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Call for tenders

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**Copernicus Emergency Management Service (EMS)
Validation**

Open procedure

TENDER SPECIFICATIONS

Part 2: Technical specifications

of 07/08/2019

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1. INTRODUCTION

The Copernicus Programme¹ entered in its full operational phase following the adoption of the Copernicus Regulation². The Emergency Management Service (EMS) Mapping, which has been an operational activity since April 2012, will continue as a full operational service as defined in Article 5 to the Copernicus Regulation.

Copernicus EMS provides information for disaster management (including all phases of the cycle) relating to different types of disasters, including meteorological hazards, geophysical hazards, deliberate and accidental man-made disasters and other humanitarian disasters.

Copernicus EMS has two separate service components:

- i. The EMS Mapping with Rapid Mapping, Risk and Recovery Mapping and Validation (potentially covering all disasters) and
- ii. The EMS Early Warning and Monitoring for floods, fires and droughts.

This document contains the tender specifications related to the open procedure for the procurement of the Copernicus EMS – Validation service.

2. BACKGROUND AND CONTEXT OF THE COPERNICUS EMS

2.1. The Copernicus programme³

Copernicus is a European Union programme aimed at developing European information services based on satellite Earth Observation and in situ data.

Copernicus is implemented by the European Commission with the support from the European Space Agency (ESA) and the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) for the Space component.

There are six Copernicus core services addressing the following main thematic areas: Atmosphere, Marine Environment, Land, Climate Change, Emergency Management and Security. The Emergency Management Service provides information on disasters and helps to prevent the loss of lives and property, and damages to the environment.

¹ Formerly known as Global Monitoring of Environment and Security (GMES).

² Regulation (EU) No 377/2014 of the European Parliament and of the Council of 3 April 2014, establishing the Copernicus Programme and repealing Regulation (EU) No 911/2010

³ <http://copernicus.eu>

Synergies between the six services of the Copernicus Programme will be sought as much as possible.

Pursuant to Article 9 of the Copernicus Regulation, the European Commission (hereafter the Commission) is in charge of the overall coordination of the Copernicus programme. For the Emergency Management Service the coordination is shared between the Directorates-General Growth – Internal Market, Industry, Entrepreneurship and SMEs (DG GROW) as overall coordinator, Humanitarian Aid and Civil Protection (DG ECHO) and the Joint Research Centre (JRC). DG GROW leads politically and financially the Copernicus Programme including the EMS. DG ECHO ensures the operational coordination and interaction with authorised users and potential end users, in particular national civil protection authorities, humanitarian aid actors and the European External Action Service (EEAS), including the European Union Satellite Centre (SatCen). DG ECHO is also responsible for the authorisation of activations based on agreed criteria and priorities. The JRC is in charge of the technical coordination of the activities and the management of contracts. The JRC is also in charge of monitoring the activations of the service and providing support to other Commission services.

Copernicus is a user-driven programme and the information services provided are freely and openly accessible to its users, whilst safeguarding specific data and information for sensitive issues, through controlled dissemination, as foreseen in the Copernicus Regulation.

2.2. Overall scope of Copernicus EMS Mapping

The Copernicus EMS is intended as an operational service provided to the users active in the field of disaster management in the EU Member States, the European Civil Protection Mechanism, the Commission's Directorates General (DGs), the participating Executive Agencies, and international actors in humanitarian aid. Authorised Users are the only entities authorised to trigger the service; they are usually the National Focal Points acting as intermediate users between a broader user community and the Copernicus EMS. In EU Member States, the National Focal Points are nominated by the national authorities.

The implementation of the Copernicus EMS foresees different components, each having several sub-components:

1. EMS Mapping

The core character of EMS Mapping lies in the provision upon activation by the authorised user of timely and accurate information derived from satellite or airborne imaging sensor data during all phases of the disaster management cycle. The information generated can be used as supplied by the contractor (e.g. as digital or printed map outputs) or further combined with other data sources (e.g. as digital feature sets in a geographic information system (GIS)) to support geospatial analysis and decision making processes of disaster managers. The following three sub-components are in place:

- a. **Rapid Mapping:** this service and supply concerns the on-demand and fast provision of geo-spatial information in support of emergency management activities immediately following an emergency event. The service and supply provision is based on the rapid processing and analysis of (i) satellite and aerial image sensor data of varying spatial and spectral resolution and (ii) other geo-spatial raster and vector data sources.
 - b. **Risk and Recovery Mapping:** this service concerns the on-demand provision of geo-spatial information in support to emergency management activities during the phases of the disaster management cycle which are not related to the immediate response, i.e. not requiring rapid mapping delivery. In particular, information provision relates to the prevention, preparedness and reconstruction phases.
 - c. **Validation:** this service concerns the on-demand provision of actions and analysis assessing the EMS Mapping outputs and supporting its continuous improvement. It includes a wide spectrum of activities, such as field data collection, quality checks and technical validation; feedback collection and impact analysis; expert advice and recommendations for improvements and innovative services.
2. **Early Warning and Monitoring:** Its first component is the European Flood Awareness System (EFAS), delivering added value information to the national hydrological services and providing a unique overview on the current and forecast flood situation. In addition, the European Forest Fire Information System (EFFIS) supports the national services responsible for protection against forest fires in the EU member states and neighbouring countries. It also provides the Commission services and the European Parliament with information on forest fires in Europe. EFFIS has been an integral part of the EMS since 2015. In 2018 a third component for monitoring droughts was introduced under Copernicus EMS: the European Drought Observatory (EDO). All early warning and monitoring systems are continuously extended to the global scale (GloFAS for floods, GWIS for forest fires, GDO for droughts).

The specifications in this document describe the Copernicus EMS - Validation only.

3. OVERALL DESCRIPTION OF THE COPERNICUS EMS VALIDATION

3.1. Scope

The primary objective of the Validation service is to support the continuous improvement of EMS Mapping, with a wide, open and scientific approach. This is based on measures of accuracy and compliance with service specifications, user evaluation of fitness for purpose and recommendations for service evolution.

The main focus is on the Rapid Mapping and Risk and Recovery Mapping services. However other parts of the EMS can also be considered, in particular when based on satellite imagery. Other services may be analysed when pursuing the primary objective.

The most recurrent topics are product and service quality and timeliness, but several other aspects are encompassed, e.g. innovation, methodologies, technology, etc.

The service is oriented to Earth Observation and GIS. However other related domains are included, e.g. Emergency Mapping, Disaster Risk Management, (automatic) Data Processing, etc.

The most common source of data/information is space imagery. However, virtually any data or information source can be used in the validation process, e.g. aerial imagery, field surveys, social media, crowdsourced data, interviews, questionnaires, etc.

The validation process encompasses standard workflows as well as a tailored approach, depending on the specific context and aim of the validation case.

The Copernicus EMS Mapping services have a global geographic scope. Therefore, the Validation scope is global as well.

During the current and previous phase of the Copernicus EMS Mapping, users have expressed their appreciation of a validation activity, as it raises overall trust in the quality of service outputs. Service providers typically benefit from a critical assessment of their products, which may identify systematic errors, weaknesses and assist them to improve specific elements of their workflow.

The Validation service is executed on demand by the Commission, where appropriate taking into account the requests of authorized users.

3.2. Description

The essential description of the service is summarized in paragraph 1.c, page 8.

There are two types of activations for the Validation service:

1. Predefined specifications and fixed cost: this applies to the modules which cover specific topics (M1 to M4, see chapter 4). In this case the service is started by the JRC with an activation form, the specifications are pre-defined and the fixed cost is defined according to the requested quantities and to the unit price values offered by the contractor in its tender.
2. Tailored specifications and variable cost: this applies to the module which covers general topics (IM, see chapter 4). In this case the service is started by the JRC sending the technical specifications; the contractor shall send back a technical and financial offer and the variable cost is defined in the offer according to the daily rate values offered by the contractor in its tender. The technical specifications may request some tasks to be carried out according to the predefined

specifications mentioned in the previous point 1; in this case the cost of those tasks is the fixed one defined in point 1.

The service is provided during normal business (office) hours.

The validation protocol developed by the JRC (Annex D) is a guiding document for the purpose of this tender.

The service will include the handling, transfer and backup of large volume datasets; the secure and fast transmission of the deliverables (e.g. detailed reports, complete datasets) over the internet. The service includes follow-up actions with the relevant actors.

The service will not include the development and maintenance of IT tools and infrastructure which replicates the functionalities of the EMS portal, including extensions to other services and platforms.

3.3. Input data (validation reference data)

One relevant task of validation is to retrieve reference data sources that are better than the ones used in the products/processes under assessment. A wide range of sources can be encompassed, provided that they prove to be fit for the purpose, i.e.:

- **Constitute a good sample for the material under validation**
 - Representative: i.e. covering the classes/information type (ideally statistically representative samples of all classes)
 - Significant: sufficient size (ideally covering all the validated extent)
- Possess sufficient reliability: accuracy, completeness, minimal time gap, etc.
- Offer sufficient usability: e.g. possibility to access, process, extract information, etc.

3.3.1. Imagery

The main data sources for Validation are remotely sensed images. Most are derived from spaceborne sensors (referred to as satellite data in the following). When available, airborne (aerial) imagery is used. High Altitude Pseudo Satellites will be considered if available and useful.

Satellite data

Satellite data will be made available to the contractor under a separate mechanism procuring licensing for space data free of charge to the contractor. The Copernicus space data are provided under the European Space Agency's (ESA) Copernicus Space

Component Data Access mechanism (CSCDA)⁴, which is separately financed by the EU. The ESA-CSCDA includes the provision of satellite imaging sensor data of the so-called Copernicus Contributing Missions and the Copernicus Sentinel missions. The Copernicus EMS is supported with a dedicated data quota to be used for activations.

The contractor, upon registering as the new Copernicus EMS – Validation contractor, shall accept the licensing terms and conditions negotiated by ESA on behalf of the Commission⁵. The registration will be confirmed by the JRC, after which the contractor will be granted access to the relevant data categories and activation interface of the ESA-CSCDA.

In line with Articles 9 and 11 of the Copernicus Regulation and the recommendations given by the Copernicus User Forum, Member States' and international capacities will be drawn upon whenever possible in the Copernicus EMS – Validation. For example, the International Charter "Space and Major Disasters"⁶ pools its member agencies' resources to provide a unified system of space data acquisition and delivery to those affected by natural or man-made disasters through Authorised Users. In particular events, satellite imagery made accessible by other sources (e.g. the International Charter) may be integrated into Copernicus EMS – Validation (since April 2018 a cooperation agreement between the Charter and Copernicus EMS – Rapid Mapping is in place). Some countries of the EU and beyond also have the capability to acquire imagery suitable for emergency mapping. These may include imagery from aerial platforms. If these data are made available to Copernicus EMS, they will be used in the Validation.

Aerial imagery

Aerial imagery is a relevant option for the Validation service, in particular for events that require detecting high level of detail. It is not included in the ESA-CSCDA mechanism.

Aerial platforms yield significant benefits due to their higher flexibility of deployment, potential better timeliness and higher spatial resolution for orthorectified imagery and Digital Surface Models (DSMs), especially in situations that require detailed mapping of impact on high value assets. Airborne systems can offer good performance in terms of spectral resolution.

Under the Copernicus EMS, the JRC conducted a pilot study to test a possible mechanism to integrate aerial imagery from manned or unmanned platforms into the Copernicus EMS service and supply context. In the future, this capacity might become an operational element of Copernicus EMS (outside this contract). When available, this imagery can be used in the validation process, free of charge. The contractor shall use it solely for the purpose of the contract and will not keep copies after the completion of the deliverables.

⁴ <https://spacedata.copernicus.eu> and for the data offer <https://spacedata.copernicus.eu/web/cscda/data-offer>

⁵ <https://spacedata.copernicus.eu/web/cscda/data-offer/legal-documents>

⁶ <http://www.disasterscharter.org/home>

High Altitude Pseudo Satellites

Also called High Altitude Platform Stations, HAPS are quasi-stationarity stratospheric platforms that stay at an altitude of approximately 20 km. Industry and research institutions are working to optimise their parameters (mission duration, weight, payload, power autonomy, etc.) in order to make them (more) effective for operational use. In case HAPS services useful for generating reference data will be available for Copernicus EMS, the Validation service will consider their use.

3.3.2. Field surveys

Field surveys are one of the most valuable sources for building reference datasets to be used in accuracy estimation. These datasets are often referred to as ground truth. Field surveys may be performed in the scope of the Validation service, following predefined specifications or tailored to the specific case.

3.3.3. European geospatial authoritative datasets (reference data)

The Copernicus In-situ Component⁷ maps the landscape of in situ data availability, identifies data access gaps or bottlenecks, supports the provision of cross-cutting data and manages partnerships with data providers to improve access and use conditions. Most European Countries signed an agreement to facilitate free access to authoritative geospatial reference data exclusively for Copernicus EMS activities. European Countries which signed the agreement have established and provided access details of national geospatial reference data such as (in order of priority):

- orthophotos, (resolution ≤ 50 cm);
- raster topographical maps 1:50,000 or better;
- georeferenced datasets in vector format (administrative boundaries, transportation infrastructure, settlement boundaries and toponyms, hydrographic network, etc.);
- digital elevation models (DEM) and digital surface models (DSM) with grid spacing 1m – 25m.

Access will be granted to the contractor on the following terms:

- The Copernicus EMS – Validation contractor's right to use national geospatial reference data shall be limited to the purpose of creating Copernicus EMS – Validation products.

⁷ <https://insitu.copernicus.eu/>

- When national geospatial reference data is used by the contractor, the source of the data shall be credited.
- When national geospatial reference data can be recreated by end-users from information included in products, this information may only be used for non-commercial or public task in emergency management.

No other use or dissemination of national geospatial reference data is allowed.

3.3.4. CORDA⁸

CORDA (Copernicus Reference Access Data) is a single entry point node to the relevant national and regional geospatial reference data. This node provides an index of URLs to the relevant for Copernicus services and digitally available national and regional reference data and services across Europe and is restricted to access by Copernicus services providers only. As the coordinating body, the European Environment Agency ensures that only authorised users, namely Copernicus service providers, are provided access to the index of URLs.

3.3.5. Social media and crowd sourcing

Information from existing mechanisms and platforms, in particular from social media, may be useful in the Validation tasks, in particular for their timeliness. Internet-based technology supporting distributed analysis tasks, such as crowd mapping and crowd sourcing, is providing novel mechanisms to generate valuable information of interest in emergency contexts. These innovative information sources can be used in the Validation process, provided they prove to be of the necessary reliability and accuracy. Integration in the final products should be agreed in advance with the Commission.

3.3.6. Ancillary data

Several types of ancillary data support and complement validation activities. Information on population density and vulnerability, infrastructural assets, building type and resilience, land cover and land use, transport networks, elevation and gradient, geomorphological, hydrological, meteorological and climate data are all relevant in varying degrees. These are especially relevant for disaster risk management and mitigation planning, as they provide the essential data for risk model parameters such as hazard exposure and vulnerability. In this context, a time series of data is also very useful as a source of information on the location, frequency and severity of events such as floods, fires and earthquakes. This is the rationale behind Copernicus's emphasis on providing data for long-term monitoring of environmental variables and disasters.

⁸ <https://corda.eea.europa.eu>

Copernicus activities in the other service domains are increasingly relevant to Copernicus EMS. In particular the Copernicus Land monitoring service is a generator of thematic information layers that may assist Copernicus EMS – Validation in analysis and integration tasks under this contract. Global and European land use/land cover data sets, such as CORINE, Urban Atlas and High Resolution Layers, the products related to the Global Human Settlement Layer GHSL⁹, the EU-DEM as well as socio-economic data are useful to estimate affected assets and population. Also important to Copernicus EMS are long-term forecast of temperature and rainfall anomalies provided by the European Centre for Medium-Range Weather Forecasts (ECMWF). These are key data sets and models on which the European Forest Fire Information System (EFFIS) and the European Flood Awareness System (EFAS) rely.

3.3.7. Other sources

In addition to the above mentioned ones, virtually any data or information source can be used in the validation process, provided that it proves to be fit for the purpose. By way of example, other sources can be: interviews, questionnaires, geo-tagged pictures, media reports, literature, etc.

3.3.8. Equivalent or better data sources

In addition to the data provided by the Commission, the contractor can make use of equivalent or better data sources provided that:

- (i) their licensing conditions are equivalent or better,
- (ii) they are free of charge for the service,
- (iii) they do not create additional administrative burden,
- (iv) they are properly credited.

It shall be for the contractor to justify this equivalence or improvement.

4. DESCRIPTION OF THE TASKS COVERED BY THE CONTRACT

Each request for service may include any of the following service modules:

Module 1 (M1): Field survey;

Module 2 (M2): Quality checks;

Module 3 (M3): Feedback collection;

⁹ <http://ghsl.jrc.ec.europa.eu/datasets.php>

Module 4 (M4): Expert advice;

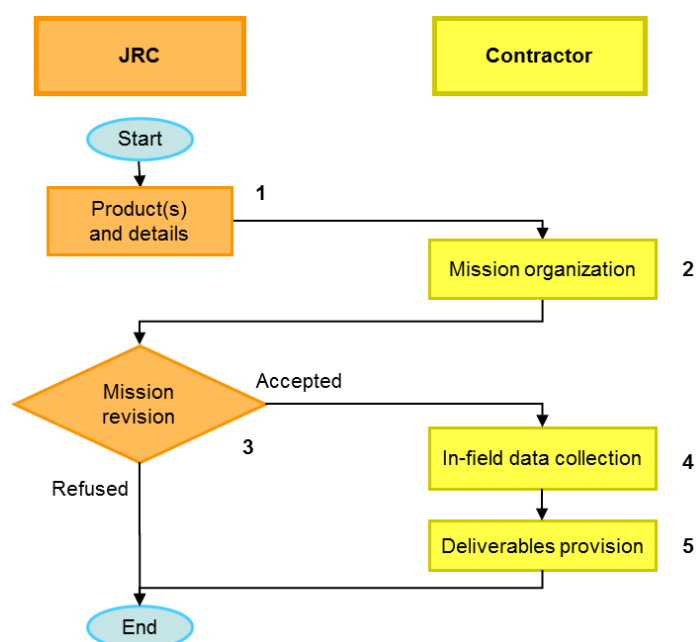
Integrated Module (IM).

In the following, workflow and timeline for each task are defined.

4.1. M1: Field survey

Subject to a request for service, the contractor shall perform a field survey in order to collect data with the aim of validating the geospatial information contained in the product(s) under validation.

4.1.1. Workflow



1. The JRC sends to the contractor the request for service (activation form) and the link to the product(s) under validation. The JRC may propose a set of Check Points (CPs) to be collected on the ground for positional accuracy and a set of CPs for thematic accuracy.

2. The contractor

Confirms activation form within 2 (two days) and organizes the mission preparing the following:

- In case the JRC proposed CPs, the contractor may accept or review those CPs. In case the JRC did not propose CPs, the contractor is requested to prepare its own set of CPs describing the section criteria. In any case the contractor sends a statement on the acceptance or revision of the CPs;

- A plan of the mission: name of the participants, schedule (travel times, number of in-field data collection days), etc.

Sends the mission organization (bullet points above) to the JRC.

3. The JRC shall approve or revise the mission organization and may:
 - Accept the mission organization and send an activation form;
 - Refuse the mission organization and end the procedure;
 - Ask the contractor for clarifications or a revised version.
4. When the JRC dispatches an activation form, the contractor signs the activation form and sends it back, then performs the field survey.
5. The contractor provides the deliverables to the JRC.

Table 1: Timeline for service provision in M1

Step	JRC Request for service (1)	Contractor Confirms Activation form sends mission organization (2)	JRC acceptance/rejection (3)	Contractor is in-field (4)	Contractor delivers (5)
Duration		Max 2 days From (1)	Max 1 day From (2)	Max 2 days From (3)	Max 10 days From end of the mission

This module may be activated only for map scales between 1:50,000 and 1:2,000 (extremes included).

4.1.2. Typical tasks

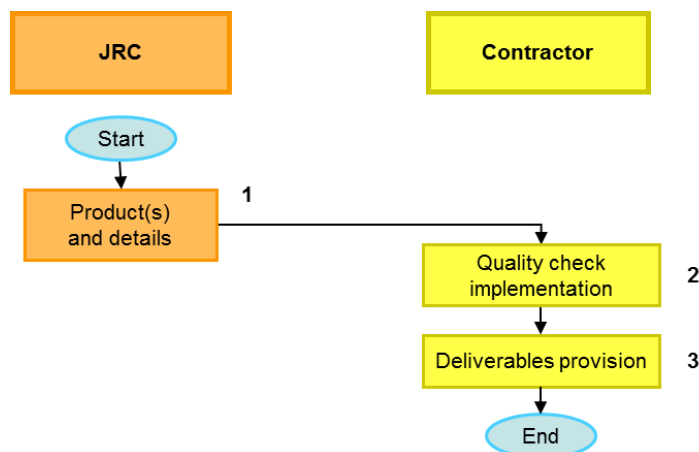
- Planning, execution of and reporting on the field survey;
- Sampling strategies: appropriate choice of the sample CPs also considering the expected accessibility;
- Event specific survey methodology;
- Liasing with national authorities;
- Asking permission to enter property to survey ground check points;
- Planning routes considering accessibility;

- Placing a DGPS ground station (when relevant);
- Collection of positional CPs and related pictures;
- Collection of thematic CPs and related pictures. CPs are suitable to be used for thematic accuracy computation;
- Meeting with local end users/experts/authorities in order to collect feedback, specific requirements, (logistic) advice and possibly already executed field surveys (aerial, GPS, etc. if available);
- Generation of deliverables: Field Survey Report (M1_FR) and Geospatial Information (M1_GI) (see chapter 6);
- Provision of deliverables via SFTP.

4.2. M2: Quality Checks

Subject to a request for service, the contractor shall perform a set of standard quality checks on Mapping deliverables.

4.2.1. Workflow



1. The JRC sends to the contractor the request for service (activation form) listing the product(s) under validation and the requested quality checks.
2. The contractor signs the activation form and sends it back; then seeks and if possible retrieves the needed data; finally implements the feasible checks.
3. The contractor provides the deliverables to the JRC.

Table 2: Timeline for service provision in M2

Step	JRC Request for service (1)	Contractor sends back the signed activation form (2)	Contractor delivers (3)
Duration		Max 1 days From (1)	Staged delivery defined in annex B From (1)

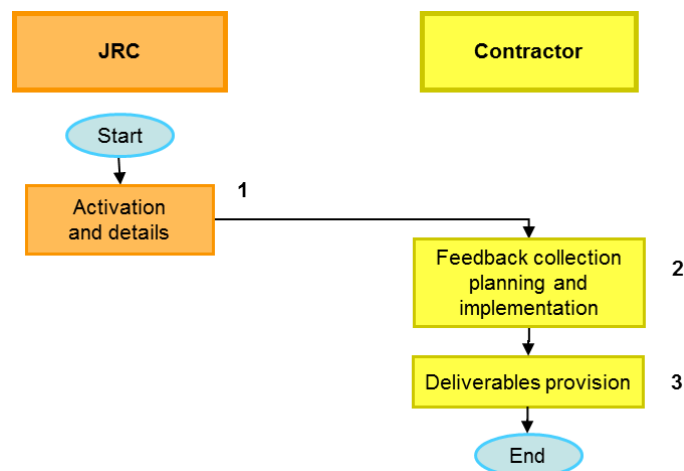
4.2.2. Tasks

- Collection and check of Copernicus EMS Mapping deliverables under validation;
- Checks on the sensor choice and acquisition procedure;
- Analysis of deliverables: completeness, consistency, correctness, readability checks;
- Retrieval/collection/download of suitable validation reference data;
- Quality checking and pre-processing of data using visual interpretation, GIS and image processing tools;
- Analysis – using visual interpretation, GIS and image processing tools – of data and extraction/generation of relevant and event dependent information (normally crisis information);
- Information/data comparison to compute positional and thematic accuracy;
- Generation of deliverables: Outcomes of the Quality Checks (M2_OQ) and Geospatial Information (M2_GI) (see chapter 6);
- Provision of deliverables M2_OQ in OLS and M2_GI via SFTP;
- The tasks are detailed in Annex B.

4.3. M3: Feedback collection

Subject to a request for service, the contractor shall perform a feedback collection regarding Mapping activations.

4.3.1. Workflow



1. The JRC sends to the contractor the request for service (activation form) with the link to the activation under validation, the requested tasks and the contacts of the person(s) who will give feedback.
2. The contractor signs the activation form and sends it back. The contractor plans and implements the feedback collection.
3. The contractor provides the deliverables to the JRC.

Table 3: Timeline for service provision in M3

Step	JRC Request for service (1)	Contractor sends back the signed activation form (2)	Contractor delivers (3)
Duration		Max 2 days From (1)	Max 20 days From (1)

4.3.2. Tasks

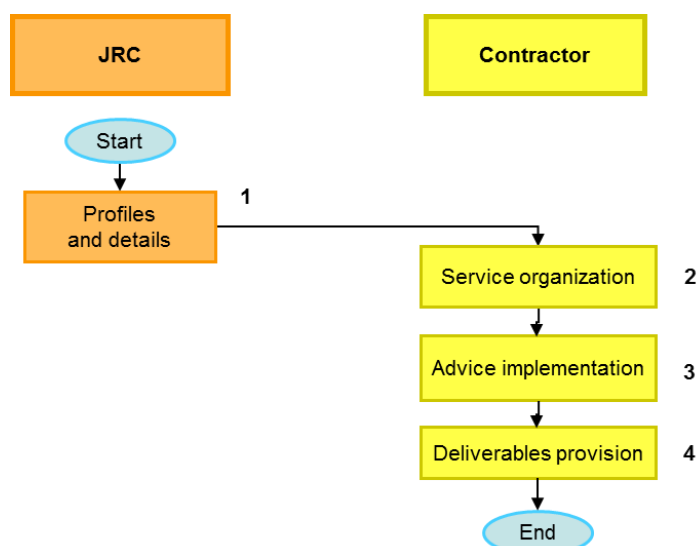
- Collection and visual inspection of Copernicus EMS Mapping deliverables under validation;
- Contact with users and planning of feedback collection;
- Review of alternative (with respect to Copernicus EMS Mapping) emergency event information; analysis and comparison of value added elements and weaknesses of the EMS Mapping deliverables;
- Execution of user feedback collection through interviews with remote connection (e.g. videoconference, telephone, etc.);
- Generation of deliverables: Outcomes of Feedback Collection (M3_OF) and Geospatial Information (M3_GI) (see chapter 6);

- Provision of deliverables M3_OF in OLS and M3_GI via SFTP;
- The detailed definition of the tasks is reported in Annex C.

4.4. M4: Expert advice

Subject to a request for service, the contractor shall provide expert advice on the topics in the scope of the contract in terms of days of professionals from different profiles. The minimum time request is for half a day. The service will normally be requested in Europe and in most cases at the contractor's premises, in Brussels, or in the Ispra area. The service can also be requested via remote connection.

4.4.1. Workflow



1. The JRC sends to the contractor the request for service (activation form) with the requested profiles, the number of days, the requested dates and the place of the service provision.
2. The contractor signs the activation form and sends it back. The contractor organizes the service provision, including the logistics when applicable (e.g. missions). Logistic organization for the Commission participants is not included in the contractor's tasks.
3. The contractor implements the advice provision, i.e. the requested profiles provide advice in the requested place.
4. The contractor provides the deliverables to the JRC.

Table 4: Timeline for service provision in M4

Step	JRC Request for service (1)	Contractor sends back the signed activation form (2)	Contractor implements advice (3)	Contractor delivers (4)
Duration		Max 4 days From (1)	Min 15 Max 30 days From (1)	Max 5 days From end of (3)

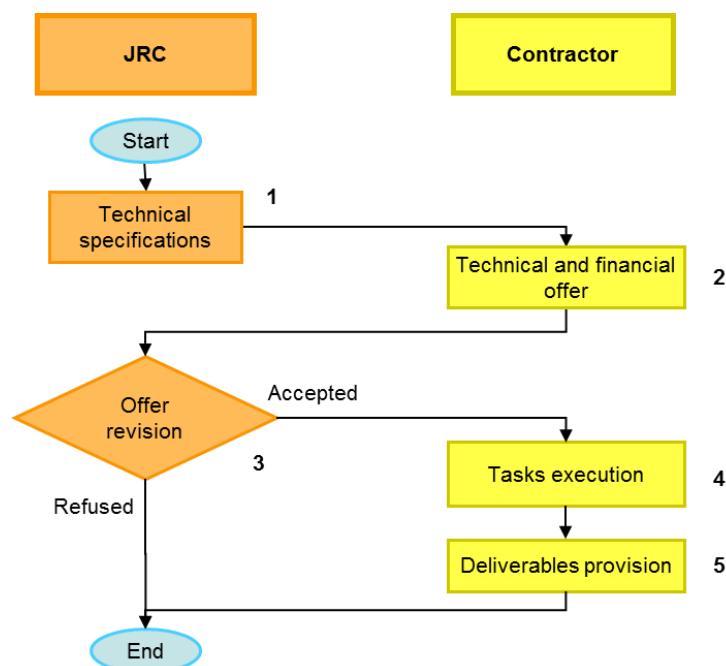
4.4.2. Typical tasks

- Design and generation of consistent and structured advice on topics in the scope of the contract;
- Data processing and analysis on sample data as prototype or proof of concept;
- Writing of high quality documents summarizing advice and associated recommendations;
- Planning and execution of missions;
- Participation in meetings, e.g. with Commission staff, Member States staff, authorized/end users/experts/authorities, etc.;
- Generation of deliverables: Summary advice/Minutes of the Meeting (M4_SM) and possible Geospatial Information (M4_GI) (see chapter 6);
- Provision of deliverables M4_SM and M4_GI via SFTP.

4.5. Integrated Module (IM)

Subject to a request for service, the contractor shall perform a validation exercise. This module covers the full scope of the Validation Service.

4.5.1. Workflow



1. The JRC sends to the contractor the request for service (technical specifications), including the link to the product(s) under validation and possible additional materials.
2. The contractor prepares and sends to the JRC a technical and financial offer for the execution of the task encompassed in the technical specifications. The offer shall contain:
 - Administrative information; e.g.: contractor's identification, dates, reference to the framework contract and technical specifications, etc.;
 - The technical offer for the execution of the tasks; e.g.: approach, data, methods, processing, feedback collection and analysis, workflow, timeline, etc.;
 - The financial offer, detailed in a table presenting tasks and subtasks in the rows, the professional profiles (P1 to Pn) in the columns and the corresponding needed effort in man-days in the cells. The following table shows this structure:

Table 5: Structure of the financial offer in the IM

Tasks and subtasks	P1	P2	P3	...	Pn	Total days
Task 1						
- Subtask 1.1						
- Subtask 1.2						
- ...						
Task 2						

- Subtask 2.1						
- Subtask 2.2						
- ...						
...						
- ...						
Total days						
Daily rates						
Total cost						
Grand total cost						

3. The JRC shall revise the offer and may:
 - Accept it and prepare a specific contract; then send it to the contractor for signature;
 - Refuse the offer and end the procedure;
 - Ask the contractor for clarifications or a revised version.
4. The contractor signs the specific contract and sends it back, then executes the requested tasks.
5. The contractor provides the deliverables to the JRC.

Table 6: Timeline for service provision in the IM

Step	JRC Request for service (1)	Contractor sends the offer (2)	JRC sends the specific contract or refusal or request for a revised version (3)	Contractor sends back the signed contract (4)	Contractor delivers (5)
Duration		Max 10 days for version 1 - unless otherwise specified in the request for service From (1) Max 3 days for revised versions - unless otherwise specified in the request for revision From (3)		Max 5 days From contract reception (3)	Max 20 days - unless otherwise specified in the request for service From the specific contract signature (4)

4.5.2. Tasks

This module covers the full scope of the contract; therefore the possible tasks are diverse in nature. The following list is indicative.

Preparation

- Collection and analysis of Copernicus EMS Mapping deliverables under validation;

Field surveys

- Tasks mentioned for M1;
- In this module, the tasks may be tailored to the specific case and conducted in the time frame described in the request for service and not in the one described in section 4.1 (M1).

Quality checks and technical validation

- Checks on the sensor choice and acquisition procedure;
- Analysis of deliverables: completeness, consistency, correctness, readability;
- Retrieval/collection/download of suitable validation reference data (see paragraph 3.3);
- Quality checking and pre-processing of data using visual interpretation, GIS image processing and data management tools;
- Analysis – using visual interpretation, GIS, image processing, modelling and data management tools – of data and extraction/generation of relevant and event dependent information. This may be applied to:
 - The data used for the products under validation, thus generating a “reprocessed product”;
 - The best available validation reference data in order to generate reference datasets;
 - Risk modelling;
 - Any other data for specific purposes;
- Detailed comparison – using visual interpretation, GIS, image processing and data management tools – between datasets. The comparison includes computation of positional and thematic accuracy. A typical example is the comparison between Copernicus EMS products and reference datasets;

- Appropriate choice of check points for positional accuracy, in terms of number and location;
- Appropriate sampling strategy when relevant, i.e. choice of the area or the points included in the computation of thematic accuracy for the most reliable and balanced estimation with the available validation reference data;
- Analysis of the results of the comparison and checks;
- Production of validation outputs, relevant digital geospatial feature sets, processed imagery, etc.;

Feedback collection and impact analysis

- Review of alternative (with respect to Copernicus EMS Mapping) emergency event information data/sources/products publicly available and effectively available to the user;
- Analysis of the emergency context and comparison of value added elements and weaknesses of the EMS Mapping deliverables with respect to alternative information which is publicly available and available to the user;
- Contacts with users and planning of feedback collection;
- Execution of user feedback collection, which may include questionnaires, telephone interviews and face-to-face meetings, etc.;
- Assessment of the impact of the EMS products on the user workflow, including (i) estimation of time and cost reduction (or increase) due to the availability of the products; (ii) estimation of emergency support effectiveness due to the availability of the products; (iii) error propagation analysis, i.e. the propagation of product errors into the user workflow;
- Analysis of the results;
- Production of feedback/impact outputs, digital geospatial feature sets (when relevant), etc.;

Expert advice and improvements

- Proposal of innovation or improvements to the overall validation process, detailing the aim, implementation measures and result indicators;
- Definition, application, analysis and comparison of alternative methodologies (e.g. alternative data sources, tools, algorithms, models);
- Integration of innovative technologies, e.g. crowd sourced data, social media, cloud computing, artificial intelligence, location-based services in the EMS;

- Participation in project meetings;
- Service performance analysis;
- Literature review;
- Provision of technical feedback and recommendations;
- Reporting.

Deliverables

- Generation of deliverables: Validation Report (IM_VR), Short Validation Report (IM_SVR) and Geospatial Information (IM_GI) (see chapter 6). When the service request encompasses Quality Checks and Feedback Collection, the related outcomes correspond to M2_OQ and M3_OF respectively and are identified altogether as IM_SO.
- Provision of deliverables IM_SO in OLS, IM_VR, IM_SVR and IM_GI via SFTP.

General

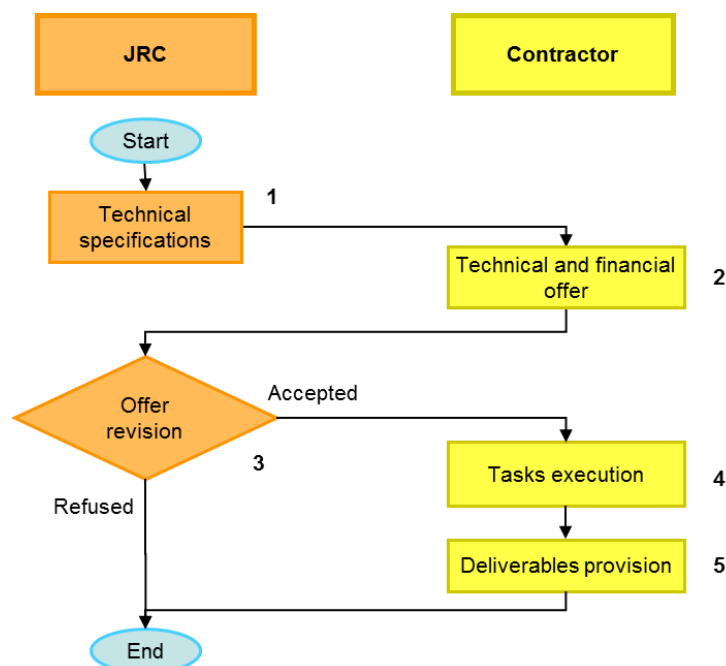
- Planning, coordination, teamwork.

The validation process shall reach and improve the quality and level of detail of the approach proposed in the JRC validation protocol (Annex D).

4.6. Regular reports

Subject to a request for service, the contractor shall provide regular reports as specified below.

4.6.1. Workflow



1. The JRC sends to the contractor the request for service (technical specifications).
2. The contractor prepares and sends to the JRC a technical and financial offer for the execution of the task encompassed in the technical specifications. The offer shall contain:
 - Administrative information; e.g.: contractor's identification, dates, reference to the framework contract and technical specifications, etc.;
 - The technical offer for the execution of the tasks;
 - The financial offer, detailing the needed effort in man-days for the professional profiles (P1 to Pn)
3. The JRC shall revise the offer and may:
 - Accept it and prepare a specific contract; then send it to the contractor for signature;
 - Refuse the offer and end the procedure;
 - Ask the contractor for clarifications or a revised version.
4. The contractor signs the specific contract and sends it back, then executes the requested tasks.
5. The contractor provides the deliverables to the JRC.

Table 7: Timeline for service provision in the regular reporting

Step	JRC Request for service (1)	Contractor sends the offer (2)	JRC sends the specific contract or refusal or request for a revised version (3)	Contractor sends back the signed contract (4)	Contractor delivers (5)
Duration		<p>Max 10 days for version 1 - unless otherwise specified in the request for service</p> <p>From (1)</p> <p>Max 3 days for revised versions - unless otherwise specified in the request for revision</p> <p>From (3)</p>		<p>Max 5 days</p> <p>From contract reception (3)</p>	<p>Max 10 days unless otherwise specified in the request for service</p> <p>From (4) or from the end of the reporting period</p>

4.6.2. Tasks

Annual Report (AR)

The Contractor shall provide an annual report to the JRC (only if one or more requests for services were executed in the reporting period). The report, shall be based on complete and accurate information.

The annual report shall include:

- A summary of the service requests for service carried out during the year, detailing the product(s) validated and the service modules encompassed.
- A summary of the results for the different types of tasks:
 - Checks/validation: the performance parameters of EMS mapping deliverables (reliability, consistency, usability, efficiency, etc.).
 - Feedback collection: the added value and impact on the user workflow of Copernicus EMS Mapping products.
 - Expert advice: elements related to the specific service requests.
- A technical review summary: instruments used, methodologies applied, validation reference data used, etc.

- A summary of the evolution of Copernicus EMS Mapping: products enhancements, uptake of new developments, incorporation of validation findings, etc.
- A summary analysis of the EMS Mapping Validation service. Evolution in the execution of the Validation service tasks, difficulties, problems, risks, suggested improvements.

Quarterly Reports (QRs)

The reports, based on complete and accurate information at the end of the reporting period, shall be succinct and delivered according to the following table:

Deliverable	Reporting Period
QR1	Jan, Feb, Mar
QR2	Apr, May, Jun
QR3	Jul, Aug, Sep
QR4	Oct, Nov, Dec

The quarterly report shall include:

- A comprehensive count per module of the activations carried out during the reporting period;
- For each M1, M4 and IM activation:
 - the main tasks carried out;
 - Possible observations, suggestions, problems, notes, etc. regarding the survey / products under validation / specific topic;
- Possible observations, suggestions, problems, notes, etc. regarding the service execution.

Recommendation Table (RT)

The contract execution will generate recommendations for the improvement of Copernicus EMS, mainly coming from M3, M4 and IM but in general from all contractual activities. The contractor will collect them regularly (as soon as they are available and by the deadline of the QRs latest) in a recommendation table, with the following structure (or similar): source of the recommendation, category of the recommendation (more classification levels), date, recommendation. The final format of the table shall be agreed with the Commission at contract start.

4.7. Ordering process

4.7.1. Modules 1, 2, 3 and 4: Provisional Order form and Activation form

The following procedure will be put in place:

- a) Provisional Order form: serves to allocate a budget commitment for an estimated number of services and is issued for an estimated amount covering one year. The Order Number is as assigned by internal JRC applications (ABAC or JIPSY).
- b) Activation Form and Revised Activation Form:

Activation forms serve to order defined services. The Activation Forms are identified with the Activation ID generated by the online logging system (OLS). They are downloaded in OLS by the contractor.

The contracting authority issues:

- the Activation Form for requesting the service. The contractor must confirm the Activation Form acceptance by providing the signed activation form to the Commission;
- the Revised Activation Form at service closure when the delivered products have been checked. This activation form is used as a basis for the invoicing.

4.7.2. Module IM & regular reporting: Technical specifications, Offer and Specific contract

The specific tasks, timing and volume of the services cannot be specified in advance. For each activation, the request is variable and will be defined by the following steps:

- a) the JRC sends a request for service including the Technical specifications of the requested service;
 - for IM, this request may include activations of modules 1,2 and 3; in this case:
 - the tasks are defined in the modules
 - the costs are the ones of the modules
 - the timeline shall be defined in the technical specifications
- b) the contractor provides a technical and financial offer within the requested time;

- c) if the offer is accepted, the JRC prepares a specific contract, signs it and sends it to the contractor for acceptance. The contractor, in turn, sends the signed contract back to the JRC.

4.8. Timing

The timeline for the service provision (acceptance, offers, deliverables, etc.) is defined in the paragraphs of chapter 4 describing the modules.

The timing is expressed in working days according to the calendar of the Country of the leading contractor. The contractor will make this calendar available to the JRC at the start of the contract and by the 10th of December for the following years.

4.9. Cost of the service

The following table details how costs are accounted for with respect to the modules composing the validation service.

Service Module	Cost of the personnel, equipment and materials.	Travel costs and subsistence expenses related to missions
M2	Application of the costs offered by the contractor in his tender (see also the Administrative Annex and Annex B).	Not applicable
M3	Application of the costs offered by the contractor in his tender (see also the Administrative Annex and Annex C).	
M1	Application of the costs offered by the contractor in his tender (see also the Administrative Annex and Annex E).	Application of the flat rates for travel costs and subsistence expenses offered by the contractor in his tender (see also Administrative Annex).
M4	Application of the daily rates offered by the contractor (see also the Administrative Annex) for the effective meeting days (rounded to units of half days), excluding travelling time.	
IM	Application of the specific offer provided by the contractor. The daily rates applied for the staff profiles are the ones offered by the contractor.	
Regular reports	Application of the specific offer provided by the contractor. The daily rates applied for the staff profiles are the ones offered by the contractor.	Not applicable

The daily rates account for all costs of the personnel, overheads, equipment and materials. They are **fixed amounts in Euro (€), offered by the tenderer in the financial offer**. A daily rate **DR.P_X** is requested for each profile P_X (X =1..N; where N is the number of profiles) listed in the selection criteria.

The flat rates for travel costs and subsistence expenses are defined as follows:

- a) Rate for travel costs: a lump sum covering all the travel expenses (roundtrip) for one person. Two values are expected: TC_{INEU} for travelling in Europe (i.e. European Union Member States) and TC_{OUTEU} outside Europe;
- b) Rate for Subsistence Expenses: a lump sum SE covering hotel, food, and any other expense related to the mission stay for one person per day. The number of persons and of effective meeting/survey days (rounded to half days), excluding travelling time, shall entitle the mission performer to the corresponding number of SE units.

The parameters TC_{INEU}, TC_{OUTEU} and SE are **fixed amounts in Euro (€), offered by the tenderer in the financial offer**.

The combination of travel costs and subsistence expenses accounts for all mission related costs. No other claim is possible and the tenderers cannot propose alternative formulas or parameters.

Example 1: two persons travel in Europe for a 1-day meeting. Regardless of whether they stay no nights / one night / two nights in hotel, the contractor will be entitled to receive the following:

$$\text{Travel costs and subsistence expenses related to the mission} = 2 * (\text{TC}_{\text{INEU}} + 1 * \text{SE})$$

Example 2: two surveyors travel in Europe for a 2-day field survey (M1). They carry instruments as extra baggage. Regardless of whether they stay one night / two nights / three nights in hotel, the contractor will be entitled to receive the following:

$$\text{Travel costs and subsistence expenses related to the mission} = 2 * (\text{TC}_{\text{INEU}} + 2 * \text{SE})$$

Important remark: the **value of the parameters DR.P_X (X=1..N), TC_{INEU}, TC_{OUTEU} and SE are essential inputs to the contract award procedure** (see Administrative Annex).

4.10. Volumes and capacity

The volume of requests is not fixed and predictable. However, a simulated yearly volume is given in the "Annex 6 of the TENDER SPECIFICATIONS -Part 1: Administrative specifications" available on the Tendering website, for the aim of computing the financial offer. Those numbers are purely indicative of the order of magnitude of the expected volume of activations.

The following table shows the required capacity of the contractor to carry out, within the specified deadlines, concurrent activations.

Service Module	Required capacity
M1	1 activation at a time
M2	<p>For Rapid Mapping, in 2 days:</p> <ul style="list-style-type: none"> • 2 requests to check vector packages • 3 requests to check ready to print maps • 1 requests to check an activation extent map <p>For Risk and Recovery, in 5 days:</p> <ul style="list-style-type: none"> • 4 requests to check anyone of the following: vector data, tabular data, map, metadata <p>For Risk and Recovery, in 10 days:</p> <ul style="list-style-type: none"> • 1 request to check raster data
M3	2 concurrent activations
M4	1 activation at a time
IM	2 concurrent activations

4.11. Data policy and dissemination

The Commission will be in charge of applying a specific Data and Information Policy to the outputs of the Emergency Management Service, including mapping validation. The products will be disseminated under the responsibility of the Commission with the logo of the European Union and the Copernicus Programme. The placement of any additional logo must be explicitly authorised *a priori* in writing by the Commission.

The detailed modes of exploitation of these products and intellectual property rights are governed by the framework service contract.

The Contractor may decide to attend meetings or conferences with the purpose of presenting and promoting the Copernicus EMS Mapping Validation service activities at its own cost. Participation to such meetings and content has to be approved, *a priori* and in writing, by the Commission.

5. SUPPORT TO SERVICE IMPLEMENTATION

5.1. JRC SFTP

The JRC will provide an SFTP site for the exchange of documents (e.g. input materials, deliverables). The SFTP site will have a directory structure named after the unique activation ID with a number of sub-directories for each of the requested deliverables.

The detailed organization of the SFTP will be discussed after contract signature.

5.2. The Copernicus EMS Mapping Portal

The aim of the Copernicus EMS Mapping Portal¹⁰ and embedded web services is to provide access to all products and documentation of EMS Mapping. The development and maintenance of the EMS Mapping Portal is under the responsibility of JRC. It is fully owned by the Commission, this way the Commission keeps all intellectual property rights and freedom to modify the portal whenever necessary and to transfer the portal to another entity if needed. The portal is developed using Open Source software and the routines are developed in-house. The portal serves all map products as files with OGC compliant formats. The validation deliverables will be uploaded to the portal by the JRC.

5.3. The JRC Online Logging System (OLS)

The JRC has developed the OLS to manage and track the flow of the EMS Rapid Mapping activations. The OLS contains key information for each activation, e.g. the main characteristics of the products and of the related satellite images, the time stamps of the workflow steps. An analogous OLS will be developed for the EMS Risk and Recovery Mapping.

The contractor will access the OLS for accomplishing the requested tasks, e.g.:

- retrieving detailed information on the products under validation;
- registering the standardized outputs (M2_OQ, M3_OF, IM_SO), etc.

5.4. The ESA-CSCDA mechanism

Copernicus EMS - Rapid Mapping makes use of the Copernicus space component data provided through the ESA-CSCDA mechanism, as described in the Data Access Portfolio (DAP) website¹¹ and Document¹². This data provision is separately financed under a delegation agreement between ESA and the Commission. The ESA-DAP has been in place since June 2011 and is regularly updated to reflect the development of the space component and evolving user requirements. The most recent version is available on the ESA website (v2.5 from December 2018) and the contractor should consult it for the technical parameters of the satellite imagery. The data offer is expected to evolve during the duration of this contract. It is expected to include extended data supply provisions and revised performance criteria, in particular those that are relevant for the execution of the various Copernicus EMS Mapping modules.

¹⁰ www.emergency.copernicus.eu/mapping

¹¹ The link available at this URL - <https://spacedata.copernicus.eu/web/cscda/data-offer/add-datasets>

¹² <https://spacedata.copernicus.eu/documents/12833/14545/DAP+Document+-+current/c2449218-3ed9-434a-b32c-edfbb95b9362>

The ESA-CSCDA currently includes the provision of satellite imaging sensor data of the so-called Copernicus contributing missions (CCM), and the Copernicus Sentinels missions as soon as they are available.

The following mission groups are defined:

- **Mission Group #1:** high & very high resolution SAR imaging missions with different radar bands for all weather, day/night and interferometry applications
- **Mission Group #2:** high resolution multi-spectral optical imaging missions
- **Mission Group #2b:** very high resolution optical multi-spectral imaging missions
- **Mission Group #3:** medium-resolution land & ocean monitoring missions (i.e. wide swath ocean colour and surface temperature sensors, altimeters)
- **Mission Group #4:** geostationary atmospheric missions
- **Mission Group #5:** low earth orbit atmospheric missions

The resolution classes are defined as follows:

- VHR1 Very High Resolution 1 where: resolution $\leq 1\text{m}$
- VHR2 Very High Resolution 2 where: $1\text{m} < \text{resolution} \leq 4\text{m}$
- HR1 High Resolution 1 where: $4\text{m} < \text{resolution} \leq 10\text{m}$
- HR2 High Resolution 2 where: $10\text{m} < \text{resolution} \leq 30\text{m}$
- MR1 Medium Resolution where: $30\text{m} < \text{resolution} \leq 100\text{m}$
- MR2 Medium Resolution where: $100\text{m} < \text{resolution} \leq 300\text{m}$
- LR Low Resolution where: resolution $\geq 300\text{m}$

Missions groups #1 and #2 are most relevant to Copernicus EMS Mapping activations, and in particular sensors with resolution classes VHR for Validation.

The contractor of the Copernicus EMS – Validation registers with ESA-CSCDA as an authorised user for the duration of the contract. This registration will be authenticated by the JRC. The contractor may be requested to set up user accounts with each of the CCMs, to facilitate direct delivery via the CCM's FTP site.

The current procedure for ordering and accessing the data from the ESA-CSCDA is summarized in the following points, and more formally specified in Annex F (note that the procedure may evolve in the future to improve the timeliness of the service and supported with automated tools):

1. The Contractor opens an ESA-CSCDA request by submitting a Service Project Data Request Form (SPDRF), detailing the requirements (area of interest, mission group and resolution class of the required data, etc.).

2. Based on the requirements, the ESA-CSCDA operator identifies the CCM(s) to be activated and orders (i) archive data over the area of interest, (ii) new acquisitions (when requested) over the area of interest.
3. The ESA-CSCDA operator collects feedback from the CCM(s) about request feasibility and confirms one or more contributions, after consultation with the Contractor in case of deviation from the original SPDRF request details.
4. The ESA-CSCDA operator creates the data dossier describing what will be made available to the contractor.
5. The ESA-CSCDA operator monitors the production (and planning) activities at the CCM and notifies the contractor of any processing (or acquisition) failure (via email).
6. CCM imagery for Validation will become available at the CCM (FTP pull by user).

The ESA-CSCDA has established a quota management system for each of the Copernicus services. The Commission will define the quota needs for the Copernicus EMS – Validation service implementation based on the experience from past EMS operations and based on the inputs from the contractor.

The contractor shall be aware of the constraints applicable to the ESA-CSCDA procedure including specific elements of performance of CCMs, e.g. fixed tasking deadlines, delivery speeds and tasking priority conflicts.

Please note that the ESA-CSCDA mechanism is constantly under revision and actual changes cannot be foreseen. Expected changes might affect tasking request handling and access mechanisms to CCMEs platforms (possibly providing direct access especially to archive imagery). Changes might also apply to the set of available sensors as well as the licensing conditions which may be slightly extended.

Tenderers who expect to be active as a CCM or affiliated companies under the ESA-CSCDA implementation shall provide a proof, stating that (and how) there is no conflict of interest arising from their involvement in both contracts. The supply of data to ESA-CSCDA has to be completely independent from the provision of Copernicus EMS – Validation Service.

5.5. Other data sources

Other sources, e.g. imagery from the EMS aerial component and European geospatial authoritative datasets (reference data) are detailed in paragraph 3.3.

6. SPECIFICATION OF DELIVERABLES

In case the tender is submitted on behalf of a consortium, the lead contractor will ensure consistency of deliverables across the consortium. All issues arising from a defect in deliverables will only be communicated to the lead contractor.

The Contractor shall provide all deliverables as detailed in this document and – when applicable – in the specific contract.

6.1. Languages

Deliverables are provided as digital documents and data sets via electronic systems (e-mail, SFTP) to JRC at Ispra, Italy. Documents, data sets and annotations must be provided in English by default.

6.2. Place of work

The execution will be performed at the Contractor's premises. The missions for M1 and M4 (and in case for IM) will be normally requested for locations inside Europe.

6.3. Formats

6.3.1. Documents

All contractor's documents have to be made available as Microsoft Office or Open Office compatible documents (or equivalent) and in PDF electronic format. All documents transmitted by the contractor must contain, at least, the Commission's references (framework contract number, order and activation reference), the type of document and revision history).

They need to be properly structured, complete, accurate, concise and in grammatically correct and clear English. The documents must be of high quality, similar to those produced for publication in a peer-reviewed journal and suitable for publication without corrections.

The exact layout and structure of the documents will be agreed between the Commission and the Contractor after the signature of the contract.

6.3.2. Geospatial deliverables

The following default rules apply (some variants might be requested in specific contracts under Module IM). The details will be agreed between the Commission and the Contractor after the signature of the contract.

File types, formats and qualities

File type	Formats and qualities
Raster input imagery	Original format and processing level as received from the data provider, digital format
Raster intermediate and final imagery*	Processing level and format used in the analysis stage, provided as Geo-referenced, ortho-rectified, radiometrically calibrated, full resolution, digital format
Vectors*	<p>By default</p> <p>1) ESRI shapefiles (containing .shp, .shx, .dbf, .prj)</p> <p>2) Google Earth KML (or KMZ) format</p> <p>Upon request</p> <p>3) TopoJSON for each layer</p> <p>4) Files containing style rules for vector data in SLD format.</p> <p>Vector data need to be topologically consistent (correct adjacency/overlapping of features, correct cover/inclusion, closure of polygons, connection of networks, absence of dangles, continuity of features across tiles)</p>
Ready to print maps	<p>Resolution 300 dpi in the following formats:</p> <p>(a) Layered Geospatial PDF with the layer grouping and naming following the map legend</p> <p>(b) Georeferenced JPEG with optimal compression ratio oriented to preserve image quality</p>
GIS project file	<p>for example a mxd file with styles and relative paths pointing to data files in the standard folder structure</p> <p>Or the correspondent file if a different GIS is used</p>

* Metadata: geospatial files delivered in the integrated module shall be compliant with the Inspire directive

File and folder naming and structure

File and folder naming shall be standardized, meaningful, without spaces, containing only letters, numbers and hyphens/underscores; e.g.

- EMSV025_for_EMSSR144_MexicoHurricane (folder)

- EMSV025_ValReport_v1.docx (file)

Folder structure shall be standardized, understandable and appropriate; e.g.

- Input data
 - Imagery
 - Ancillary
 - Pictures
 - etc
- Delivery
 - reports
 - geodeliverables
 - imagery
 - vectors
 - maps
 - projects

File and folder naming will be agreed with the Commission at contract start.

Coordinate and reference system

Geospatial deliverables must have the same coordinate, reference system and projection as the products under validation. By default, products are provided in UTM cartographic projection using WGS 84 geodetic system (EPSG code: 4326). However a different projection and geodetic system can be requested by a user or the Commission to fulfil a specific activation request.

6.4. Outputs with a standardized structure (M2_OQ and M3_OF)

Quality checks (M2) and feedback collection (M3) generate outputs with standardized structure M2_OQ and M3_OF, defined in Annexes B and C respectively. The Integrated Module, when requesting the same tasks, shall generate the same outputs (IM_SO). These outputs shall be accurately uploaded in OLS.

6.5. Module Reports

Field survey (M1), Expert advice (M4) and the Integrated Module (IM) generate a report per each activation.

6.5.1. Field survey report (M1_FR)

It includes:

- The title /topic, author(s), date;
- Unique identification and a short description of the validated Copernicus EMS Mapping service output(s);

- Essential description of the field survey (surveyor(s), dates, places);
- Data collection scheme: planned and actually executed;
- Methodology and instruments used for the information collection;
- Description of the data collected;
- Post processing applied to the collected information;
- Collection of other info sources, e.g.: survey reports from local authorities, web references, etc.;
- Collection of feedback and specific requirements from end users / local experts (if available);
- Conclusions / recommendations.

6.5.2. Summary advice/Minutes of the Meeting (M4_SM)

It includes:

- The title /topic, author(s), date;
- The list of participants/contributors;
- Introduction (to the context/topic);
- Summary advice / main results;
- If applicable: next steps and actions to take;
- Conclusions / recommendations.

6.5.3. Integrated module validation report (IM_VR)

It shall be rigorous and contain all the technical details about objectives, data input, algorithms, models, processes and output, sufficient to allow reproducing the full methodology.

It includes:

Preparation

- The title /topic, author(s), date;
- Unique identification and short description of the validated Copernicus EMS Mapping service output(s).

Field survey

- Detailed report of the field survey, following the structure of M1_FR (if applicable).

Quality checks and technical validation

- Description of validation reference data sets and other available data sets used in the validation approach;
- Complete and accurate description of validation methodology applied in the specific case, including: (i) pre-processing and re-analysis of satellite data if applied; (ii) sampling strategy; (iii) comparison methodology, (iv) error propagation;
- Validation results, in form of a standard template, including:
 - Reliability of information contents, with particular attention to thematic and positional accuracy or consistency;
 - Consistency of the information contents and of the information support;
 - Usability of the product;
 - Efficiency of the service;
- User specific requirements, if available;

Feedback collection and impact analysis

- Analysis of alternative emergency event information available and of the added value, effectiveness and relevance of the Copernicus EMS Mapping product for the user in the specific emergency context;
- User feedback and analysis;
- Analysis of the impact of the Copernicus EMS Mapping product on the user's workflow: time and cost reduction, effectiveness increase, error propagation.

Expert advice and improvements

- Comprehensive summary related to tasks contained in the specific service request;
- If applicable: next steps and actions to take;
- Detailed conclusions and recommendations on the validated Copernicus EMS Mapping service output(s), e.g. weaknesses, risks, problems, strengths, suggested improvements, recommendations to the service providers, possible incorporation of previous validation recommendations, etc.

6.5.4. Short Validation Report IM_SVR

For the integrated module a short summary report (maximum 5-6 pages including the cover sheet) is required. It includes:

- An introduction covering the objectives of the validation exercise;
- A paragraph for each task, summarizing the main elements, e.g.:
 - For technical checks/validation tasks: main reference data used, methods, processing steps; major findings, summary table of results (e.g. list of accuracies) and main conclusions;
 - For feedback collection: major findings and conclusion on the analysis of product's added value, weaknesses, impact on users' workflow, users' feedback and main conclusions;
 - For expert advice: elements related to the specific service request and main conclusions.
- Recommendations

The report will contain essential cartographic outputs.

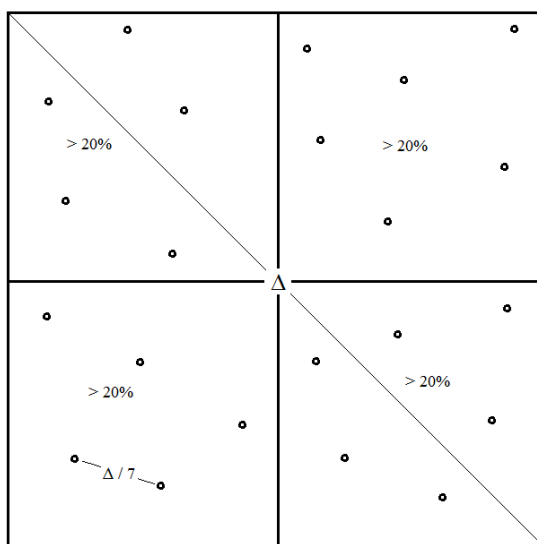
6.6. Geospatial Information deliverables

6.6.1. Field survey data (M1_GI)

- **Number of CPs per ready-to-print map**
 - Before starting a field survey, for each ready-to-print map to be validated, 20 CPs for positional accuracy estimation ("positional CPs") and 40 CPs for thematic accuracy estimation ("thematic CPs") must be defined.
 - The positional and thematic CPs may coincide, provided that they fulfil all the specifications described in this paragraph (M1_GI) for both classes.
- **Characteristics / distribution of CPs (main elements)**
 - CPs must be univocally locatable on the map and on the ground. The selected points will differ depending on the type of dataset and output scale of the dataset. For imagery with a 1m pixel size or better resolution, suitable well-defined points may represent features such as road intersections (corners) in addition to right-angle intersections of linear features and circular objects. For lower resolution images, the same principles should apply, although the features to be detected may be more often similar to cartographic representations. Features which are over-generalised on maps should be avoided. Buildings or any other objects

which represent vertical displacement (corners of buildings, telegraph poles) should not be selected as checkpoints.

- Positional CPs must be at least 20 % in each quarter of the map whereas the distance between points should not be less than $1/7^{\text{th}}$ of Δ (Δ is the diagonal distance of the map area). The following figure is purely indicative.



- Thematic CPs must cover the following area:
 - for delineation maps, a buffer including approximately 20% of the surface of the affected area in the product under validation, both external and internal to the perimeter of the same affected area. Random sampling of the buffer area shall be applied.
 - for grading maps the affected area in the product under validation and its immediate surroundings (approximately +25% of area with respect to the impact area). All damage classes must be covered with a stratified random sampling approach; 80% of CPs inside the impact area, 20% outside.

▪ Positional Accuracy of CPs

The expected positional accuracy of the map to be validated depends on its scale, according to the guideline of the American Society for Photogrammetry and Remote Sensing based on the cartographic convention to fix the minimum readable thickness for graphic elements of a map to 0.2-0.3mm¹³.

CPs for validation must be collected with sufficient positional accuracy; in particular ten times better than the expected map accuracy is required.

Map scale	Expected map accuracy	Positional accuracy for CPs
1:10,000	2.5m	25cm
1:20,000	5m	50cm
1:50,000	12.5m	1.25m

Other cases can be derived by proportion.

▪ Acquisition of CPs

- The CPs acquisition must be performed according to a good practice survey, avoiding acquiring data close to obstacles that can affect sky visibility and that can generate multipath effects.
- During the field survey, unforeseen difficulties may arise, hence, provided that the resulting sets of CPs fulfil all the specifications described in this paragraph (M1_GI), the following strategies can be applied:
 - Replacement. In case the planned point is not accessible, it can be replaced with an accessible one.
 - Shifted acquisition. If the points that have to be acquired are accessible but close to some obstacle, the acquisition point can be shifted a few meters away from the original one and its obstacle (e.g. a building wall). In this case, the distance and azimuth of the new point with respect to the initial point location must be recorded together with the information of the initial point.
- Number of CPs which may be replaced or acquired with shift:

Operation	Positional CPs	Thematic CPs
Replace or shift	8	15

- The thematic CPs classification will be based on the information gathered in the field:
 - Each point will be classified following the map legend categories, i.e. for delineation maps: impact/no impact; for grading maps: the specific damage grades and no impact. The contractor will apply the same category definitions as the map provider.
 - For each point, the (field) sample area taken into account will be a circle, with the centre coinciding with the point and a radius given in the following table (other cases can be derived by proportion).

Map scale	Radius of the sample area
1:10,000	5m
1:15,000	7.5m
1:20,000	10m
1:50,000	25m

▪ **Formats for CPs and related attributes**

The collected data sets shall be provided as follows:

- Geospatial vector feature layer containing the planned and actually collected CPs
- The following attributes will be provided for each CP in the vector file:
 - Unique identifier code;
 - Acquisition day/time;
 - class: positional CP or thematic CP;
 - Status: planned and not acquired / planned and acquired / shifted acquisition / replacement acquisition
 - X, Y, Z coordinates; delivered with an adequate number of digits to account for the required precision (e.g. for submeter precision, at least 6 decimal places for the geographical coordinates);
 - Shift distance and azimuth for shifted acquisitions;
 - Source (GPS, DGPS, etc.);
 - Estimation (or proof) of positional accuracy of the coordinates;
 - for thematic CPs: classification and degree of reliability of the classification (estimated by the contractor during the field survey);
 - links to the pictures related to the CP;
 - any other relevant remark.
- Project file classifying the CPs per class and status.
- In case the CPs are derived from differential GPS, the RINEX (Receiver Independent Exchange Format) files need to be included in the set of delivered information.
- The coordinate system of M1_GI deliverables must be the one of the product under validation, to allow for a direct comparison.

- In addition, supporting information included with the ground reference coordinates must state all parameters for the coordinate system, including the ellipsoid and identification of all geodetic controls used during the field survey.
- **Geo tagged pictures**
 - Two pictures of each surveyed CP, one at close range, to show the instrument location, and one at far range to show the context.
 - For thematic CPs: a sufficient number of pictures of the environment around the CP, which allow performing the thematic accuracy validation.
 - In most cases, 5 pictures are sufficient: a nadir one of the point location and one per cardinal direction;
 - In specific cases, more pictures may be needed, e.g. when surveying a forest affected by fire, 12 pictures: 4 cardinal directions at 3 different heights – downwards, horizontal, upwards pointing.
 - Unique identifier code.
 - Acquisition day/time.
 - Clear link to the ID of the CP contained in the picture.
 - jpeg format (size around 0.5-1 MB per picture).
 - The EXIF shall contain coordinates and image direction information.

▪ **Data coming from other sources/field surveys**

In case other useful (field) data are acquired (e.g. from local authorities or the users), such data will be included as annexes in the M1_GI deliverable. Examples:

- paper maps;
 - ancillary data collected during the field survey;
 - orthophotos.
- **Alternative surveying strategies**

In specific cases, the JRC and the contractor may agree variations on the surveying strategy. The cost of the service remains unchanged.

6.6.2. Quality Checks Geospatial Information (M2_GI)

All raster and vector files as well the final project file used for implementing the quality check and computing the requested accuracies and highlight the thematic overlap,

omission and commission errors. This deliverable supports, completes and details the outcomes M2_OQ.

6.6.3. Feedback collection Geospatial Information (M3_GI)

In relevant cases, geospatial information is a supporting element for the feedback collection. This deliverable supports, completes and details the outcomes M3_OF.

6.6.4. Expert advice Geospatial Information (M4_GI)

Geospatial data and information can be an integral part of the requested expert advice. M4_GI supports, completes and details the deliverable M4_SM.

6.6.5. Integrated Module Geospatial Information (IM_GI)

All raster, vector, maps and (final) project used for implementing the requested tasks and generated to collect the results.

- Field surveys: when performed in the scope of the Integrated Module, by default the same specifications as in M1_GI apply unless otherwise specified in the specific request for the service.
- Checks/validation: e.g.: raster, vector and project file used for implementing the quality check and computing the requested accuracies; files which highlight the thematic overlap, omission and commission and quality issues that need to be addressed; they identify, delineate and explain the non-conformity of the validated products with respect to their specifications. In more general terms, the files that contain the requested analysis.
- Feedback collection: e.g. highlight/exemplify qualities of alternative emergency event information; highlight/exemplify strengths and weaknesses of the product under validation with respect to user needs/expectations; point out the product characteristics which impact on the user workflow.
- Expert advice: related to the specific service request.
- Files related to the specific tasks of the activation.

This deliverable supports, completes and details the validation report (IM_VR).

6.7. Software and digital ancillary data

With respect to all the results described in these technical specifications and related annexes, intellectual property rights are governed by the service framework contract.

6.8. Main types of meetings and missions

- A **kick-off meeting** will be organised at the JRC at the start of the framework contract. This meeting shall generate no specific payment.
- **Review meetings** may be organised when needed at the Contractor premises or at the Commission's premises, either at the JRC, Ispra, Italy or in Brussels. The Commission will define the duration of the meeting and the contractor staff members that are expected to attend in the related specific service request. This kind of meeting is included in the scope of Module 4.
- **Field surveys** are normally requested under Module 1. Their duration depends on the number and type of maps to be validated or the extension of the areas of interest. At least one of the participants must be the field surveying expert.
- **The integrated module** may require field surveys and meetings for feedback collection, expert advice or other tasks. The duration and payment will be defined in the specific service contract. The Commission may decide to join such missions at any time during the contract period.
- The contractor might be requested to attend **additional meetings**, in the scope of Copernicus EMS e.g. discussing technical needs, collecting specific feedback, giving expert advice are included in the scope of module 4. The Commission may decide to join such meetings at any time during the contract period.
- The Commission may decide to **visit the Contractor's premises** for specific purposes at any time during the contract period. Costs for such meetings are not chargeable under this contract.

6.9. Acceptance of work

For each activation, official acceptance will be based on the review of the final deliverables against the framework contract (and related annexes) and against the specific contract or activation form. Invoices may be issued only for executed activations and deliverables that have been completed and duly accepted.

7. SERVICE ORGANIZATION

7.1. Required service elements

The service organization shall include:

- management methodologies and tools;
- workflows definition;

- roles definition;
- data management;
- communication;
- risk identification and mitigation measures;
- quality control.

7.2. Management level of service

Project management shall be accurate, punctual and professional.

- The project manager shall be available for telephone calls within 8h from commission request (business hours). In case of holidays, sickness, missions, the project manager can be replaced by the deputy;
- The requested professional profiles shall be available for video conference within 3 working days from commission request;
- In any case, a contact point is to be available 8/5;
- Written request from the Commission shall be answered in writing within maximum 2 working days (technical/administrative/management issues).

7.3. Required professional profiles

1. Project Manager (at least 1 person)

A total of at least **12 (twelve) years** of relevant studies and experience after secondary school, including:

- At least 3 years' experience in management of projects related to supply of digital products derived from satellite remote sensing, including overseeing project delivery, quality control of delivered service and client orientation in projects and having experience in management of a team of at least 8 people. He/she must have a good knowledge of project management standards and methodologies, a good knowledge of geo-information use in emergency management operational services, knowledge of relevant remote sensing and GIS technology.
- A minimum of 7 (seven) years of professional experience in the field of satellite remote sensing, data processing, geo-spatial analysis, environmental modelling, GIS and digital cartography
- At least C1 level of English

2. Production Coordinator (at least 1 person)

A total of at least **10 (ten) years** of relevant studies and professional experience after secondary school, including:

- At least 3 (three) years in the production coordination of digital products derived from satellite remote sensing and GIS. He/she must have good knowledge of geo-information use in and good knowledge of relevant remote sensing and GIS technology.
- A minimum of 5 (five) years of professional experience in the field of satellite remote sensing, data processing, geo-spatial analysis, environmental modelling, GIS and digital cartography
- At least C1 level of English.

3. Specialist in optical satellite remote sensing (at least 1 person)

A total of at least **10 (ten) years** of relevant studies and professional experience after secondary school, including:

- At least 3 (three) years of professional experience related to the supply of map products derived from satellite remote sensing in emergency management contexts or equivalent. He/she must have in-depth knowledge of principles of satellite remote sensing and relevant sensors, techniques for the derivation of information from optical satellite image data, tools and software for image processing, GIS, quality and accuracy assessment.
- A minimum of 5 (five) years of professional experience in the field of remote sensing data processing,
- At least B2 level of English.

4. Specialist in SAR satellite remote sensing (at least 1 person)

A total of at least **10 (ten) years** of relevant studies and professional experience after secondary school, including:

- At least 3 (three) years of professional experience in projects related to the supply of map products derived from of satellite remote sensing in emergency management contexts or equivalent. He/she must have in-depth knowledge of principles of satellite remote sensing and relevant sensors, techniques for the derivation of information from SAR satellite image data, tools and software for image processing, GIS, quality and accuracy assessment.
- A minimum of 5 (five) years of professional experience in the field of remote sensing data processing,
- At least B2 level of English.

5. Technology expert (at least 1 person)

A total of at least **10 (ten) years** of relevant studies and professional experience after secondary school, including:

- At least 3 (three) years of professional experience in handling innovative technology applied to geomatics. He/she must have in-depth knowledge in one or more of the following fields: crowd sourced data, social media, cloud computing, artificial intelligence, location-based services
- Minimum 5 years of professional experience working in the above mentioned domains.
- At least B2 level of English

6. Specialist in data quality and accuracy assessment (at least 1 person)

A total of at least **10 (ten) years** of relevant studies and professional experience after secondary school, including:

- At least 3 (three) years of professional experience in assessment of accuracy of geospatial products. He/she must have in-depth knowledge of both thematic and spatial accuracy assessment of satellite image-derived products. In-depth knowledge of sampling strategies for robust estimation of accuracy. In-depth knowledge of remote sensing data, cartographic accuracy standards, knowledge of remote sensing and GIS software.
- Minimum 5 years of professional experience working with geospatial accuracy standards and accuracy assessment of geospatial products
- At least B2 level of English

7. Domain expert in emergency and security management (at least 1 person)

A total of at least **10 (ten) years** of relevant studies and professional experience after secondary school, including:

- At least 3 (three) years of professional experience in of all phases of the emergency management (preparedness, response, recovery and mitigation). The domain expert in emergency management must have a good knowledge of the effects of natural and man-made disasters on various types of assets (urban, agriculture, forestry); basic knowledge of the technical capabilities of remote sensing for use in emergency management.
- A minimum of 5 (five) years of professional experience in the domain of management of emergencies related to natural and man-made disasters.
- At least B2 level of English

8. Domain expert in disaster risk assessment (at least 1 person)

A total of at least **10 (ten) years** of relevant studies and professional experience after secondary school, including:

- At least 3 (three) years of professional experience in disaster risk assessment for natural and man-made disasters, including Natech (Natural Hazard Triggering Technological Disasters), associated models and the requisite data to carry out such assessments.
- A minimum of 5 (five) years of professional experience in the domain of disaster risk.
- At least B2 level of English

9. Specialist in geomorphology & geohazards (at least 1 person)

A total of at least **10 (ten) years** of relevant studies and professional experience after secondary school, including:

- At least 3 (three) years of professional experience in working as geomorphologist in emergency management contexts, or equivalent. Assessment of risks relating to earth surface processes and natural and man-made causes of disasters – e.g. earthquakes, landslides, erosion, mudflows, etc.
- Minimum 5 years of professional experience in working as geomorphologist;
- At least B2 level of English

10. Specialist in field survey (at least 1 person)

A total of at least **8 (eight) years** of relevant studies and professional experience after secondary school, including:

- At least 2 (two) years of professional experience in working as professional land surveyor, using DGPS and post processing, software, Ground Control Point and Check Point collection/ measurement for airborne and space-born photogrammetric projects.
- Minimum 3 years of professional experience in working as professional land surveyor. Experience in the planning and collection of field data for validation is required.
- At least B2 level of English

11. Specialist in image processing (at least 2 persons)

A total of at least **8 (eight) years** of relevant studies and professional experience after secondary school, including:

- At least 2 (two) years of professional experience of processing of satellite images for digital map production. Must also have experience GIS; practical experience with both visual and automatic image interpretation techniques, ability to program or script.
- A minimum of 3 (three) years of professional experience in the field of satellite image processing.
- At least B2 level of English.

12. Specialist in digital cartography, GIS and data integration (at least 2 persons)

A total of at least **8 (eight) years** of relevant studies and professional experience after secondary school, including:

- At least 2 (two) years of professional experience in digital map production using satellite remote sensing and GIS. Must have ability to script or program to customise and automate the map production chain. Knowledge of cartographic and map production standards, spatial analysis, integration of relevant sources of ancillary data (e.g. DEMs, demographic, LULC, economic assets, crowd sourced data, early warning and monitoring systems and social media).
- A minimum of 3 (three) years of professional experience in the field of digital map production and GIS,
- At least B2 level of English.

13. Specialist in processing and analysis of aerial image data (at least 1 person)

A total of at least **8 (eight) years** of relevant studies and professional experience after secondary school, including:

- At least 2 (two) years of professional experience in projects requiring aerial orthophotos and DSMs for digital map production. He/she must have in-depth knowledge of relevant sensors and platforms, tools and software for processing of manned and unmanned aerial image data.
- A minimum of 3 (three) years of professional experience in aerial photo data processing and analysis.
- At least B2 level of English.

14. Specialist in IT support (at least 1 person)

A total of at least **8 (eight) years** of relevant studies and professional experience after secondary school, including:

- At least 2 (two) years of professional experience in IT support including systems and data management, network transfer, relational database systems and back-up

of large volume datasets. Must have knowledge of software and hardware requirements necessary for running remote sensing, GIS tools.

- A minimum of 3 (three) years of professional experience in IT support
- At least B2 level of English.

8. LIST OF ANNEXES

- A. Annexes A: Technical specifications of Copernicus EMS Rapid Mapping and of Copernicus EMS Risk and Recovery
- B. Annex B: Quality Check Scheme
- C. Annex C: Feedback Collection Scheme
- D. Annex D: Copernicus EMS Mapping Validation Protocol
- E. Annex E: Field Survey Cost Scheme
- F. Annexes F: Coordinated Data Access System v3: (1) Top level ICD for CSPs and (2) Emergency ICD for CSPs (ESA-CSCDA technical documents)