ECMWF Copernicus Procurement

Invitation to Tender



Copernicus Atmosphere Monitoring Service

Volume II

Development of the Global Fire Assimilation System (GFAS)

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Table of Contents

1	Intro	duction3
	1.1	Definitions4
2	Conti	ract Summary5
3	Tech	nical Specification5
	3.1	General Requirements5
	3.2	Work package 6410 – Support to the operational implementation of GFAS6
	3.3	Work package 6420 – Provision of FRP retrievals from geostationary satellites7
	3.4	Work package 6430 - Monitoring of consistency between FRP products8
	3.5	Work package 6440 - Service evolution9
	3.6	Work package 6450 – User support and documentation of service
	3.7	Work package 6400 – Management and coordination11
4	Gene	ral Requirements
	4.1	Implementation schedule13
	4.2	Deliverables and milestones13
	4.3	Acquisition of necessary data and observations14
	4.4	Communication14
	4.5	Support for user engagement and training activities14
	4.6	Data and IPR15
5	Tend	er Format and Content15
	5.1	Page Limits15
	5.2	Specific additional instructions for the tenderer's response16
	5.2.1	Executive Summary
	5.2.2	Track Record16
	5.2.3	Quality of Resources to be Deployed16
	5.2.4	Technical Solution Proposed16

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 control 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 effect 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 - 2027), 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 CO₂, CH₄ and N₂O net surface fluxes, allowing the monitoring of the evolution in time of these fluxes.
- h) Climate forcing from aerosols and long-lived (CO₂, CH₄) 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 CO₂ and CH₄ for the global domain and emission hotspots.

This Invitation to Tender (ITT) is mainly targeting the CAMS service elements described under items (j).

1.1 Definitions

Definitions specific for this ITT are defined below.

Global Service Provider: ECMWF is the provider of global products

Regional Service Provider: the contractor for the CAMS2_40 contract for Regional Air Quality Products.

Global Production System: the modelling and data assimilation infrastructure used to provide the CAMS global analyses and forecasts of atmospheric composition.

Regional Production System: the modelling and data assimilation infrastructure used to provide the CAMS regional (re)analyses and forecasts of atmospheric composition

Real-Time Global Products: The operational real-time analyses and forecasts from the global CAMS data assimilation and forecasting system, which is run by the Global Service Provider. These analyses and forecasts are produced at least daily and include 3-dimensional fields of aerosols, chemical species, and greenhouse gases with a temporal resolution of at least 6 hours.

Forecast-only Global Products: the outputs of a global CAMS forecasting system that is based on the system used to produce the Real-Time Global Products but without the assimilation of observations of atmospheric composition. The forecasts are produced at least daily and include 3-dimensional fields of aerosols, chemical species, and greenhouse gases with a temporal resolution of at least 6 hours.

Global Reanalysis Products: the outputs of a reanalysis from the global CAMS data assimilation and forecasting system, which is being run by the Global Service Provider. The reanalysis will cover the period between 2003 onwards and provide analyses and forecasts every 12 hours of 3-dimensional fields of aerosols, chemical species, and greenhouse gases with a temporal resolution of at least 6 hours.

Regional Products: the outputs of analyses and forecasts from the regional CAMS data assimilation and forecasting systems, which are run by the Regional Service Provider. The Regional Products consist in the first place of real-time analyses and forecasts. The regional CAMS data assimilation and forecasting systems will comprise at least seven individual systems as well as their model ensemble products. These analyses and forecasts will be produced every 24 hours and include 3-dimensional fields of aerosols and chemical species with a temporal resolution of 1 hour. The Regional Products also include the outputs from interim re-analyses based on fast-track in-situ observations and reanalyses based on fully validated in-situ observations. Outputs from these reanalyses consist of analyses of chemical species and aerosols with a temporal resolution of 1 hour and will be provided on an annual basis by the Regional Service Provider.

2 Contract Summary

This ITT, entitled "Development of the Global Fire Assimilation System (GFAS)", is for providing support for and further development of GFAS, which is operated at ECMWF. GFAS delivers near-real-time emissions of gases and aerosols from biomass burning through data assimilation of multi-satellite FRP retrievals supporting atmospheric composition forecasts. The Successful Tenderer shall provide improvements for the current GFAS system in terms of evaluation and improvement of injection height estimation, provide near-real-time Fire Radiative Power (FRP) observations from the GOES and Himawari geostationary satellites, evaluate and refine the merging of GEO and LEO satellite FRP products including the introduction of new products, provide and implement recommendations for service evolution, update information on spurious FRP signals, as well as deliver memoranda and reports.

The Successful Tenderer will also advise the team working on the global production system at ECMWF. The Successful Tenderer will have to demonstrate considerable experience in the field of estimation of fire emissions from satellite data.

3 Technical Specification

3.1 General Requirements

The Global Service Provider provides estimates of emissions from wildfires and biomass burning based on the Global Fire Assimilation System (GFAS). GFAS uses satellite observations of Fire Radiative Power (FRP) to detect fires and estimate emissions of large range of pollutants (see https://confluence.ecmwf.int/display/CKB/CAMS%3A+Global+Fire+Assimilation+System+%28GFAS%29+data+documentation for more details). These emissions are key inputs to the CAMS modelling systems that are used for providing the Real-time Global Products, the Forecast-only Global Products, the Global Reanalysis Products and the Regional Products. The fire emissions are also part of the CAMS product portfolio. The emission rates of aerosol and gas species are derived through the use of so-called emission factors for each particular species, which relate the dry matter combustion rate estimated from FRP to the actual emission rates of these species. GFAS also provides an estimate of the injection height of the fire emissions using a Plume Rise Model (PRM). The PRM uses FRP (strength of the fire) as well as meteorological variables to derive the instantaneous vertical transport of the emitted aerosols and gases providing an altitude of maximum injection of these species into the atmosphere. GFAS currently provides both daily and hourly means of FRP, emission rate and injection height.

The Successful Tenderer shall support the further development of GFAS, in coordination with the Global Service Provider, by improving the GFAS modelling and assimilation system, by providing FRP retrievals from the constellation of geostationary satellites, and by monitoring the consistency between the FRP products from the various satellite sensors that are currently available, as outlined in the work packages in the following sections.

The Successful Tenderer shall provide code developments and new parameter definitions for GFAS in the format as used at ECMWF, including current Python coding practices (Python 3) and ECMWF use of GRIB encoding. It is of importance that all new developments for GFAS need to be directly implemented and tested in the GFAS version used at ECMWF, to which access shall be given to the Successful Tenderer.

3.2 Work package 6410 – Support to the operational implementation of GFAS

Over the past several years, several developments have been carried out to increase the number of FRP observations by merging observations from Low Earth Orbit (LEO) and Geostationary (GEO) satellite instruments. However, the operational version of GFAS is still based on MODIS observations only. The developments need to be further tested and potentially adjusted before their implementation in the operational GFAS suite.

The Successful Tenderer shall evaluate and refine the bias correction scheme used to combine the FRP estimates from multiple satellites. During Cop1, scaling factors have been computed for each FRP product to ensure a consistent Fire Radiative Energy (FRE) budget compared to that of the MODIS FRP product, which is used as the baseline to calibrate the FRP dry matter combustion rate relationships. These coefficients have been computed using a single year of data. The Successful Tenderer shall evaluate the robustness of these scaling factors across several years and the available FRP products at both regional and global scales. This shall result in a consolidated set of scaling factors for use in the operational GFAS configuration. The updated scaling factors shall also take into account the change from MODIS to VIIRS as the main baseline data set for the bias correction.

Satellite observations of FRP are not only sensitive to wildland fires but also to thermal signals from other sources such as volcanoes and gas flaring. These 'spurious' signals are somewhat accounted for in GFAS and the Successful Tenderer shall provide an update to the global spurious signal mask which can omit the non-fire signals. The spurious signal mask shall make use of available information on active volcanoes, on-shore gas flaring, and urban developments, along with and evaluation of persistent annual emissions in the GFAS output. The spurious signal mask shall have a spatial resolution of 0.1 degrees longitude by 0.1 degrees latitude.

The Successful Tenderer shall also provide continued assistance and support to ECMWF in the maintenance and operational implementation of GFAS in case any issues are encountered in the operational production of the GFAS outputs. This also includes support for the implementation of new FRP products within the duration of the contract, such as from NOAA20/VIIRS, the Sentinel-3/SLSTR daytime product, and the future Sentinel-3C/SLSTR.

The Successful Tenderer will work directly on the development of the GFAS code in the ECMWF computing environment to ease the testing and implementation of revised and new developments prior to their operational use.

WP6410 Delive	erables		
#	Туре	Title	Due
D1.Y.Z ¹	Report	Updated scaling factors for GFAS bias correction	TBD

¹ 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

	and data		
D.1.Y.Z	Data	Updated spurious signal map	M12
D.1.Y.Z	Ponort	Overview of support give to ECMWF on maintenance and operational implementation of GFAS	Annually

WP6410 Milestones			
#	Title	Means of verification	Due
M1.Y.Z	Establish access to ECMWF computing environment	Agreement with ECMWF	M1

3.3 Work package 6420 – Provision of FRP retrievals from geostationary satellites

The CAMS GFAS system has focussed historically on the use of FRP observations from the MODIS instruments on of the polar orbiting Aqua and Terra satellites. Over the past few years, the operational system has been upgraded with the capability to utilise FRP observations from VIIRS, Sentinel-3 and geostationary platforms (SEVIRI, GOES-E/-W and Himawari-8), although these instruments are not operationally assimilated yet. Geostationary FRP observations from EUMETSAT's Meteosat satellites are provided through EUMETSAT's Land Surface Analysis Satellite Applications Facility (LSA SAF), and a similar mechanism has been established under CAMS to provide FRP retrievals from the American GOES-East and GOES-West satellites and the Japanese Himawari-8 satellite delivered within 3 hours after observation with at least 3-hourly resolution for the full disk GOES/Himawari imagery. The continued provision of these FRP retrievals shall be provided for the duration of the contract. The geostationary FRP retrievals will ensure high-temporal resolution coverage of a large part of the globe. The Successful Tenderer shall provide Fire Radiative Power (FRP) values from GOES-East, GOES-West and Himawari-8 with associated uncertainties, as well as geo-location information for each individual satellite footprint (at least the longitude, latitude, viewing angle and pixel size of the observation). The quality of the retrieval values shall be competitive with international products, such as are for instance available from MODIS, VIIRS and Meteosat. This quality shall be assessed, against independent observations if possible, and documented in annual reports. The Tenderer shall indicate the expected timeliness and reliability of its GOES/Himawari FRP data provision. The latter shall take into account operational aspects of the data provision with a focus on risk management (e.g., dependencies on raw satellite data timeliness, potential failure of required hardware, monitoring of processing chain, timely communication of system down-time).

WP6420 Deliverables			
#	Туре	Title	Due

format shall be applied for Milestones. Continuous deliverables at higher frequency can be labelled in the same way as quarterly deliverables.

D2.Y.7	Data & Report	Daily data provision and quarterly status report of GOES- E/-W & Himawari FRP data stream in near-real-time	Quarterly
D2.Y.Z-yyyy	Report	GOES-E/-W & Himawari FRP Retrieval Quality Assessment	Annually

WP6420 Milestones			
#	Title	Means of verification	Due
M2.Y.Z	Title		

3.4 Work package 6430 - Monitoring of consistency between FRP products

GFAS produces estimates of fire emissions through the assimilation of FRP observations from geostationary (GEO) and Low Earth Orbit (LEO) satellite sensors. A critical element of this data assimilation process is the assumption that the FRP products from the various sensors (after bias correction) are consistent with each other. Differences in FRP algorithms as well as issues with saturation of spectral channels of the instrument or problems with the detection of small fires can lead to significant differences that need to be accounted for before FRP observations from different satellites can be combined. The Successful Tenderer shall provide routing monitoring, using the python-based monitoring system developed under the previous GFAS development contract (CAMS_44), of FRP products from the currently available instruments (MODIS, SEVIRI, GOES, VIIRS, Sentinel-3, Himawari-8) to assess the consistency between the products. The Successful Tenderer shall further develop this monitoring tool in a web-based monitoring system to make the results of the FRP product monitoring easily available on a daily basis. Differences in sensitivity, sampling time, and pixel size of the various instruments shall be taken into account. The monitoring shall also be used to detect the impact of any potential satellite sensor degradation on the FRP product. The provided comparison statistics for monitoring will consist of at a minimum a) FRP values on a per fire basis, b) number of active fire pixels per region, and c) number of low-FRP fire pixels per region. The achievable temporal resolution for these statistics shall also be monitored. While the monitoring system shall provide a user-friendly means to monitor the behaviour of the FRP products from the various satellites over time, the information shall also be used as input to the work on the bias correction coefficients in WP6410.

In addition, the Tenderer shall provide ideas and plan to evaluate GFAS outputs against other biomass burning data sets and, if feasible, against field campaign observations

The Successful Tenderer shall document its findings based on the monitoring in quarterly reports, which shall be delivered within 2 months after each quarterly period, and shall also provide the Global Service Provider with all necessary inputs to include elements of the developed monitoring system in the operational GFAS production chain.

WP6430 Delive	WP6430 Deliverables				
#	Туре	Title	Due		
D3.Y.Z- yyyyQx	Report	FRP product consistency monitoring for the past 3 months	Quarterly		
D3.Y.Z	Tool	Web-based monitoring system to make the results of the FRP product monitoring	TBD		

WP6430 Milestones				
#		Means of verification	Due	
M3.Y.Z	Acquire the existing FRP monitoring code from ECMWF	Code available to Tenderer	M1	

3.5 Work package 6440 - Service evolution

Service evolution is a critical part of all CAMS services. The Tenderer shall therefore provide a research and development plan covering the full duration of the contractual agreement that results from this ITT. The proposed developments shall capitalize on the outcomes of the research carried out in previous contracts and shall consider the following aspects of GFAS (based on feasibility within the contract duration and budget):

Revision of the methodology to derive the biomass burning emission rates from FRP

Currently, emission rates of gases and aerosols are estimated in two steps: firstly, FRP is converted into dry matter combustion rate using conversion factors established between MODIS FRP and dry matter (DM) combustion rate for distinct vegetation types taken from the Global Fire Emissions Database (GFED) data set; then, the dry matter combustion rate is converted into emission rates for the various species using emission factors derived from literature. The main shortcomings of the current approach are the i) uncertainties in the GFED conversion factor and land cover map and ii) uncertainties in the representativity of emission factors. In previous contracts, several aspects have already been improved:

- updated emission factors based on more recent literature data sets
- testing of two alternative methodologies:
 - exploiting CAMS global atmospheric analyses as a proxy for biomass burning plumes to adjust the FRP to DM conversion factor and the emission factors,
 - using a top-down approach that relates FRP to particulate matter and other species for distinct fire biome classes.

The Successful Tenderer shall propose, develop, test and compare new or similar approaches for emission rate estimation from FRP. The use of machine learning technique is encouraged to represent the relationship between FRP and emission rate. The evaluation shall be conducted over different regions and compared with other biomass burning emission datasets.

Revision of the parameterization of the observation error variance

The observation error is a key component used to combine FRP observations from multiple satellites in the GFAS assimilation system. It is currently inversely proportional to the fraction of observed

area associated with each FRP product. Two possible deficiencies with this approach have been identified:

- excessive weight given to GEO products,
- lack of accounting for sources of observation error other than representativity error.

New developments should consider better exploiting Quality Assurance information associated with the FRP retrieval products.

Revision of the bias correction scheme used to ensure the consistency across FRP products int terms of FRE budget.

The current method relies on using the ratio between FRE of a given FRP product with the MODIS FRP product currently used as the baseline. This could be refined using machine learning methods that handle better non-linearities and could lead to more robust scaling factors in time and space.

Revision of the Gaussian parametrization of the FRP diurnal cycle used in GFAS to better represent the variability across fire biomes

The current system relies on a single parametrization of the diurnal cycle applied at global scale. The evolution should consider a regional parametrization based on geographic location and fire biome. This can be achieved by exploiting Machine Learning techniques and exploit the long time series of the GFAS dataset.

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.

WP6440 Deliverables			
#	Туре	Title	Due
D4.Y.Z- yyyyQx	Report	Development plan	Annually
D4.Y.Z	Report an code	Progress and results of annual developments	Annually

WP6440 Milestones			
#	Title	Means of verification	Due
M4.1.1			

3.6 Work package 6450 – User support and documentation of service

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

ECMWF has established a centralised Copernicus Service Desk to provide multi-tiered technical support to all users of CAMS data, products, tools and services. The Service Desk handles user queries through a ticketing system and distributes these queries to specialists when needed. Dedicated staff at ECMWF provide basic support in the form of self-help facilities (FAQs, Knowledge Base, online

Forum, tutorials etc.) as well as individualised support on technical queries related to the Atmosphere Data Store (ADS), data formats, data access etc. In addition, ECMWF staff provide specialised scientific support to address questions related to its industrial contributions to CAMS, e.g. in the areas of global forecasting of atmospheric composition.

All CAMS contractors are expected to contribute to the delivery of multi-tiered technical support for the data and/or services they provide. Such specialised user support shall take the form of direct response to individual user queries via the Service Desk facility, as well as contributions to FAQs, Knowledge Base, and user guides. Contractors may also be requested by the CAMS Service Desk to contribute to support questions in the online Forum.

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

Tenderers shall also 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 web site. The successful Tenderer shall therefore produce documentation describing in detail the methodologies and products 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.

WP6450 Deliverables				
#	Туре	Title	Due	
D5.Y.Z-yyyy	Other	Overview of contribution to CAMS Knowledge Base to document products and services requiring expertise specific to the GFAS developments	Annually	
D5.Y.Z-yyyy	Report	Contribution to documentation of products and services based on the GFAS developments	Annually	

WP6450 Milestones			
#	Title	Means of verification	Due
M5.Y.Z			

3.7 Work package 6400 – 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 will organise six-monthly project review meetings (linked to Payment milestones).
 - Tenderers can propose additional project internal meetings (kick-off meeting, annual face-toface 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 subcontractors.
- Subcontractor management, including conflict resolution, e.g. the prime contractor is responsible for settling disagreements, although advice/approval from ECMWF may be sought on the subject.
- A list of subcontractors describing their contribution and key personnel shall be provided, as well as back-up names for all key positions in the contract. The Tenderer shall describe how the Framework Agreement, in particular Clause 2.9 has been flowed down to all their subcontractors.
- Management of personal data and how this meets the requirements of Clause 2.8 and Annex 6 of the Volume V Framework Agreement

WP6400 Deliverables				
#	Responsible	Nature	Title	Due
D0.Y.Z-yyyyQx	Tenderer	Report	Quarterly Implementation Report QQ YYYY QQ YYYY being the previous quarter	Quarterly on 15/04, 15/07 and 15/10 (only at the above dates; QIR for Q4 will be part of the AIR)
D0.Y.Z-уууу	Tenderer	Report	Annual Implementation Report YYYY YYYY being the Year n-1	Annually on 28/02
D0.Y.Z-уууу	Tenderer	Other	Preliminary financial form YYYY YYYY being the Year n-1	Annually on 15/01
D0.Y.Z	Tenderer	Report	Final report	60 days after end of contract (Tenderer to

				include date based on Contract Notice)
D0.Y.Z-yyyy	Tenderer	Report	Finalised Implementation plan YYYY YYYY being the Year n+1	Annually on 30/09
D0.Y.Z-yyyy	Tenderer	Other	Copy of prime contractor's general financial statements and audit report YYYY YYYY being the Year n-1	Annually in June
D0.Y.Z	Tenderer	Other	Updated KPIs (list, targets) after review with ECMWF	One year after start of contract

WP6400 Milestones				
#	Responsible	Title	Means of verification	Due
M0.Y.Z-Px	Tenderer	Progress review meetings with ECMWF / Payment milestones		~ Every 6 months

4 General Requirements

4.1 Implementation schedule

The Framework Agreement will run from 1 May 2022 to 30 April 2024. The Tenderer shall provide a detailed implementation plan of proposed activities for the full period.

4.2 Deliverables and milestones

Deliverables should be consistent with the technical requirements specified in section 0. A deliverable is a substantial, tangible or intangible good or service produced as a result of a project. In other words, a deliverable is an outcome produced in response to the specific objectives of the contract and is subject to acceptance by the technical contract officers at ECMWF. When defining deliverable 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.

In Volume IIIA, List of Deliverables, each Deliverable shall have an associated resource allocation (person-months and financial budget, resource type: payroll only). The total of these allocated resources shall amount to the requested budget associated with payroll. Milestones shall not have an associated budget in Volume IIIA, List of Deliverables.

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 Annex IIIA, tab "Deliverables List". Apart from the payment milestone review meetings, all foreseen meetings shall not be classified as milestones but listed in a separate overview table for each work package.

The Tenderer shall ensure that the proposed due dates of deliverables and milestones are realistic and achievable. Any dependencies on input data shall be taken into account in the risk table

4.3 Acquisition of necessary data and observations

The Successful Tenderer shall acquire the relevant observational data sets needed for the optimisation and evaluation of the developments of this ITT.

4.4 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.

4.5 Support for user engagement and training activities

While user engagement and training activities are not part of the scope of this ITT, the Tenderer shall accommodate for eventual needs in providing technical and scientific expertise in support of these activities. The bidder shall specify in the bid the experts intended to be allocated to provide this support.

Requests to support activities may be raised on for example:

- Contribute with content specific input to training, education and capacity building material: development and/or review of learning resources in the domain of the contract, participation in train-the-trainer events and MOOCs;
- Contribute with content specific input to user-oriented communication material such as slides, story maps and user testimonials;
- Contribute and attend User Uptake workshops and stakeholder meetings. Presentations in your mother tongue may be asked to be provided;
- Input to the URDB with user requirements (cf. template as provided during the negotiation process) as well sharing needs and aspirations as raised by potential new user communities;

An indicative maximum budget of 5,000.- EUR shall be allocated in the pricing table to accommodate for these needs. This shall be paid as a 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 User Requirements Database (URDB) in a structured and traceable way. This URDB tracks all requirements emanating from a wide variety of user fora, surveys, user support and direct interactions between service providers and their users. The entries of the URDB are analysed on a regular basis in terms of user requirements per domain, importance and feasibility. This analysis constitutes the basis for distilling, filtering and translating user requirements into technical specifications for the Service and its evolution.

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

The following deliverables are thus to be added to the WP6450 deliverable lists:

WP6450 Deliverables				
#	Туре	Title	Due	
D5.Y.Z-yyyy	Other	linnut to CAMS LIRDB - VVVV	Checked by ECMWF annually in November	
D5.Y.Z	Report	ISummary of user engagement activities	Due 1 month before contract end date	

4.6 Data and IPR

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

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

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	2 (excluding Table 1 in Volume IIIB and CVs with a maximum
Deployed	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	6 (excluding Table 3, Table 5, Table 6 and Table 7 in Volume IIIB) +
Implementation	2 per each Work package description (Table 4 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 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 estimating fire emissions using satellite FRP observations.

An exhaustive and detailed description of the proposed technical solution for all work packages described above 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 and delivering the FRP retrievals for the GOES and Himawari satellites. The Tenderer shall describe the various required and proposed improvements of the GFAS system. Finally, the Tenderer shall describe how they will deliver the required service evolution aspects.