions for use in social media.

The material used in the video, where relevant, shall include:

- 2D/3D animations (pre-owned by ECMWF or produced in this contract)

- Infographics (pre-owned by ECMWF or produced as part of video content creation)

- Narration and subtitles (the latter in English, German, French, Italian, and Spanish)

- Real satellite imagery and CAMS CO2MVS visual material

- Data visualisation elements derived from WP1 tool

Topics

It is expected to produce eight videos, each with a duration of between 2 and 2 ½ minutes. Based on the four contextual categories mentioned above, the following topics are indicatively proposed:

- Foundations (GHG science & climate), e.g.
  - What are greenhouse gases and how do they affect the planet?
  - Methane vs CO_2: why both matter for climate action?
- Monitoring & Measurement (CO2MVS science)
  - How do we get from satellite observations to emission estimates?
  - Why do we need emission estimates from satellites?
- Applications (policy, inventories, cities)
  - Detecting emission hotspots at facility level
  - Tracking progress on Nationally Determined Contributions (NDCs) **OR** Supporting the Global Stocktake.
- CAMS & CO2MVS Products

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[3] https://atmosphere.copernicus.eu/sites/default/files/2018-11/2018_CO2_video_final_web.mp4
[4] https://atmosphere.copernicus.eu/sites/default/files/2020-01/Air%20Quality%20Captions%20IOB.mp4
[5] https://atmosphere.copernicus.eu/sites/default/files/2018-04/Copernicus_short_HD.mp4

- o   What are CO2MVS products and how to interpret them?
- o   How to use the CAMS interactive visualisation tools (existing, like methane hotspot explorer **and/or** those developed in WP1)?

The Tenderer shall provide in its proposal a clear timeline for the development of the required animated videos, within the duration allocated for this contract, using the indicative deliverables listed below.

Indicative list of required deliverables:

- Editorial concept and narrative framework (including quality assurance plan / scientific review workflow)
- Video scripts and storyboards
- Prototype / pilot video(s)
- Final video production package including accessibility and dissemination assets (for re-use in CAMS communication channels)
- Final delivery, documentation, and handover package

3.2.3   Work package 3 (WP3) – Development of user-friendly GHG Science-Explained (SE) pages for the CAMS website

In this WP the Successful Tenderer shall design and deliver public-facing Science-Explained (SE) webpages for the CAMS website that explain GHG-related scientific knowledge in a clear, accessible, and scientifically rigorous manner for non-expert audiences. This section shall summarise and consolidate the key messages from the explanatory video scripts (WP2), including topics that are **proposed but ultimately not produced as videos**. The intended audience comprises general public (approximately ages ~16+), readers with no assumed STEM background, interested but non-expert users, as well as educators, journalists, policymakers and civil society organizations. The section shall serve users who prefer text, require quick reference material, or cannot access video content. It shall also ensure that the communication benefits of WP2 extend to all intended audiences, regardless of accessibility constraints.

Key required content formats shall include, but not be limited to:

- Short explainer articles (800–1,200 words)
- Visual storytelling (infographics, diagrams, explanatory figures)
- A dedicated "Big Questions" section addressing common questions or misconceptions

While final text and graphics will be reviewed and approved by ECMWF, the Successful Tenderer is expected to provide demonstrated expertise in public-facing science communication and in the production of high-quality explanatory content.

Scope of work:

The proposed work shall include, at a minimum, the following components:

1. Extraction and consolidation of key messages from scripts, outlines, and storyboards created under WP2 as well as the existing FAQ pages already in place from CAMS[6]. This shall include identification of core scientific explanations, definitions, data-use examples, and policy-relevant messages to consolidate into structured content aligned with the needs of different user groups (general public, education, policy-adjacent audiences).
2. Provision of text for the SE pages: text shall be understandable to non-experts while remaining scientifically accurate, clarifying aspects related to main greenhouse gases, satellite monitoring, emission estimation, uncertainties, and CO2MVS products and capabilities.
3. Provision of supporting graphics for the SE pages designed to enhance conceptual understanding.
4. Provision of support for integrating the SE section into the CAMS website. The Successful Tenderer shall update the SE pages during the contract duration to reflect newly produced content and when new CO2MVS capabilities or datasets become operational.

Thematic structure:

The website section shall be constructed around main thematic pillars such as (indicatively including):
Pillar 1: What are Greenhouse Gases
Pillar 2: How do GHGs affect climate
Pillar 3: Estimating and Monitoring GHGs and their emissions and natural fluxes
Pillar 4: Emission pathways and future
Pillar 5: GHGs and society (link to sectors, trade-offs and co-benefits)

The 'Big Questions' section shall constitute a flagship component of the platform organised around the following main (indicatively) categories:

- Foundational Concepts (*How do we actually know how much CO_2 is in the atmosphere? Why do different sources report different emissions numbers? How certain are scientists about GHG trends? What are the main greenhouse gases, and how do they differ in effect?* etc.)
- Technology and Trust (*How do satellites measure greenhouse gases? What are the differences between "bottom-up" inventories and "top-down" estimates? How reliable are the measurements and models used to estimate emissions? How do we validate and cross-check these data?* etc.)
- Time and Scale (*Why do today's emissions affect climate decades from now? If emissions stopped today, would warming stop immediately? Why is methane treated differently from CO_2? How do local emissions relate to global climate impacts?* etc.)
- Policy, International Agreements, and Stocktakes (*How do international agreements (e.g., Paris Agreement, Global Methane Pledge) guide emission reductions? What is the global stocktake, and how is it informed by monitoring? How do Nationally Determined Contributions (NDCs) relate to actual emissions? How can monitoring support policymakers and civil society in assessing mitigation progress?* etc.)

Tenderers are invited to propose alternative formulations of the "Big Questions," including additional categories, restructured groupings, or revised wording, provided that the final set remains clear, accessible to non-expert audiences, and scientifically accurate.

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[6] https://atmosphere.copernicus.eu/ghg-services/carbon-dioxide-qas and https://atmosphere.copernicus.eu/ghg-services/methane-qas

Beyond content creation, the Successful Tenderer shall contribute to the design and development of the specific webpages and their features required to deliver the SE and "Big Questions" content within the CAMS web environment, in collaboration with ECMWF, using provided ECMWF-infrastructure and aligned with applicable European Commission web accessibility and communication standards.

The Tenderer shall provide in its proposal a clear timeline for the development of the required content, and webpage integration, within the duration allocated for this contract, using the indicative deliverables listed below.

Indicative list of required deliverables:

- Content architecture and thematic structure (with key-message mapping)
- Draft content package (including scientific review and user testing feedback)
- Visual and graphic assets for SE pages
- Integrated SE section (pre-production release)
- Final SE section, documentation, and handover package

3.2.4 Work package 0 (WP0) – Management and coordination

The following management and coordination activities are part of WP0 and shall be briefly described, and included accordingly 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. The Kick-Off meeting will be hosted at the ECMWF premises in Bonn in a hybrid format. The prime contractor is expected to attend in person with a maximum number of 5 people. 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 and the Successful Tenderer will organise Progress Review Meetings, linked to Payment Milestones, every six months online unless otherwise agreed.

  - Tenderers can propose additional project internal meetings (annual face-to-face meeting and monthly teleconferences) as part of their response.
  - See Section 4.8 for further guidance regarding Travel Costs.

- 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 and subcontractors.

- 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.

    o 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.

Minimum list of required deliverables:

WP0 Deliverables			
#	*Nature*	*Title*	*Due*
D0.Y.Z-yyyyQx	Report	Quarterly Implementation Report YYYYQQ *YYYYQQ being here the previous quarter (e.g. 2025Q3)*	Quarterly on 15/04, 15/07 and 15/10 *(only at the above dates since QIR for Q4 will be part of the AIR Part 1)*
D0.Y.Z-yyyy	Report / Other	Annual Implementation Report Part 1 for year YYYY *including both:* • *the Quarterly Implementation Report YYYYQ4 and* • *the requested financial information for year YYYY* *YYYY being here the year n-1*	Annually on 15/01
D0.Y.Z-yyyy	Report	Annual Implementation Report Part 2 for year YYYY *YYYY being here the year n-1*	Annually on 28/02
D0.Y.Z	Report	Final Implementation Report	By end date of the contract
D0.Y.Z-yyyy	Report	Annual Implementation Plan for year YYYY *YYYY being here the year n+1*	Annually on 30/09
D0.Y.Z-yyyy	Other	Copy of Prime Contractor's general financial statements and audit report for year YYYY *YYYY being here the year n-1*	Annually, not later than on 15/12[1] (no associated cost)
D0.Y.Z	Presentation/MoM	Kick-Off Meeting	Not later than 30 days after the start of contract
D0.Y.Z	Presentation/MoM	Progress Review Meeting No. xx / Payment Milestone SC1-PMx *xx being here the iteration number of the PRM*	~ Every 6 months[2]
D0.Y.Z	Report	Mission reports (brief) from the travel listed in the Cost and Prices tab in the "Pricing tables"	By end of April 2028 or once per calendar

			year, depending on the mission schedule

WP0 Milestones			
#	*Title*	*Means of verification*	*Due*
M0.Y.Z	Updated KPIs (list, targets, etc.) after review with ECMWF	Report	One year after start of contract

These due dates are indicated to frame the corresponding deliverables and milestones schedule only, consequently the following shall be considered by the Tenderer:

[1] the general financial statements shall be sent by the Successful Tenderer as soon as available,

[2] the schedule of the PRMs shall be aligned with the different Payment Milestones,

[3] depending on the year, the CAMS GA may take place at a different period of the year.

ECMWF will provide the templates for reports and plans at the beginning of the contract. Reporting documents should be short and factual, following the guidance which will be provided by ECMWF during negotiations with the Successful Tenderer.

> ⇒ Contract management and coordination is expected to amount to approx. 7% - 10% of the planned use of the resources (effort and personnel costs).

4   General Requirements

4.1   Implementation schedule and allocation of resources

ECMWF intends to award a single Framework Agreement, which shall be implemented via a single Service Contract expected to commence on 1 July 2026 and finish on 31 December 2027 (18 months).

4.2   Deliverables and milestones

The Tenderer shall provide the list of deliverables and milestones (cf. ITT Volume IIIA "Pricing and deliverables", Excel spreadsheet "Deliverables List") for each WP. 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 a verifiable outcome produced in response to the specific objectives of the contract and is subject to approval by both ECMWF's TO and CMO before being considered as contractually approved. All document deliverables shall be periodically updated and versioned as described in section 2.

- Milestones should be designed as markers of demonstrable progress in service development and/or quality of service delivery during the contract implementation (see also the milestone definition in this ITT Volume V Clause 1.2). They should not duplicate deliverables.

The following shall apply to the deliverables and milestones:

- The deliverables and milestones should be consistent with and meet the technical requirements specified in section 2 of this ITT Volume II;

- All contract deliverables shall be produced in English;

- The quality of reports shall be equivalent to the standard of peer-reviewed publications and practice;

- Unless otherwise specified in the contract, or requested by ECMWF during the contract implementation the final version of each deliverable shall be made available to ECMWF without any comments and tracked changes in electronic format (Microsoft Word/Microsoft Excel/HTML or compatible, PDF in case of signed version, while all other formats – if any – must be agreed during the contract negotiation) via the Copernicus Deliverables Repository portal – OpenText Core (OTC).

The following shall apply in ITT Volume IIIA "Pricing and deliverables" (cf. Excel spreadsheet "Deliverables List"):

- Deliverables and milestones shall respectively follow the referencing system used in section 2 of this ITT Volume II. Additional deliverables and milestones, if any, shall follow the same referencing system.

- 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 shall not attract the budget under Volume IIIA in the Excel spreadsheet "Deliverables list".

The Tenderer shall provide a due date for each proposed deliverable and milestone (in accordance with those indicated in section 3 for each WP). The Tenderer shall ensure that the proposed due dates of deliverables and milestones are realistic and achievable.

⇒ Please note that any dependency on input data, whose origin must be specified, shall be detailed by the Tenderer, and also accounted for in the risk register (cf. ITT Volume IIIB Section 5.6).

4.3 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 CAMS website provides access to its Atmosphere Data Store at https://ads.atmosphere.copernicus.eu.

4.4 Data and IPR

It is a condition of EU funding for CAMS that ownership of any datasets/software 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/software. Suppliers will be granted a non-exclusive licence to use the datasets/software which they have provided to CAMS for any purpose.

All software and products used by the Successful Tenderer to produce the CAMS datasets/software 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 Tenderer's 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.

It is expected that data sets (including databases) generated or acquired by the successful Tenderer will be delivered via the Atmosphere Data Store (ADS). The section below indicates generic requirements for these datasets in terms of standards and conformity.

4.5 Travel Costs

The travel costs shall be presented in accordance with the following provisions:

Travel costs should, in principle, be based on the [European Commission's calculator](#) [Table 3: Unit cost per distance band for air or combined air/rail travel, Commission Decision C(2024)5405], and consider a daily subsistence allowance not to exceed €300.

Travel costs must reflect **estimated actual costs and must not include any profit margin**.

If the proposed travel costs deviate from these reference values, the deviation shall be clearly indicated and duly justified.

The Tenderers are requested to provide a summary table as shown below as part of their bid.

Type of cost	Route/Destination	Estimated number of missions	Estimated unit price [€]
Travel/Subsistence			
Travel/Subsistence			

Travel Costs summary

ECMWF will reserve the right to re-claim any declared unspent or unaccounted budget for "Travel", as it will be described in the Annex 2 Pricing Tables of the Framework Agreement.

4.6   Payment Plan

The Tenderer can propose a draft 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).

- Given the total duration of the contract, it is recommended to abide by a circa 6-month frequency between each Payment Milestone and associated payment. Any other plan can be submitted by the Tenderer but shall be duly substantiated.

- In case of request for a payment at contract signature, please note that this should be duly substantiated by the Tenderer (e.g. in terms of necessary investment that would be necessary prior to or during first weeks/months of implementation for ensuring the initial set up of the project). It is necessary to relate this payment to activities subject to other Payment Milestones.

The frequency of Progress Review Meetings might be adapted to synchronise with the anticipated date of completion of each Payment Milestone (i.e. with one PRM ca. 15 days before each PM anticipated date of completion).

5   Tender Format and Content

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

5.1 Page Limits

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

Section	Page Limit
Executive Summary	2
Track Record	2 (for general) and 2 (per entity)
Quality of resources to be Deployed	2 (excluding Table 1 in Volume IIIB and CVs with a maximum length of 2 pages each)
Technical Solution Proposed	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)
Management and Implementation	6 (excluding Table 4 and Table 5 in Volume IIIB) + 2 per each Work package description (Table 3 in Volume IIIB)
Pricing Table	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 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 one additional senior team members with more than 5 years of experience on performing activities related to the various aspects of this ITT.

- The Successful Tenderer shall appoint a Service Manager, which will be its primary contact for contractual delivery and performance aspects.

These team members shall be involved in the activities of this ITT at a minimum level of 10% of their total working time.

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 current state of forecasting of global atmospheric composition and regional air quality, and the current state of building comprehensive and consistent data sets of emissions.

An exhaustive and detailed description of the proposed technical solution for all work packages described above shall be given.