

Annex II

Frontex/OP/141/2017/RS

Terms of Reference

Environmental Assessment - Meteorological and Oceanographic Services

1. Background

1.1. General information on Frontex and Frontex Situation Centre

The European Border and Coast Guard Agency - Frontex (hereinafter referred to as “Frontex”) was established by the Council Regulation (EC) Regulation (EU) 2016/1624 with a view to improve the integrated management of the external borders of the Member States of the European Union.

Further information about Frontex can be found on the Agency’s web site www.frontex.europa.eu

Frontex Situation Centre (FSC) is a unit within the Operational Division structure of Frontex (the Agency).

FSC Strategic Objectives:

- Ensure that the right information is made available at the right time to the right person in the right format and at the right place;
- Increase the reaction capabilities of MS (Member States) and Frontex’ activities and support an adequate and rapid operational response, in particular by facilitating operational coordination.

FSC Operational Objectives:

- Serve as a safeguard for collecting and distributing operational & management information and provide in this respect a holistic approach for internal and external customers;
- Serve as a safeguard for the quality, integrity, security and trustworthiness of operational information.

FSC objectives are implemented through Eurosur Fusion Services.

1.2. Eurosur Fusion Services

Eurosur Fusion Services (FFS) provide extended and customized information exchange services to EU Member States (MS) / Schengen Associated Countries (SAC) and Frontex, based on their information needs and requirements pertaining to border surveillance, with special emphasis on those set out in the Regulation (EU) No 1052/2013 of the European Parliament and of the Council of 22 October 2013 establishing the European Border Surveillance System (Eurosur Regulation). This includes provision of diverse services for the European Situational Picture (ESP) and Common Pre Frontier Intelligence Picture (CPIP).

Eurosur Fusion Services acquire and fuse stand-alone services from different sources into a single, combined and customised service. After the customized service is developed it can be visualized in an interactive Frontex Geographic Information System (GIS) and transferred to other systems in a form of an information layer. Ultimately this provides a standardized and comprehensive situational picture for MS/SAC with all elements required by the Eurosur Regulation alongside other components as stipulated by MS/SAC and Frontex operational requirements, respecting the principle of single point of entry/exit of data and information.

1.3. Current solutions

The solutions currently developed for Frontex for the environmental (weather) assessment include meteorological services, which provide information on the atmospheric and marine conditions.

They include:

- Station based atmospheric and oceanic observation data (from 5000 weather observation stations across Europe and around Mediterranean Sea);
- Station based atmospheric and oceanic forecasts (multiple prediction model in conjunction with long term observational information from meteorological weather stations a (MOS)”);
- Station based tidal forecast data;
- Map overlay of live precipitation radar (national weather service reports of radar reflectivity,

which are translated to precipitations rates in [mm/h]); extended with forecasted precipitation radar;

- Map overlays of satellite images;
- Map overlay with live lightning data;
- Meteograms;
- Weather alerts and warnings (the information of risk of hazardous weather conditions based on thresholds pre-defined in advance for a set of parameters. The alerts are issued in case of forecast of such weather warnings;
- Historical weather data and reports:
Available directly in the system (7 days back); the hindcast report format for time series (model output time series) and climatology database and monthly reports (with averages of 0.1° x 0.1° resolution).

2. Objectives of the tender

The environmental assessment services are an important component of the European Situational Picture (ESP) and Common Pre-Frontier Intelligence Picture (CPIP) as described in the Regulation (EU) No 1052/2013 of the European Parliament and of the Council of 22 October 2013 establishing the European Border Surveillance System (Eurosir).

The objective of this tender is to establish a long term contractual relationship with a supplier for the purchase of a set of environmental services. These services shall provide precise, robust, detailed, customized and frequently updated information on atmospheric and oceanographic conditions of designated areas, based on the requirements described in this Terms of Reference document.

When submitting the tender, special attention shall be paid to the distinction between the **Obligatory requirements** - tasks and services (as described in #6) and the **Additional services** (#7). The complete lists of Obligatory and Additional services are also listed in *Appendix I* and *Appendix II to Annex II* respectively).

During the implementation of the contract Frontex shall require the delivery of all Obligatory tasks and services for period of 2 years and might request some or all of the Additional services, depending on the specific needs. The renewal of the contract by additional 2 years means the repetition of the scenario described above.

3. Scope

In the scope of this tender is the purchase of meteorological services:

Detailed atmospheric and oceanographic/marine conditions:

- measured data service;
- modelled forecast service;
- severe weather warnings service;
- maintenance, testing and improvements of the services;

Detailed atmospheric and oceanographic/marine meteorological services shall be built, tested, delivered, developed further, continuously improved and maintained.

Under the scope of this tender it is also included:

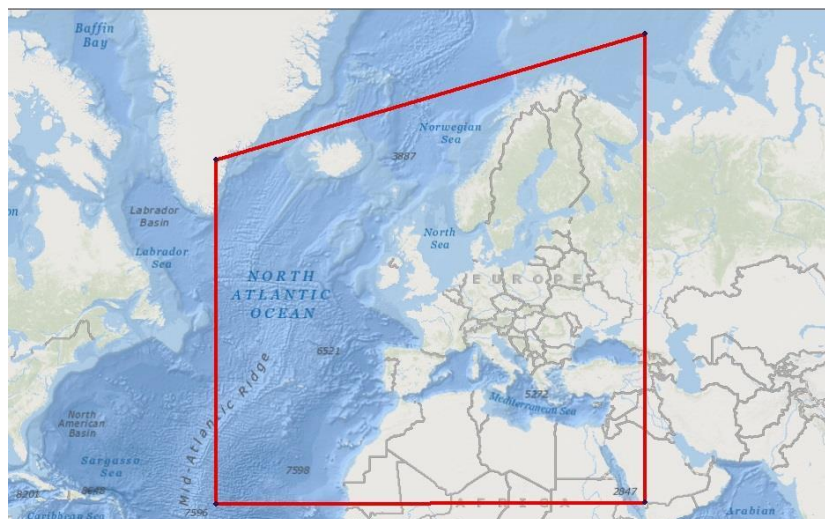
- consultancy and training services.

4. Area of Interest (AOI)

The required Area of Interest, within which the services in the scope of this tender shall be delivered permanently, is indicated by the polygon in the picture below.

Longitude / Latitude:

-43° 34'4.12"	17° 7'33.26"
-43° 34'4.12"	64° 48'11.62"
42° 45'56.47"	73° 35'12.52"
42° 45'56.47"	17° 29'58.22"



5. List of Deliverables

5.1. Development of Business documentation.

The contractor shall deliver the business documents described below following the set quality standards (# 8.10) and according to the delivery schedule (# 8.2).

All delivered business documents shall undergo the formal acceptance procedure (# 8.16).

1. Service Delivery Plan
2. Service Description Document
3. Testing documentation
4. Service management reports
5. Minutes of the meeting (MoM)
6. Training documentation and training delivery

5.1.1. Service Delivery Plan

The service delivery plan shall include the following chapters:

- Introduction;
- Scope statement;
- Planning assumption and constraints;
- Approach to service design and development;
- Approach to service implementation and operation;
- Work breakdown structure;
- Detailed master schedule of service design, development & implementation;
- Quality management and service operation performance indicators;
- Risks identified;
- Approach to monitoring, reporting, assessment and supervision procedures;
- Configuration management;

- Change control;
- Annex 1 - Acronyms and definitions

5.1.2. Service description document

The service description document shall include the following chapters:

- Functional specifications;
- Technical specifications, including minimum hardware, software and network requirements;
- Scope and description of each service and its components;
- Visual presentation, including symbology;
- List of the meteorological stations/buoys being source to the provided services;
- Source of data and forecast model concepts;
- All severe weather events/types of hazards (including the thresholds);
- Conditions for retrieval of historical data;
- Data availability and frequency.
- Annex 1 - Acronyms and definitions

5.1.3. Testing documentation

The testing documentation shall include:

- Test Plan;
- Test Scenarios;
- Test Reports.

5.1.4. Service management reports

The service management reports shall be delivered on monthly basis and include the following chapters:

- Summary of the activities for the past month;
- Identified risks and suggestions for their mitigation;
- Statistical analysis reports on service levels;
- Recommendations on improvements;
- List of bugs fixed;
- List of requests for change implemented.

5.1.5. Minutes of the meeting (MoM)

The contractor is required to prepare and distribute the MoM within 3 working days after the meeting. MoM shall be prepared for:

- Meetings;
- Phone conference calls;
- Video conference calls.

5.1.6. Training documentation and training delivery

Training documents required are:

- 1- Training Proposal shall contain following information:
 - Aims and objectives of the training;
 - Training organization, including: agenda, materials, equipment, location;
 - Description of training materials;
 - Post-training needs.
- 2- Training report shall include the following information:
 - Summary of the activity;
 - Feedback collected by the trainer (including suggestions, requests for improvement);
 - Trainer's assessment, including suggestions for improvement.

5.2. Development of the requested services

The development and implementation of the measured data service, modelled forecast service and severe weather warnings service shall strictly follow Service Delivery Plan and the Service Description Document approved by Frontex.

5.3. Service Operation

The delivered services shall be accessible and maintained according to the specifications below.
All services should operate within the defined service levels.

5.4. Consultancy services

The purpose of consultancy and training services is to ensure sufficient guidance to the users in order to gain the optimal competency in usage of the provided services.

6. Scope of the obligatory tasks & services

6.1. Obligatory tasks & services - description

6.1.1. Development of the requested services

The development and implementation of the measured data service, modelled forecast service and severe weather warnings service shall strictly follow Service Delivery Plan and the Service Description Document approved by Frontex.

6.1.1.1. Maintenance, testing and improvements of the services

The delivered services shall be accessible and maintained according to the specifications below.

6.1.1.1.1. Availability

The provided services shall be accessible 24h/7d without any transfer limitation. The proposed solution has to be available for 98% of time.

Availability %	Downtime / year (365 days)	Downtime / month (30 days)	Downtime / week
98%	7.30 days	14.4 hours	3.36 hours

6.1.1.1.2. Maintainability

The Contract shall cover maintenance enabling proper and non-disruptive functioning of the delivered services.

The following tasks and activities shall be performed:

- Monitor and evaluate service performance based on agreed service performance indicators;
- Perform statistical analysis and deliver to Frontex on monthly basis reports on availability of the services as an integral part of the service management report.

Maintenance and supporting services are described as Standard Maintenance (the service is working partially) and Critical Intervention (service is disrupted, and whole service is not functioning at all).

Maximum response time	Standard Maintenance	Critical Intervention
	48 hours	5 hours

6.1.1.2. Testing and implementation of the services

The overall purpose of testing is to ensure that services delivered meet all of the functional and non-functional requirements as described in this ToR # 6.2 and 6.3.

The performed tasks and activities shall be conducted according to following documentation and include:

- Test plan and test approach;
- Test scenarios;
- Execution of all the relevant tests, including User Acceptance Tests;
- Test reports.

The services shall be implemented only after all tests are successfully completed and formally accepted by Frontex.

6.1.2. Improvements of the services

During all duration of the service delivery the contractor shall search and propose improvements to the services in scope. Based on the Agile developments methodology this should be done continuously and following the users business analyses and consultancy. Based on monthly reporting, the scope of the possible improvements (both functional and non-functional) will be agreed during the process of implementation of the contract.

6.1.3. Business consultancy

It is requested to provide up to 20 man/days of consultancy and training per year of contract.

In order to allow efficient cooperation a part of the Contractor's team shall be prepared to spend up to 75% of the total amount of yearly training and consultancy services time (15 man/days out of total 20 man/days per year) at Frontex premises or other bilaterally agreed location. Office space and Internet connection will be provided by Frontex for that purpose.

6.1.3.1. Consultancy

Following activities shall be covered by consultancy services:

- Support to identification and understanding of the stakeholders' requirements and needs;
- Support to translate requirements into functional specifications and architecture;
- Support to implementation of the services into the business environment;
- Advise on best practices for implementation with regards to models, symbols, technology, results, usability, accuracy, etc.;
- Support in identification of improvements based on results of monitoring and analysis of existing solutions.

The outcome of the consultancy services shall in be reflected in the monthly Service Management Report.

The request for consultancy services will be initiated by Frontex and follow the On-Request service process described in # 8.7 of this ToR.

6.2. Obligatory tasks & services - non-functional requirements

Minimum Non-functional technical parameters required

This part describes the non-functional requirements that should be fulfilled under the contract.

6.2.1. Data format requirements

6.2.1.1. Specific format requirements WMS

Points (stations, lightning's, etc.), areas (forecast, weather warnings, etc.) and contours (forecast, etc.) shall be delivered in following formats:

- Web services - WMS in accordance with OpenGIS Web Map Service Implementation Specification Version 1.3.0 (OGC 06-042)

All of the provided WMS Web Services must be time aware. Layers shall use the following time format: YYYY-MM-DDThh:mm:ss.SSSZ or YYYY-MM-DDThh:mm:ssZ

GetMap capability shall be available for all layers.

GetFeatureInfo capability shall be enabled for each layer and timestamp. XMLtext, JSON and plain text formats must be enabled for GetFeatureInfo results.

GetLegend capability shall be available for the layers when applicable.

Output SRS for the layers must be WGS84 (EPSG:4326) and WGS 1984 Web Mercator Auxiliary Sphere (102100(3857)).

6.2.1.2. Stations/locations data

There shall be one unique web service provided for stations/locations data for both data sets: measured (current - including past data up to 7 days) and forecast data. Measured data could be replaced by immediate forecast to cover gaps in data reported by stations and in stations' spatial coverage.

If data is available or comes from various elevations this parameter, elevation, should be provided when data for a single location is requested.

GetMap request shall return a map image containing icons (to be described in Service Description Document, "symbolology" chapter).

In order to improve map interpretation each zoom level in the service must contain a subset of stations depending on the scale and/or category. Then some stations will not be visible at all scales.

GetMap request shall return a subset of stations depending of the scale / extension, providing min.20 locations per one extension.

GetFeatureInfo request shall return:

- stations properties (see more in 6.3.1.1.4 "Meteorological stations coverage"), like name, ID, etc.
- measurements or forecast from the stations (including all possible parameters and units)
- time of measurement or forecast (in the format specified in this document)

Time-aware GetFeatureInfo shall include all scope of the time ranges:

- current - (including past data up to 7 days)
- forecast data

If there is no time provided in the request the service shall return the observations from the latest available time.

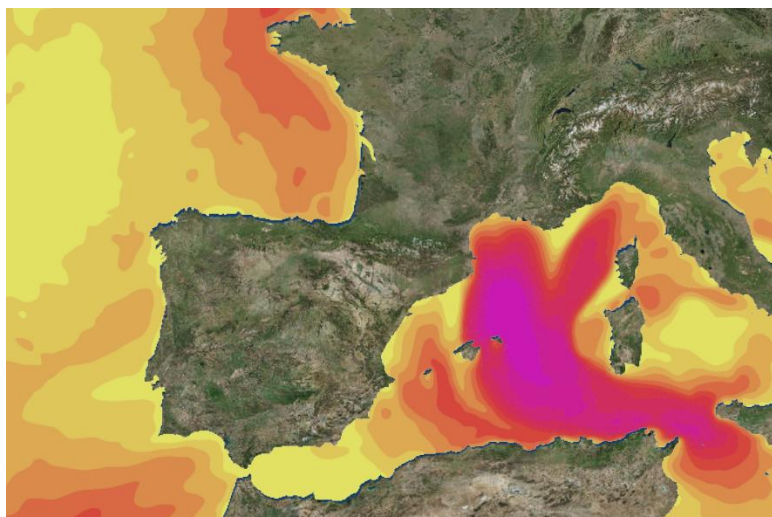
It should be possible to visualize multiple parameters (correlated parameters relevant for a particular location) displayed in a map for the location (e.g. air temperature, weather conditions phenomena) in one aggregated visualization.

6.2.1.3. Area data

There shall be one web service provided for the area data. A unique layer shall be provided for each parameter for both data sets: current - including past data up to 7 days - and forecast data.

GetMap request shall return a map image presenting area, contours and for some parameters also gridded values (to be decided by Frontex at a later stage).

Examples:



Service presentation should avoid icons overlapping and over density.

The request for GetFeatureInfo shall return:

- time of measurement (in the format specified in this document)
- the attribute' value
- the attribute' unit
- average measurement error (e.g.: Wind speed measurement average error = 1 m/s)

Time-aware GetFeatureInfo shall include all scope of the time ranges, available per each attribute:

- past data (up to 7 days in the past)
- forecast data

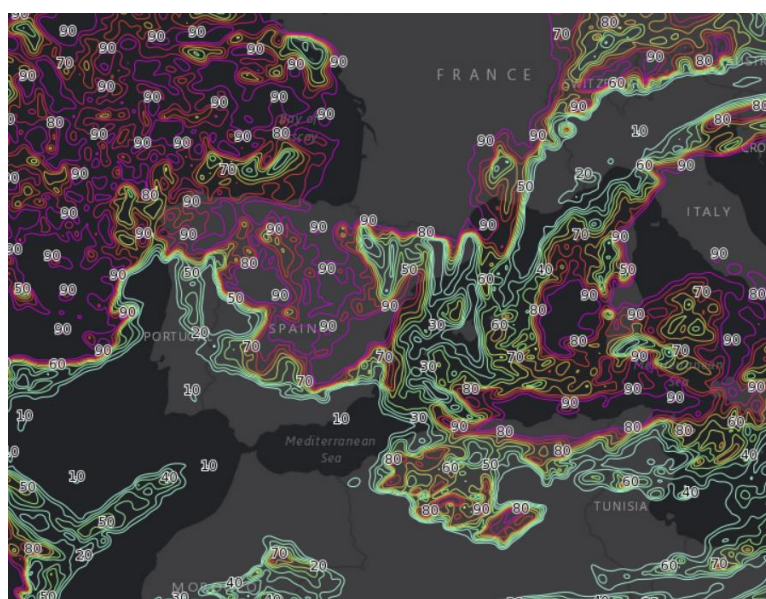
6.2.1.4. Contour data

There shall be one web service provided for the contour data. A unique layer shall be provided for each parameter for both data sets: current - including past data up to 7 days - and forecast data.

GetMap request shall return a map image presenting coloured isolines and values associated with the lines.

Service presentation should avoid icons overlapping and over density.

Examples:



The request for GetFeatureInfo shall return:

- time of measurement (in the format specified in this document)
- the attribute' value
- the attribute' unit
- average measurement error

Time-aware GetFeatureInfo shall include all scope of the time ranges, available per each attribute:

- past data (up to 7 days in the past)
- forecast data

6.2.1.5. Grid data

There shall be one web service provided for the grid data. A unique layer shall be provided for each parameter for both data sets: current - including past data up to 7 days - and forecast data.

GetMap capability shall be available.

Symbology for GepMap shall be similar to the example below:

Examples:



The request for GetFeatureInfo shall return:

- time of measurement (in the format specified in this document)
- the attribute' value
- the attribute' unit
- average measurement error

GetFeatureInfo operation shall return data all over the AoI.

Time-aware GetFeatureInfo shall include all scope of the time ranges, available per each attribute:

- past analysis data (up to 7 days in the past)
- forecast data

6.2.1.6. Categorization in the scaling the map for zoom levels

The maps shall have the possibility to zoom in and out. Map scales categorization shall be based on 2 levels:

- 1) Zoom levels according to ArcGIS online/BING maps/Google map standard:

20: 1128.497220

19: 2256.994440
18: 4513.988880
17: 9027.977761
16: 18055.955520
15: 36111.911040
14: 72223.822090
13: 144447.644200
12: 288895.288400
11: 577790.576700
10: 1155581.153000
9: 2311162.307000
8: 4622324.614000
7: 9244649.227000
6: 18489298.450000
5: 36978596.910000
4: 73957193.820000
3: 147914387.600000
2: 295828775.300000
1: 591657550.50000

The zooming should also take into account the relevancy of data where some locations have higher priorities and shall be displayed at all times.

2) Source of data/location, for example:

Airports stations located at the external borders of the Schengen Area and oceanographic stations/buoys

6.2.2. Map visualization

All data shall be ready to be visualized in maps and data retrieval shall be allowed for coordinates all over the map.

The visual outcome of the services presented to an end-user shall allow for extracting various sets of data (combining current conditions + forecast; dynamic ways to switch between time ranges, attributes, etc.)

Different flexible configurations of such data extracts should be possible in user-friendly way. The visual output produced shall allow for efficient, reliable and fast data exploring from within various available attributes

6.2.3. Projection

The required Spatial Reference Systems are WGS 1984 Web Mercator Auxiliary Sphere (102100(3857)) and WGS84 (EPSG: 4326).

6.2.4. Spatial resolution

The spatial resolution should be minimal 0.1 degrees x 0.1 degrees resolution for oceanographic parameters and minimal 0.125 degrees x 0.125 degrees for atmospheric parameters and allow for the highest accuracy possible.

6.2.5. Availability of data - frequency

The data for all parameters should be available in at least 3 hour intervals, on the full hour¹ (UTC time). For some particular parameters up to 15 minute intervals could be requested.

Delivered services shall enable for requesting any chosen time (past or future) from the same/individual chosen location or area via Web Service.

All the services provided shall be implemented in such a way that would allow time to be set to work globally for all the available parameters.

¹ Irrelevantly on the forecast update

6.2.5.1. Time aware properties

All time aware parameters shall be described by service provider in the Service Description Document and Service Metadata description (e.g. GetCapabilities). All descriptions shall be updated according to data updates.

6.2.5.2. Time parameter

All data shall be provided in UTC time. All dates should be defined in ISO8601 standard, using the following notation: YYYY-MM-DDThh:mm:ssZ or YYYY-MM-DDThh:mm:ss.SSSZ.

6.2.5.3. Method response values

All the attribute types and attribute limited values like dictionaries returned by service should be described by Service Provider in Service Metadata description (e.g. GetCapabilities) and the Service Description Document.

6.2.6. Security

All web services shall be secured by SSL/TLS encryption in version TLS 1.2
Meteograms application and Weather warnings service shall implement in addition JWT or other suggested method for authentication and authorization.

6.2.7. Specific format requirement for Warnings data

Warnings data shall be available using WMS and WFS.

GetFeatureInfo operation must return warning attributes, including: type and value exceedance as minimum requirements.

For management of warning configurations a specific REST API is needed.

6.2.7.1. WFS specific requirements

WFS should be the format used for:

- Distribution channels for the severe weather warnings data: filtering by date and type.

WFS version:

- Web services - WFS in accordance with OpenGIS Web Map Service Implementation Specification at least version 1.1.0 (preferable 2.0.0)

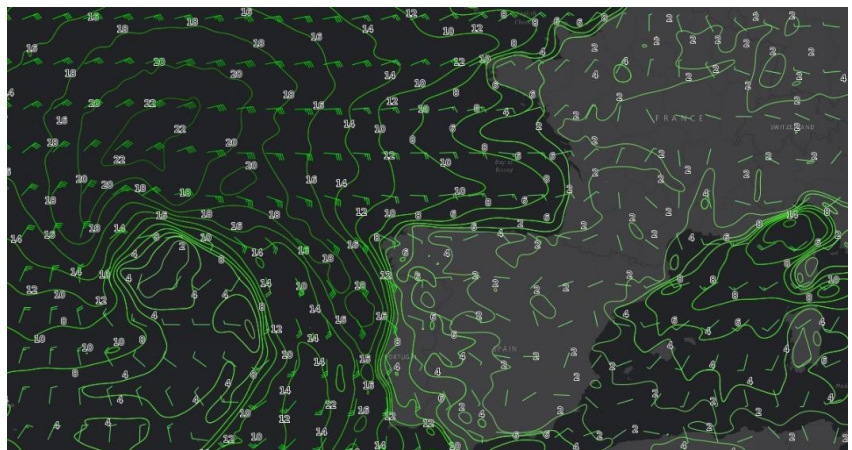
XML, JSON and CSV formats should be available as response for WFS requests.

6.2.8. Wind Vector presentation and similar data (streams)

For the attributes related to wind there shall be wind maps created. The attributes shall be presented in a combined point grid including: wind direction + wind speed.

For the wind direction there should be direction of arrows related to, and for the wind speed colours and thickness of arrows.

The presentation should comply with the following example:



Other streams as currents data or swell data should also use complex symbols.

6.2.9. Text description

For each parameter there shall be a text description (legend with details) made available. It should be possible to request such information to be displayed when needed (e.g. info button). See more under: “7.1.1. Specific format requirements WMS”).

6.3. Obligatory tasks & services - Functional requirements

6.3.1 Measured and forecast data for both: atmospheric and oceanographic meteorological conditions

6.3.1.1. Measured data

Measured detailed atmospheric weather and oceanographic conditions is the service where the source of data would be coming from the meteorological stations, satellites, buoys, ships, other available sources.

The outcome should be:

- detailed atmospheric weather picture of the current situation at the location of interest;
- detailed oceanographic weather picture of the current situation at sea, at the location of interest.

6.3.1.1.1. Time range

The time range for the measured data service (current atmospheric weather and oceanographic conditions) is considered to be from the latest observations down to 7 days in the past. The full range visualization shall be enabled automatically via the provided delivery channels.

6.3.1.1.2. Temporal resolution

Time interval for the measured data shall be hourly, or less.

6.3.1.1.3. Service update times

For all the services provided under measured data the service shall be updated hourly.

6.3.1.1.4. Meteorological stations coverage

The list of the meteorological stations/buoys being source to all of the provided services shall be provided.

For filtering and visualization purposes, the following station parameters shall be indicated:

- Detailed number of stations within the area of interest;
- Station name;
- Station ID;
- Station category (country capital, regional capital, province capital, international airport, national airport, etc.);
- Detailed data report (station approximate frequency e.g. from 0 to 100)
- Time intervals for the station coverage;
- Station elevation (m above sea level);
- Station coordinates (Latitude, Longitude).

The coverage of the Area of Interest should be clearly specified, representing the details on: station availability, parameters provided and corresponding frequency of updates of the parameters.

The list of stations shall be kept up to date throughout the entire life time of the contract.

6.3.1.2. Forecast data

Forecast detailed atmospheric weather and oceanographic conditions is the service which shall provide detailed and precise forecast of the state of the atmosphere and sea for all requested parameters and time ranges, based on all possible combinations of available models, measured data and other available sources.

6.3.1.2.1. Forecast models

The forecast service shall be based on compilation of multiple global numerical forecast models providing the best available solutions taking into account the resolution, accuracy, coverage and all the needs described in these Terms of Reference. The final solution shall provide a fully integrated (also from various model sources, e.g. a combination of regional and global models) and compatible service and it shall present one integrated graphical interface.

For the medium range forecast, the European Centre for Medium Range Weather Forecasts (ECMWF) model shall be delivered.

The methodology, source of data and forecast model concepts should be clearly explained in the service description document.

6.3.1.2.2. Time range for the forecast

All forecast services shall allow for data consultation from the nearest data available up to 7 days in the future.

The range of time in the forecast shall be:

- Short term forecast: up to +48 hours;
- Medium range forecast: from +48 hours to +7 days.

The final solution shall be ready to be merged in one graphical interface, regardless of the forecast time range used as a source. The ultimate goal is to provide the outcome with the best balance between:

- The best accuracy possible;
- The highest confidence possible;
- The most detailed information possible;
- The highest resolution possible;
- The feasible integration between various models;
- The highest usability standards and user-friendly presentation of the final outcome.

6.3.1.2.3. Temporal resolution

Time interval for the model forecast data shall not exceed 3 hours (for the short term forecast).

6.3.1.2.4. Service update times

All forecast services shall be updated with regular intervals at least 2 times per 24 hours.

6.3.1.3. Atmospheric weather conditions

Atmospheric weather conditions (both measured and forecast) shall include the below listed parameters.

The parameters listed below should be flexible for modifications (parameters themselves, units, etc.) in order to address the changing business needs. In case such a modification would be required, Frontex will notify the contractor and the change would be made according to the bilateral agreement, following the On-Request Service process described in # 8.7.

6.3.1.3.1. List of Atmospheric parameters

The environmental assessment services shall provide the information on the current conditions and forecast according to the parameters listed below on permanent basis (unless otherwise agreed in the delivery plan) for the requested area of interest and in the specified format.

The parameters listed below are compulsory:

1. Air Temperature - 2m above ground (minimum, maximum, average) (deg C)
2. Dew Point temperature (deg C)
3. Wind Chill (deg C)
4. Relative Humidity (%)
5. Pressure (mB at sea level)
6. Wind Direction (degree, radian) -
7. Wind Gust (in km/hr, in m/s and in Beaufort/knot/meter per second/kilometre per second/mile per second)
8. Wind Speed (in km/hr, in m/s and in Beaufort/knot/meter per second/kilometre per second/mile per second)
9. Precipitation occurrence (probability)
10. Precipitation amount rate (mm/hr)
11. Snow Fall (y/n)
12. Snow Depth (cm)
13. Cloud Cover (%)
14. Lightings
15. Weather conditions - phenomena: smoke, mist, haze, fog, weather front, storm, hail, hailstorm, thunder, dust storm.

The parameters listed below are optional/extra (added value):

16. Air Temperature near surface (minimum, maximum, average) (deg C)
17. Apparent Temperature (deg C)
18. Cloud Ceiling (in feet and in m above ground)
19. Visibility (km)
20. Heat Index (deg C)
21. Pressure (mB at the location)
22. Whether conditions - phenomena - other than enumerated as compulsory.

6.3.1.4. Oceanographic conditions

Oceanographic conditions (both measured and forecast) shall include the below listed parameters.

The parameters listed below should be flexible for modifications (parameters themselves, units, etc.) in order to address the changing business needs. In case such a modification would be required, Frontex will notify the contractor and the change would be made according to the bilateral agreement following the On-Request Service process described in # 8.7.

The oceanographic conditions parameters shall be delivered, in the format specified earlier.

6.3.1.4.1. List of oceanographic parameters

The services shall provide the information on the current oceanographic conditions and forecast according to the parameters listed below on permanent basis (unless otherwise agreed in the delivery plan) for the requested area of interest and in the specified format.

The parameters listed below are compulsory (for forecast data):

1. Sea surface Temperature (deg C)
2. Sea wave height (cm/m) / Significant Wave Height (cm/m)
3. Sea current speed (m/s and in Beaufort/knot/meter per second/kilometre per second)
4. Sea current direction (degree, radian)
5. Swell height (cm/m)
6. Swell direction (degrees)
7. Swell period (s)
8. Tides (tide state and tide height (m)
9. Wind wave height (cm/m)

10. Wind wave period (s)

The parameters listed below are optional/extra:

11. Sea wave length (cm/m)
12. Wind wave direction (degree, radian)
13. Sea wave period (in seconds)
14. Total wave mean direction (degrees)

6.3.2. Radar derived live animation

The radar animation shall provide the dynamically updated (animated) live picture of the current precipitation intensity and precipitation type over the area of interest, based on available weather radar data according to the requirements specified below. The actual development of and movement of precipitation areas shall be presented in an animated visualization of the predictions.

The service shall provide a combination of high resolution model data and precipitation intensity data generated by satellite images.

Live picture from weather radars shall be updated in intervals not exceeding 15 minutes (WSR or/and Doppler weather radar).

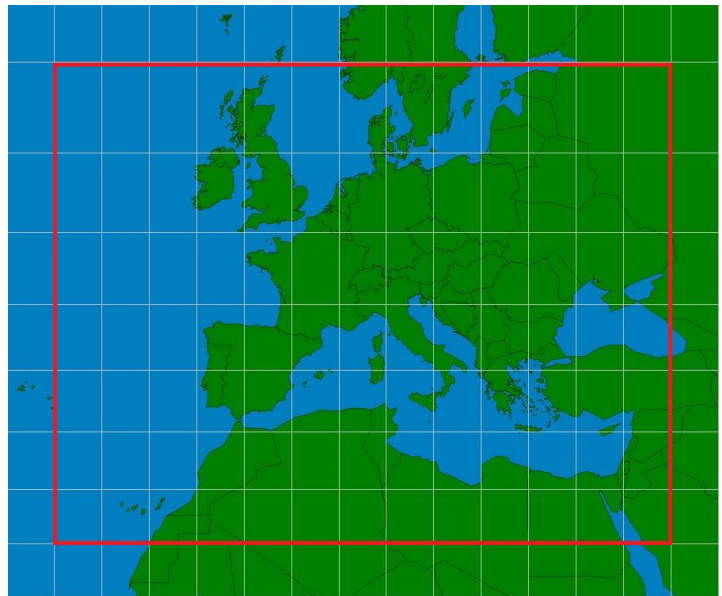
The animation shall provide data from the latest known down to 3 days in the past.

The parameters listed below are compulsory:

1. Location of precipitation
2. Type of precipitation (rain, snow, hail, sleet, freezing rain)
3. Intensity of the precipitation

The service shall provide the information on the analysis of the precipitation: identification of precipitation intensity, movement and precipitation type.

At least the following area shall be covered:



6.3.3. Severe weather warning service

The service shall provide the latest information on potentially hazardous weather covering the scope of all defined area and all available parameters.

The service shall provide warnings of extreme weather conditions and issue alerts if severe weather or extreme phenomena are predicted. Detailed and reliable warning information shall be provided in such cases and made visible in the system, with easily retrievable more detailed information.

The definition of all severe weather event / types of hazards (including the thresholds) shall be described in the service description documents.

6.3.3.1. Parameters

The service shall forecast the violation of thresholds of certain parameters and/or weather events. The parameter shall be chosen between existing oceanographic and atmospheric parameters. It shall provide the information on:

- the configuration of the warning ;
- start date-time and end date-time of the violation.

Predefined and user defined criteria for warnings shall be stored in configurations. Personal data (e.g. phone number) shall not be part of the configuration.

A configuration shall contain for example:

- User ID
- Configuration active period
- Warning window
- Parameters/events + thresholds
- One (user) defined area

A (user) defined area shall be a point, line or area.

It shall be possible to combine parameters/events in a configuration.

Contractor shall advice Frontex about a set of predefined warning parameters /events.

6.3.3.2. Time range

The predictions and warnings shall be provided with the maximum possible advance.

6.3.3.3. Presentation

All warnings produced by one or more warning configurations shall be ready to be displayed on a map.

If a warning or warnings is/are displayed in an area or areas, the warning type shall have a descriptive icon visible on the map.

Once this information is displayed, more detailed warning information (including probability, time period, detailed information) shall be retrievable from the map (clicking on the area of warning).

Both WMS and WFS shall be supported.

6.3.3.4. Distribution channels - Notification system

Contractor shall deliver the warnings via API, so that Frontex is able to link the warnings to their end users via user-ID to send out notifications.

6.3.3.5. Service update times

All warnings shall be recalculated after new data has become available.

In addition, when a warning configuration is changed the service shall recalculate the configuration for possible violations of parameter threshold(s).

6.3.3.6. Warnings configurations

Individual users shall have access to custom warnings configurations created by them.

Users shall be able to list, create, edit and delete their custom warning configurations.
Users shall be able to create warning configurations combining available parameters.

7. Additional tasks & services

7.1. Additional tasks & services - description

7.1.1. Trainings

Each time a specific training is required (according to the 'on-request' procedure # 8.7), Frontex will send to the Contractor all relevant information concerning the training needs, audience, location, dates, etc.

Based on this information the Contractor will be asked to prepare the Training Proposal. The proposal shall include at least 2 CVs of the potential trainers, corresponding to the profile needed. Once this proposal is formally accepted by Frontex, the training delivery can start.

Training sessions and all training materials are to be provided exclusively in English language.

At the end of each training activity, the trainer is expected to present the full training report. In parallel, Frontex will conduct a satisfaction survey among the training participants. The results of the survey will be communicated to the Contractor.

The yearly estimate of amount of trainings as well as indicative dates and locations will be provided to the Contractor by Frontex Service Manager at the beginning of each calendar year. All expenses related to Contractor's staff shall be borne by the Contractor.

(# Appendix 5 - for reference)

7.1.2. Other additional tasks and services are outlined in more detail below with respect to functional and non-functional requirements (as well as listed in Appendix 2, Annex II) and ordered 'on-request' procedure # 8.7.

7.2. Additional tasks & services - non-functional requirements

7.2.1. Specific format requirement for Radar data and cloud animations

Radar data and cloud animations shall be available using WMS.

7.2.2. Specific format requirement for Meteograms

It should be possible to request a meteogram from any point on the map (x and y coordinates in WGS84 Geographic) and the results of such meteograms shall be presented in a new window.

Web site for meteograms shall be built in HTML5 + JAVASCRIPT and it shall be compatible with the most common web browsers (Explorer, Chrome, Mozilla).

The meteogram should be exportable and printable as PNG and PDF.

The data to create the meteogram should be exportable as CSV or Excel. Excel format shall contain raw data plus graphics.

7.2.3. Symbology

The provided services shall allow for visualization of data with descriptive icons related to each parameter, as well as to all types of severe weather anomalies

The Contractor shall propose examples of icons. The final agreement on the symbology to be used will be reached during the phase of approval of the Service Description Document by Frontex Service Manager.

7.3. Additional Functional requirements

7.3.1. Short range radar/precipitation forecasts

The service shall provide the model of development of the precipitation fields across the requested area for the next hours (e.g. based on remote sensing, like radars and using products for building tracks and predictions of the precipitation fields of the localized weather structures, based on data analysis of reflectivity and radial velocity). Radar reflectivity and min 2h forecast shall be provided. It should also provide the animated visualization of the predictions. The forecast should allow to identify the areas of precipitation and determine the direction and speed movement of the fields.

7.3.2. Cloud animations

The actual development of the weather and clouds moving shall be presented as an image. The cloud animation shall provide the dynamically updated (animated) live picture of the current cloud coverage (live picture for clouds patterns).

Live picture of cloud animation shall be updated in intervals not exceeding 15 minutes.

Animations update shall be not exceeding 30 minute intervals.

Live animation of clouds should include images of Visible and Infrared channels.

The animation shall provide data from the latest known down to 3 days in the past.

The service shall provide the information on the analysis of the clouds: identification of cloud layers with cloud type and coverage, height and temperature.

Where possible, the service shall provide the model of development of the clouds across the requested area, including the visualisation of the predictions.

7.3.3. Lightning animations

The lightning animation shall provide the dynamically updated (animated) picture based on lightning data according to the requirements specified below.

Every image shall contain lightning data over the past 60 minutes, with color-coded the recentness of the strikes. The polarity of a strike must be indicated.

GetFeatureInfo request shall return:

- Time of strike
- Type (cloud to ground or cloud to cloud)
- Amplitude

The picture with lightning data shall be updated in intervals not exceeding 15 minutes.

Animation interval shall not exceed 15 minutes.

The animation shall provide data from the latest known down to 3 days in the past.

7.3.4. Meteograms

A dynamically created meteogram should be provided for the forecast data. The meteogram should show the forecast up to 7 days.

Meteograms web site shall receive parameters that will be used to create meteogram. A number of selected parameters should be included (with having a default set parameter). When the meteogram has been loaded, it shall be possible to change the parameter to any other weather parameter (to be allowed to load additional parameters). Several meteograms shall be available in the same report.

The following weather parameters shall be available at least:

Current direction and speed, Sea temperature, Total wave height, Swell height and period, wind wave height and period, Air temperature, Apparent temperature, Dew Point, Precipitations amounts and probability, MSL Pressure,

Relative humidity, Snowfall amounts, Snow depth, Total cloud cover, Visibility, Wind chill, Wind direction, speed and gusts.

The presentation should comply with the example below:



7.3.5. Access to historical data/climatology

The contractor shall be ready to deliver the historical:

- 1- reanalysis (for measured) data (from older than 7 days and up to 20 years in the past)
- 2- forecasted data (from older than 7 days and up to 20 years in the past),

Climatology layer within atmospheric weather the minimum should be: Wind speed, Wind direction, Precipitation amount, Air temperature.

Climatology layer within oceanographic conditions the minimum should be: the averages for Significant wave height, wave direction.

The historical data shall be delivered as raw data or as aggregated data, with monthly averages in formats as excel, CSV, Shapefile if feasible. Monthly maps when possible should be also delivered.

In addition time series and reports shall be provided if requested. Seasonality plots will be enabled for predefined critical locations and 20yrs of hourly time series with monthly average distribution tables will be provided upon Frontex request.

The technical conditions of such retrieval shall be specified in the Service description document.

Each query and timeframe of the climatology data will be defined by Frontex Service Manager.

7.3.5.1.1. List of optional Atmospheric parameters

See more under 6.3.1.3.

7.3.5.1.2. List of optional oceanographic parameters

See more under 6.3.1.4.

8. Contract implementation

8.1. Duration

The contract is expected to be concluded for two years with possible extension for another two years (for a maximum total duration of four years). The extension will be automatically applied unless one of the parties receives formal notification to the contrary at least three months before the end of the ongoing duration. Tenderers shall submit tenders which demonstrate, that the services could be provided for a period of 4 years in total.

8.2. Delivery schedule

The contract shall enter into force on the next day after is signed by the last contracting party.

The kick-off meeting shall be organized within 5 working days after the signature of the contract. The detailed planning, schedule of deliveries, milestones, structure of deliveries, etc. shall be discussed.

The deliverables under the contract for the provision of environmental assessment meteorological and oceanographic services shall be delivered following the schedule below:

Nr.	Deliverable	Timeline
1.	Service Delivery Plan	Within 10 working days after kick-off meeting
2.	Service Description Documents	Within 15 working days after kick-off meeting
3a.	Test Plan & Scenarios	Within 5 working days after Frontex approval of the Service Delivery Plan & Service Description Document
3b..	Test Reports	Within 5 working days after completion of tests
4.	Service Operation	After completion of the tests, but not later than 15 working days after Frontex approval of the Service Delivery Plan & Service Description Document
5a.	Service management reports	On monthly basis after service implementation
5b..	Recommendations of Improvement	As a part of the Service Management Report
6a.	Training Proposal	Within 1 week after reception of the training request submitted by Frontex Service Manager
6b.	Training Materials	Within 1 week after Frontex approval of the Training proposal
6c.	Trainings	According to Frontex training plan/ on request
7.	Consultancy services	When requested by Frontex

8.3. Place of work

Work shall be performed at the Contractor's premises.

In exceptional duly justified cases, the presence of the team at Frontex or Frontex Partners' premises may be requested. In case such need occurs, Frontex Service Manager will notify the Contractor and further agree all conditions.

The exceptional cases shall not exceed 10 man/days per calendar year of the overall time allocated to the service development and implementation. All expenses related to Contractor's staff shall be borne by the Contractor.

8.4. Monitoring and reporting

Throughout the duration of the contract, Frontex shall conduct an accurate appraisal of whether the Contractor is executing the tasks assigned to him in accordance with the contract's provisions.

To allow a regular monitoring of progress made, the Contractor shall set up the appropriate monitoring mechanisms for defined service levels.

The Contractor is requested to deliver the Service management reports on monthly basis (before the 10th of the following month), the content of reports shall follow the # 5.1.4. The monthly report summing up the activities shall be accepted by Frontex Service Manager.

Frontex shall monitor the quality of the service provided by the Contractor, including following elements:

- The quality standards as stated in this ToR;
- The compliance of the deliverables to the all functional and non-functional requirements;
- The customer satisfaction for consultancy and training services;
- The speed and agility of responding to requests;
- The adherence to deadlines;
- The customer assessment of user-friendliness of the provided service.

8.5. Communication

Day-to-day communication between Frontex and the Contractor may be face-to-face, by e-mail, by telephone and/or virtual meeting rooms. The Contractor shall appoint a contact person(s) and provide their e-mail address(es) and mobile phone number(s).

Regular meetings will be held between the Contractor and the Frontex Service Manager to discuss ongoing issues.

At least two times per year one face-to-face meeting shall take place at Frontex premises. All expenses related to Contractor's staff shall be borne by the Contractor.

The minutes of all meetings shall be drafted in English by the Contractor and approved by Frontex Service Manager.

8.6. Warranty

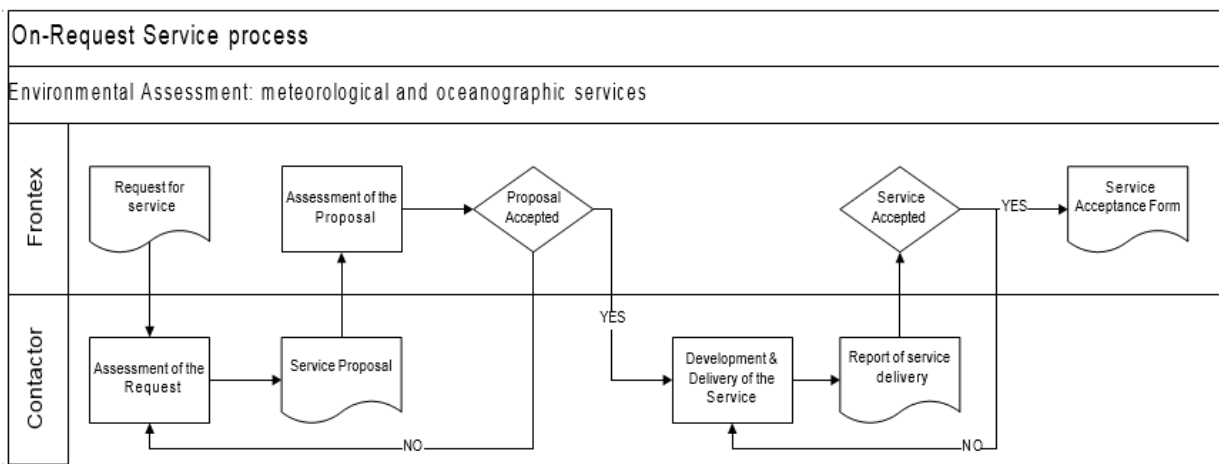
The Contractor shall provide warranty for all the supplied services and works during the period of validity of the contract.

8.7. On-Request Service process

When a specific service needs to be requested or modified, the On-Request Service process shall be followed. The ad-hoc delivery/ modification can be requested for the following services within the following boundaries:

#	Service	Boundaries
7.1.1.	Training services	10 m/d per year; up-to 75% outside contractor's premises
5.2	Service development and implementation - on-site Frontex premises	Up to 10 man/days per calendar year
6.1.1.1.	Maintenance - on-site Frontex premises	Up to 6 interventions per calendar year
7.2. & 7.3.	Parameters	Up to 25 % of parameters can be requested to be modified (per year)

All steps of the On-Request service delivery process shall be followed. All expenses related to Contractor’s staff presence outside the Contractor’s premises shall be borne by the Contractor.



8.8. Security

The chosen **Contractor will be asked to sign the relevant Declaration of Secrecy** regarding performance of the contractual tasks entrusted, in accordance with the provided template (*Appendix III to Annex II*).

The Contractor shall respect the Frontex Security Manual. **The Contractor’s staff** involved in the execution of the Contract **will be asked prior to the start date of the contract to sign a Declaration of Confidentiality** *Appendix V to Annex II*). If the Contractor or its personnel and, where applicable, sub-Contractors fail to comply with the Frontex security rules or with instructions from the Frontex Security, Frontex may, without prejudice to any indemnity due by the Contractor to Frontex, terminate the contract with immediate effect by giving notice in writing to the Contractor. In these circumstances, no costs or compensation relating to such termination shall be due by Frontex to the Contractor.

8.9. Contract Management

The Agency will appoint a member of staff as Frontex Service Manager for this Contract, who will be the main contact person for all issues relating to the implementation of the Contract.

8.10. Documentation

Frontex requires that all the documents created in the course of the project maintain a high quality and are:

- Fit for purpose;
- Clear, thorough, free of errors and up-to-date;
- Equitable, consistent and inclusive, (i.e. take into account the diversity of users and different user needs);
- User centred and user friendly.

All documentation delivered, both in paper and electronic form, shall be in English.

8.11. Licences

The most complete range of relevant software licenses, subscriptions and modules shall be an integral part of the service delivered.

8.12. Payment

The payments for the implementation of the contract shall be made as follows:

Delivery of Obligatory services.	On quarterly basis upon presentation of the invoices and under the condition that the delivered services are formally accepted.
Delivery of Additional tasks and services.	On quarterly basis upon delivering the services and presentation of the invoices and under the condition that the delivered services are formally accepted.

8.13. Language

All deliverables shall be provided in English language.

8.14. Redistribution rights

Redistribution rights are required for all data provided (web services, hardcopy renditions, static, electronic map images (for example, .tiff, .jpeg, vector data formats) that are plotted, printed, or displayed (e.g. on intranet network for 500 remote users).

8.15. Licenses and intellectual property rights (IPR)

Proposals must be compliant with the web map source licensing policy and shall not violate any copyright or IPR.

8.16. Acceptance

All deliverables shall meet the criteria established under acceptance criteria. Acceptance of tasks will be performed as soon as Frontex assess the compliance to the acceptance criteria defined below and signs the Acceptance Form (*Appendix IV to Annex II*).

All service components shall be delivered in specified and agreed format, with all attributes and timeframe specified in signed contract.

All service components shall meet the identical or higher quality criteria to the ones provided by the bidder in the submitted Sample Service (see details in *the Annex I*).

Acceptance criteria

Nr.	Deliverable	Acceptance criteria
1.	Service Delivery Plan	<ul style="list-style-type: none"> contains all elements stated in the ToR, is compliant to the document standards set in # 8.10 of this ToR
2.	Service Description Document	<ul style="list-style-type: none"> contains all elements stated in the ToR, is compliant to the document standards set in # 8.10 of this ToR
3a.	Test Plan & Scenarios	<ul style="list-style-type: none"> contain all required information, is compliant to the document standards set in # 8.10 of this ToR

3b.	Test Reports	<ul style="list-style-type: none"> ○ are compliant to the document standards set in # 8.10 of this ToR ○ tests carried out and passed according to test plan and test scenarios
4.	Service Operation	<ul style="list-style-type: none"> ○ Adherence to deadlines ○ Compliance to the Service Delivery Plan and Service Description Document ○ Compliance to requirements stated in the ToR ○ Absence of major errors of bugs (detected in the testing phase) ○ Service levels (# 6.2) maintained
5.	Monthly service management reports	<ul style="list-style-type: none"> ○ are compliant to the document standards set in # 8.10 of this ToR ○ Correction of business functionalities of the system in respect to identified bugs and shortcomings
6a.	Training Proposal	<ul style="list-style-type: none"> ○ are compliant to the document standards set in # 8.10 of this ToR ○ contain all relevant elements stated in the ToR
6b.	Trainings	<ul style="list-style-type: none"> ○ Training delivery is compliant to the training proposal; ○ User satisfaction level is from medium to high
7.	Consultancy services	<ul style="list-style-type: none"> ○ Training delivery is compliant to the training proposal; ○ User satisfaction level is from medium to high ○ Speed and agility of responding to requests

8.17. Business continuity and handover

The Contractor must set up and maintain business continuity for the services. This combined plan must be provided to Frontex. In particular, at the end of the Contract, the Contractor shall take all necessary actions to support a smooth transition, where applicable.

The Contractor shall provide Frontex with all necessary information for the transition (management information, working procedures, etc.) at the latest three months before the end of the Contract.

9. Prices

The financial offer should be presented in the prescribed format of *Annex IV*. All prices shall be expressed in EUR. The Financial offer shall be submitted for the 2 year duration of the contract and separately for the possible extension of the project (for another 2 years). The financial offer should be provided in a form of a lump sum which should include all potential costs the proper implementation of the contract.

For the Additional tasks and services a price offer for separate services (which the tenderer is willing to provide) shall be given.

10. Appendixes

Appendix I - the list of Obligatory services

Appendix II - the list of Additional tasks and services

Appendix III - Declaration of Secrecy (to be signed by the contractor)

Appendix IV - Deliverable Acceptance Form

Appendix V - Declaration of Confidentiality

Appendix I - the list of Obligatory services

Obligatory requirements of services/list of minimum technical parameters		
		Please mark 'X' if you confirm the delivery of the service/parameter
1	Area of Interest covered fully (ToR # 4)	
2	Maintenance, testing and improvements of the services (ToR # 6.1.1.1.)	
3	Consultancy (ToR # 6.1.3.1.)	
4	Format of the service delivery channels (ToR # 6.2.1.)	
5	Map visualization (ToR # 6.2.2.)	
6	Projection (ToR # 6.2.3.)	
7	Spatial resolution (ToR # 6.2.4.)	
8	Availability of data - frequency (ToR # 6.2.5.)	
9	Security (ToR # 6.2.6.)	
10	Specific format requirement for Warnings data (ToR # 6.2.7.)	
11	Wind Vector presentation and similar data (streams) (ToR # 6.2.8.)	
12	Text description (ToR # 6.2.9.)	
13	Time range for measured data (ToR # 6.3.1.1.1.)	
14	Time range for forecast data (ToR # 6.3.1.2.2.)	
15	Temporal resolution for measured data (ToR # 6.3.1.1.2)	
16	Temporal resolution for forecast data (ToR # 6.3.1.2.3)	
17	Meteorological stations coverage (ToR # 6.3.1.1.4)	
18	Service update times for measured data (ToR # 6.3.1.1.3.)	
19	Service update times for forecast data (ToR # 6.3.1.2.4)	
20	Compulsory parameters for atmospheric weather conditions (both measured and forecast) (ToR # 6.3.1.3.1, points 1-15)	
21	Compulsory parameters for oceanographic conditions (both measured and forecast) (ToR # 6.3.1.4.1., points 1-11)	
22	Radar derived live animation (ToR # 6.3.2.)	
23	Severe weather warning service (ToR # 6.3.3.)	

Please note that all the above services must be provided. Lack of confirmation of any of the listed services will result in cancellation of the offer.

Appendix II - the list of Additional tasks and services

Additional tasks and services		
		Please mark 'X' if you intend to deliver the service
1	Meteograms (ToR # 7.3.4.)	
2	Short range radar/precipitation forecasts (ToR # 7.3.1.)	
3	Trainings (ToR # 7.1.1.)	
4	Cloud animations (ToR # 7.3.2.)	
5	Lightning animations (ToR # 7.3.3.)	
6	Access to historical data/climatology (ToR # 7.3.5.)	
7	Optional parameters for atmospheric weather conditions (ToR # 6.3.1.3. points 16-22)	
8	Optional parameters oceanographic conditions (ToR # 6.3.1.4. points 11-14)	

Please note that only proposed services might be ordered during the implementation of the contract.

Appendix III - Declaration of Secrecy (to be signed by the contractor)

Declaration of Secrecy

Tender Procedure: Frontex/OP/141/2017/RS

I,(full name),

in my function of(full function name),

representing(full company name),

hereby declare that I and the company I am representing will treat the information and/or documents that are received from Frontex in the context of the execution and/or performance of the contract awarded to the company I represent with the strictest secrecy. No information and/or documents will be divulged to third parties.

I and the company I represent are aware that all the tasks carried out in view of the execution and/or performance of this contract also are governed by this the principles and provisions of this Declaration of Secrecy.

I and the company I represent are also aware of the fact that the requirements of secrecy spelled out in this Declaration continue to apply even after the completion of all tasks required within this contract.

I oblige myself to obtain from each staff member (involved in the execution and/or performance of the contract) of the company I represent a Declaration of Confidentiality (in accordance with the template as shown in the *Appendix V to Annex II*) in line with this Declaration of Secrecy that they respect the secrecy of any information which is linked, directly or indirectly, to the execution and/or performance of (tasks under) the contract and that they will not divulge information and/or documents to persons not having given a declaration mentioned above, to third parties or use for their own benefit or that of any third party any information or document not available publicly, even after completion of the contract.

All information and documents received will be used solely for the execution and/or performance of the present contract.

.....
[Place, date]

.....
[Company official stamp]

.....
[Name, Function]

DELIVERABLE ACCEPTANCE FORM

Project No: 2017/FSC/01	Date: dd/mm/yyyy
Contract No: OP/141/2017/RS	Service Order for:
Commitment: FRO.xxxxx	
Frontex Ref. No:	

To:

(contractor's name and address)

Lot No (if applicable):	Summary description of lot (if applicable):
-------------------------	---

In accordance with Article x.x of the contract no. OP/141/2017/RS we accept all deliverables.

Comments: All deliverables have been provided in the requested format and quality as well as on time.

Signed in 2 originals - one for each party:

Contractor: x x	[Legible signatures]
FRONTEX Plac Europejski 6 00-844 Warsaw, Poland	
Appendixes:	

Appendix V - Declaration of Confidentiality

DECLARATION OF CONFIDENTIALITY

Contract No.: Frontex/OP/141/2017/RS

I, (full name),

hereby declare that I will treat the information and/or documents that are received from Frontex in the context of the execution and/or performance of the above mentioned contract with the strictest secrecy. No information and/or documents will be divulged to third parties.

I am aware that tasks carried out in view of the execution and/or performance of this contract (including the final product) also are governed by this principle of secrecy.

I am also aware of the fact that the principle of secrecy pointed out in the first paragraph will continue to apply after the completion of the above mentioned contract.

All information and documents received will be used solely for the execution and/or performance of this contract.

.....
[place, date]

.....
[name/stamp of the Tenderer]

.....
[Signature]