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ANNEX 1

ANNEX

to the

Commission Implementing Decision

**Concerning the adoption of a financing decision for 2015 in the framework of the
Copernicus Programme**

ANNEX

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1. COPERNICUS REGULATION – ANNUAL WORK PROGRAMME 2015

This document constitutes the annual work programme adopted by the European Commission in conformity with Art. 12 of the Copernicus Regulation¹.

The Copernicus Regulation defines the fields that may be covered by actions. With a view to the funding available in 2015 and in order to optimise the available resources, the Commission proposes to concentrate the 2015 work programme on the following fields funded by budget lines 02.0601 and 02.0602:

- (1) Emergency Response, including Disaster Rapid Mapping and Disaster Risk and Recovery Mapping, as well as Early Warning System for floods and forest fires;
- (2) The Land Monitoring Service (including Pan-EU land cover, European local land, global land coverage, global land hot spot monitoring, Sentinel-2 Pre-processing, and LUCAS 2015);
- (3) The Marine Environment Monitoring Service;
- (4) The Atmosphere Monitoring Service;
- (5) The Security Service;
- (6) The Climate Change Service;
- (7) Cross-cutting activities (including Communication, in-situ coordination, user-uptake activities of Copernicus products, assesment for large data distribution options, security framework);
- (8) The space component (including construction, launch and operation of satellites and ground segments, data access and dissemination, consolidation of user requirements).

For the Copernicus services component, the activities planned for 2015 will ensure the continuity of the Copernicus 2014 work programme and of the actions launched in the 2011-2013 GMES Initial Operations (GIO) phase. These activities focus primarily on the Emergency Management Service and the Land Monitoring Service. In addition, the Marine Environment Monitoring Service and the Atmosphere Monitoring Service, the components of the Security Service and the Climate Change Service are new activities that have started in 2014, building on projects initially financed with research funds.

The development of the Copernicus space component in 2015 is ensured via the Delegation Agreements with ESA and EUMETSAT for the continued procurement and introduction into operations of the Sentinel satellites. Activities will cover in particular the operations of Sentinel-1A and the launch and initial operations of Sentinel-2A and Sentinel-3A. In addition, preparation will continue for the launches and operations of subsequent Sentinels. Data dissemination activities and data access from Copernicus Contributing Missions will further evolve in line with the increasing availability of Sentinel data.

The budget for 2015 relating to the Copernicus Regulation amounts to EUR 553.870 thousand under budget lines 02.0601 and 02.0602. The activities, their indicative costs and milestones described in this document illustrate the expected progress in the various areas. Cumulative changes within or between the allocations to the specific actions not exceeding 20% of the maximum contribution are not considered to be substantial provided that they do not significantly affect the nature and objective of the work programme.

¹ Regulation (EU) N° 377/2014 of the European Parliament and of the Council of 3 April 2014

2. INDICATIVE BREAKDOWN OF 2015 BUDGET BY ACTIVITY

SERVICES COMPONENT - Budget 2015 (thousands EUR, rounded)	
Activities	Budget Line 02 06 01
1. INDIRECT MANAGEMENT	
Land Monitoring Service (<i>indirect management components</i>)	10.300
Marine Environment Monitoring Service	21.000
Atmosphere Monitoring Service	14.940
Security Service (Border & Maritime Surveillance)	5.500
Climate Change Service	25.000
In-situ coordination	2.300
Sub-total	79.040
2. DIRECT MANAGEMENT	
Emergency Management Service	7.600
Land Monitoring Services (Direct management components)	12.000
Cross-cutting Activities	12.010
Security Service (Support to External Actions)	2.500
Expert Support & Assessment	500
Sub-total	34.610
TOTAL	113.650

SPACE COMPONENT - Budget 2015 (thousands EUR)	
Activities	Budget Line 02 06 02
1. INDIRECT MANAGEMENT	
A - INDUSTRIAL COSTS	
Construction and Launch Services (ESA)	204.900
<i>Of which construction</i>	173.900
<i>Of which launch services</i>	31.000
Operations	104.478
<i>Of which: ESA part</i>	90.400
<i>Of which: EUMETSAT part</i>	14.078
Management and Dissemination of Sentinel data	5.400
Access to Contributing Mission Data	36.932
<i>Of which: ESA part</i>	36.800
<i>Of which: EUMETSAT part</i>	132
Pre-financing of payments or Q1 2016	29.300
<i>Of which: ESA part</i>	21.000
<i>Of which: EUMETSAT part</i>	8.300
Contingency margin	10.106
Sub-total	391.116
B - INTERNAL COSTS	
<i>Of which: ESA part</i>	40.909
<i>Of which: EUMETSAT part</i>	995

	<i>Sub-total</i>	41.904
2. DIRECT MANAGEMENT		
User Requirements (External study)		2.500
Final Evaluation of GIO (External study)		100
SST Contribution		4.600
	<i>Sub-total</i>	7.200
TOTAL		440.220
GRAND TOTAL		553.870

3. 2015 WORK PROGRAMME – DETAIL OF ACTIONS

3.1. OBJECTIVE 1: SERVICES

3.1.1. ACTION No 1: Emergency Management Service

The objective of the Copernicus Emergency Management Service is to support users in the field of crisis management, notably the Civil Protection, Humanitarian Aid and External Action communities by providing them with information based on space data combined with other sources of data, also taking into account national capacities. It addresses disasters caused by natural hazards (floods, forest fires, earthquakes, tsunamis, volcanoes, landslides, storms, etc.), as well as man-made hazards (industrial, nuclear accidents, etc.), inside and outside the EU.

This action aims to ensure the continuity of activities started under the GMES Initial Operations (GIO) programme and pursued under the Copernicus 2014 work programme. In particular, the main objective in 2015 is to continue the mapping and early warning operations of the Emergency Management Service started within the 2011 to 2014 work programmes, and to integrate more systematically the alerts (for floods and forest fires) into the rapid mapping products. In addition, future developments of the service will be taken into consideration.

The Emergency Management Service will focus on the priority activities defined with guidance from the Copernicus Committee and the User Forum. Synergies with the other Copernicus services and activities will be sought, notably the Security Service, the Land Monitoring Service, user requirements definition and user uptake activities.

ACTIVITIES

This action is composed of the following two activities:

Mapping Service

Early Warning Service

3.1.1.1. Emergency Management Service - Mapping

Mapping in support of crisis management inside and outside the EU is comprised of 4 priorities:

- Ensure the continuity of the operational mechanism for delivering emergency mapping products during the emergency response phase, i.e. emergency response rapid maps produced in rush mode to show the impact, to assess the damage and to follow the evolution of the disaster in the hours and days after the crisis, as well as geographic reference maps made available in rush mode (Disaster Rapid Mapping) providing basic topographic maps on areas affected by the disaster, in particular on infrastructure and key natural resources.
- Support to the other phases of the crisis management cycle and the validation work, i.e. the prevention, preparedness and recovery phases, inside or outside the EU, by providing pre-disaster or post-disaster mapping products, including refugee/IDP (Internally Displaced Person) camps maps under a non-rush mode (Disaster Risk and Recovery Mapping). In 2015, the budget will accommodate an expansion of the non-rush mode service, especially in the domain of Disaster Risk Reduction, which has received significant international attention.

- Validation of the outputs of the previous two activities. The validation will continue in the same way as in the preceding period focusing on the most relevant disaster cases. The aim of validation is to support continuous improvement of the emergency service.
- Other activities related to the further development of the service. Possibly, depending on outcomes, the continuation of the targeted study on Unmanned Aerial Vehicles (UAV).
- Increased outreach and communication activities in liaison with key stakeholders.

These activities will be carried out as much as possible in coordination with the Member States and international partners, including UN-SPIDER, the International Charter, the African Union and the International Working Group on Satellite Emergency Mapping, in order to optimise the extent and the performance of the service.

EXPECTED OUTPUT OF THE IMPLEMENTING MEASURE

- 1) Operation of a 24/7/365 service handling activations by users and service coordination tasks.
- 2) On-demand mapping in rush mode in support to emergency response to crisis and disasters inside and outside the EU, delivered to users within the demanded time frame and with predefined set of cartographic product.
- 3) On-demand mapping in non-rush mode in support to other phases of the disaster cycle (prevention, preparedness, recovery...) inside and outside the EU.
- 4) Catalogue, archiving and dissemination of all generated products.
- 5) External validation and quality control.
- 6) Insight into the feasibility of integrating unmanned platforms in EMS implementation.
- 7) Change management and corresponding continuous development work for the integration of newly available input data and response to user requests and findings from wider research activities.
- 8) Communication and outreach to link existing and new users with the operational service.

INDICATORS

- 1) Number of activations of the service by users in rush mode (for ‘rapid mapping’ during the response phase).
- 2) Number of activations of the service by users in non-rush mode for preparedness / prevention and recovery mapping.
- 3) Number of maps produced in rush mode for the emergency response.
- 4) Number of maps produced in non-rush mode for the preparedness/prevention and recovery phase.
- 5) Number of satellite images ordered and produced.
- 6) Timeliness in rush mode: average time between the activation and the first crisis product delivery highlighting the disaster extent.
- 7) Results of user satisfaction evaluation.

IMPLEMENTATION METHOD

Direct management in accordance with Art 58 (1) (a) of the Financial Regulation.

OPERATION TIMETABLE

MILESTONE DESCRIPTION	INDICATIVE QUARTER
Annual Service Performance Review	Q4/2015

BUDGET

ACTIVITY	YEAR	BUDGET LINE	BUDGET
Procurement	2015	02.0601	5.400.000 ²

3.1.1.2. EMS Early Warning System – European Flood Awareness System

The European Flood Awareness System (EFAS) activity is strongly linked to meteorology, hydrological data and forecasts. The activities foreseen within the frame of Copernicus in 2015 will cover operational flood forecast activities for European rivers including four distinct tasks:

- Operating the meteorological data collection centre: Collection and processing of meteorological in-situ data from national hydro-meteorological services and other relevant data providers to calculate the initial conditions at the beginning of the flood forecasts and for calibration and validation purposes for EFAS.
- Operating the hydrological data collection centre: Collection of historic and near-real time river flow data, including automated data from National Hydrological Services, quality control and near real time transfer of data to the EFAS computational centre for updating real time forecasts and skill score calculations. Data are also used for verification of past flood forecasts, and calibration and validation of the hydrological model used for EFAS.
- Operating the EFAS computational centre: Twice daily collection and pre-processing of numerical weather forecasts and observed data, collection of satellite information such as snow cover and soil moisture, calculation of initial conditions before the start-up of the forecasts, executing the hydrological model for EFAS with the multiple ensemble meteorological inputs, post-processing of numerical model results and visualising them on a username and password protected web interface. Final products are probabilistic flood forecasts for Europe with a 3-15 day lead-time and the possibility of monthly outlook on the hydrological situation. Skill scores are calculated regularly and published in monthly bulletins which are made available on the Copernicus website.
- Operating the EFAS dissemination centre: twice daily analysis of the EFAS results and communication of EFAS flood information to the EU Emergency Response Coordination Centre (ERCC in DG ECHO) and national EFAS partners, management (and extension) of EFAS partner network, collection of feedback and information from flood events, organisation of annual EFAS workshops and provision of training on EFAS products to partners when necessary.

Furthermore, the next operational phase of the EFAS will start during 2015. Following the publication of tender documents for the four EFAS centres for meteorological data collection, hydrological data collection, computational tasks and dissemination centre in 2014, the

² This takes into account €3.8 million from 2014 which will be used for 2015 activities. The total for 2015 will thus be €5.4 million.

selection of consortia is expected to be finalised in 2015 and the new centres established. In parallel, the existing operational centres will continue to run the service until the handover by the end of the year. During the next operational phase of EFAS, the model domain will be enlarged and include also EU eastern and southern neighbourhood as well as all Balkan countries.

EXPECTED OUTPUT OF THE IMPLEMENTING MEASURE

- 1) Twice-daily pan-European flood forecast information with lead-times of 3-15 days. Information is complementary to available national information and provided to relevant entities indicated by the competent Member States authorities as national and regional hydrological services, 32 Participating States in the Civil Protection Mechanism (28 EU Member States, 3 additional states of the European Economic Area (EEA) and the former Yugoslav Republic of Macedonia), as well as the European Commission. Information will be provided for river floods and probability for flash floods. The information is available on a password protected web-interface accessible on 24/7 basis. In case of predicted floods, the relevant authorities and the Emergency Response Coordination Centre (ERCC) are informed also by email with flood alert and flood watch messages.
- 2) A daily updated pan-European overview of on-going floods available on a public website.
- 3) Daily reports to the ERCC with an overview of on-going and forecasted floods and flash floods.
- 4) Providing pan-European forecasts for potential use in the Copernicus Emergency Management Service and its rapid mapping products.
- 5) Set-up of future EFAS operational centres for the period 2016-2020.

INDICATORS

- 1) Service indicator: Reliable 7/24/365 service.
- 2) Number of timely EFAS flood alerts, flood watches and flash flood alerts sent out to national hydrological services, participating States in the Civil Protection Mechanism and the Commission. Target: flood alerts sent more than 3 days before event, flood watches more than 24 hours before event and flash flood watches more than 12 hours before event.
- 3) Skill and performance scores including false/total warning ratio and hit/total warning ratio. Target: EFAS provides more skilful forecasts compared with the best available benchmarks.
- 4) Evaluation of user satisfaction regarding the quality of the service. Target: User satisfaction is the same or higher as compared to previous year.
- 5) Subscription and usage by national public institutions. Target: Number of partners and number of users connecting to EFAS interface following a flood alert or flood watch remains the same or is higher than in previous year.

IMPLEMENTATION METHOD

Direct management in accordance with Art 58 (1) (a) of the Financial Regulation.

OPERATION TIMETABLE

MILESTONE DESCRIPTION	INDICATIVE QUARTER
Annual Service Performance Review	Q4/2015

BUDGET

ACTIVITY	YEAR	BUDGET LINE	BUDGET
Procurement of EFAS operations *) *) includes continuation of EFAS operations and set-up of new services on extended domain.	2015	02.0601	1.800.000

3.1.1.3. EMS Early Warning System – European Forest Fire Information System

The European Forest Fire Information System (EFFIS) consists of a modular web geographic information system that provides near real-time and historical information on forest fires and forest fires regimes in the European, Middle Eastern and North African regions. Fire monitoring in EFFIS comprises the full fire cycle, providing information on the pre-fire conditions and assessing post-fire damages. EFFIS includes, starting from the pre-fire state, the following modules: (1) Fire Danger Assessment, (2) Rapid Damage Assessment, which includes the (2.1.) Active Fire Detection, (2.2.) Fire Severity Assessment and (2.3.) Land Cover Damage Assessment, (3) Emissions Assessment and Smoke Dispersion, (4) Potential Soil Loss Assessment, and (5) Vegetation Regeneration. Additionally, two other EFFIS modules supporting fire monitoring are the (6) Fire News module and the (7) Voluntary Geographic Information module. Additionally, at the core of EFFIS lies the so-called Fire Database, which includes detailed information of individual fire records provided by the EFFIS network countries; currently data in the database comprises nearly 2 million records provided by 22 countries.

Within the first module of EFFIS, meteorological and numerical weather prediction data are processed daily at the global scale, while the second module processes optical satellite image data on a daily basis to produce fire danger forecasts and information on active fires and the perimeters of burnt areas in the European, Middle Eastern and North African regions.

The activities under the current Copernicus programme will cover pre-operational forest fire monitoring activities for Europe including, at least, the first two modules:

1. Fire Danger Forecast:

- Collection of meteorological in-situ data from national meteorological services and other relevant data providers for calculating the initial conditions at the beginning of the fire danger forecasts, for calibration and validation purposes.
- Processing of meteorological Numerical Weather Prediction datasets (NWP) and in-situ data from national meteorological services and other relevant data providers for calculating the initial conditions at the beginning of the fire danger forecasts, for calibration and validation of fire danger predictions, for the computation of fire danger forecasts and fire danger anomalies.
- Results of the above will include the computation, with a resolution of 10 to 36 km, of: (1) daily fire danger forecast 1 to 10 days ahead, (2) the computation of fire danger anomalies, and (3) the provision of seasonal and monthly fire weather forecasts, i.e. temperature and rainfall anomalies that are expected to prevail over European and Mediterranean areas during the next 2 weeks and the next two months. The former

anomalies will be updated every week during the fire season, while the later anomalies will be updated monthly during the fire season. Normally in the beginning of each week a forecast for the next 2 weeks will be made available, and the beginning of each month the seasonal forecast for the next two months will be made available.

2. Active fire mapping and near real-time monitoring of burnt areas:

- Location of active fires, as detected by satellite imagery and the accurate mapping of fires of approximately 40 ha or larger and updated information on their perimeters will be provided twice daily based on medium (approx. 250-300 m ground spatial resolution) imagery. Additionally, a seasonal high-resolution burnt area map will be produced on the basis of high spatial resolution imagery (approx. 20-30 m ground spatial resolution) for the European, Middle East and North-Africa region, i.e. that covered by EFFIS Rapid Damage Assessment.

3. Development of dissemination services:

- Enhancement of the EFFIS web-information system to maintain and adapt the information flow from the service providers to EFFIS and from EFFIS to the Emergency Response Coordination Centre (ERCC) mechanism. Dissemination services will be developed and implemented by external contractors within the JRC premises to ensure compatibility of EFFIS Copernicus products with those of other EFFIS modules.

EXPECTED OUTPUT OF THE IMPLEMENTING MEASURE (DURING THE MAIN FIRE SEASON MARCH TO SEPTEMBER)

- 1) A daily updated fire danger map of the current day and forecast for 1 to 10 days ahead using weather forecast data, provided as layers with 6 classes (very low, low, moderate, high, very high and extreme) with a spatial resolution of about 10 km to 36 km and daily fire danger anomalies at the same spatial resolution. The fire danger classes are the same for all countries and maps show harmonised information of the spatial distribution of the fire danger levels.
- 2) A weekly updated pan-European overview of prevailing fire weather forecast for the following two weeks.
- 3) A monthly update overview of prevailing fire weather forecast for the following 2 months.
- 4) Daily maps of active fires (4 daily updates) and medium-spatial resolution maps of burnt areas (2 daily updates) in the European, Middle East and North Africa region and seasonal high-spatial resolution maps of burnt areas for the same region.
- 5) Daily reports to the ERCC with an overview of fire danger conditions, active fires and the extent of burnt areas.
- 6) Provision of fire danger forecasts and burnt area maps and potential damage of critical fires for its use in the Copernicus Emergency Management Service and its rapid mapping products.

INDICATORS

- 1) Service indicator: Reliable 7/24/365 service.
- 2) Number of timely EFFIS fire forecasts and accurate burnt area information uploaded in the system and detailed reports sent to forest fire services, participating States in the Civil Protection Mechanism and the Commission.

- 3) Skill and performance scores including recalibration of the fire danger forecast according to fire occurrence and burnt areas.
- 4) Results of user satisfaction evaluation.

IMPLEMENTATION METHOD

Direct management in accordance with Art 58 (1) (a) of the Financial Regulation.

OPERATION TIMETABLE

MILESTONE DESCRIPTION	INDICATIVE QUARTER
Annual Service Performance Review	Q4/2015

BUDGET

ACTIVITY	YEAR	BUDGET LINE	BUDGET
Procurement of EFFIS operations	2015	02.0601	400.000 ³

3.1.2. ACTION No 2: Land Monitoring Service

The objective of the Land Monitoring Service is to provide users in the field of environment and terrestrial applications with relevant information based on space data combined with data from other sources. It addresses a wide range of policies such as environment, agriculture, regional development, transport and energy as well as climate change at EU level. At global level it answers to European commitments in International Conventions. The Land Monitoring service focuses on the priorities defined by a broad consultation of key users within the EU institutions and agencies (addressing a broad variety of policies, such as environment, regional development, enlargement, development, humanitarian aid) as well as outside, the Copernicus User Forum, the National Focal Points of the European Environment Information and Observation Network (EIONET), the National Reference Centres (NRCs) and international stakeholders, including UN institutions.

ACTIVITIES

This action is composed of six activities:

- 1) Pan-European Land Coverage;
- 2) European Local Land;
- 3) Global Land Coverage;
- 4) Global Land Hot Spot Monitoring;
- 5) Sentinel-2 Pre-Processing;
- 6) LUCAS 2015.

³ Based on an annual budget of 1,3 MEUR, this figure includes the last quarter of the year only.

3.1.2.1. Land Monitoring Service - Pan-European Land Coverage

In the pan-European component, High Resolution Layers (HRLs) on thematic characteristics of land cover are updated in a 3-yearly cycle. The first full series (imperviousness, forestry, permanent grasslands, wetlands and small water-bodies) was deployed along the reference year 2012 +/- 1 year. The update will have the reference year 2015 +/- 1 year; hence production has already started in 2014. Production will thus continue in 2015, as 2015 is the reference year for this second HRL exercise. These layers provide intermediate and complementary information to the CORINE Land Cover (CLC) dataset that has a 6-yearly update frequency.

The main objectives consist of 3 parts: 1) the continuation of the time series of High Resolution Layers (HRL) on land cover characteristics (2015 is the reference year) with additional information if necessary, 2) the re-analysis of the 2006-2009-2012 time series of imperviousness layer in continuation with the exercise of 2014, and 3) the implementation of a new pan-European HRL on green linear features in view of Europe's green infrastructure ("greening" policies) and of a snow monitoring approach.

Green linear landscape features (like hedgerows, stonewalls, or ditches) play an important role in landscape functions. They serve as habitats and bio-corridors in intensively used open landscapes and are considered as indicators for a high biodiversity. Moreover, they provide important ecosystem services serving many functions including animal habitats, windbreaks, erosion control and the provision of field boundaries. A Europe-wide mapping of linear landscape features is proposed in 2015 after an initial feasibility study clarifying the technical implementation approach. The landscape features are to be detected and classified using V/HR imagery available in the Copernicus Data Warehouse. This dataset will build the basis for a future monitoring and change detection of the linear features for assessing landscape diversity, agriculture typology and trends in their changes.

The knowledge about snow extent, its change and related snow-water equivalents are important information for water accounting, agriculture, vegetation cycle analysis, flood warning and climate change. Moreover, snow information is an important factor for modelling hydro-power yields and hence electricity rates. In 2015, it is planned to start activities in this domain and to conduct, in a first step, daily and monthly snow extent and snow-water equivalence monitoring for the 39 EEA countries. The service should be based on European satellite missions and complemented by international missions. For efficiency, it may be implemented in liaison with DG JRC mid-resolution Global Land component activities. A possible overlap with existing services, such as EUMETSAT Hydro SAF will be avoided. Research and development already undertaken will be taken into account, following the conclusions of the common White Paper produced by the ESA-EU-EUMETSAT projects.

In the Land Monitoring Service, support will be given to the implementation of LUCAS-2015. Specific attention will be paid in the Pan European Land Coverage exercise to the integration of the field survey with the HRL processing chain, specifically in the calibration and validation tasks. LUCAS-2015 could also provide additional information to and complement the pan-European Earth Observation layers, improving statistically derived parameters.

Support to the EAGLE working group focusing on the methodology to translate national land monitoring initiatives to common European nomenclatures such as CORINE Land Cover (CLC), as well as methodological improvements to the permanent grassland HRL will continue as part of the work on the land monitoring service evolution. The EAGLE support is in line with strengthening the involvement of Member States' products in the Copernicus framework. The implementation of the EAGLE model approach will continue. The creation of the necessary software tools to facilitate the translations from national nomenclatures

towards the common European EAGLE concept, as well as the CLC nomenclature will be addressed in the 2015 work programme. This will include testing with existing national nomenclatures. In addition, the EAGLE working group may also address the question of interoperability of the Land Service products.

In line with the 2014 work program, reference data essential for land monitoring at European scale will be now considered in the Pan European Land coverage component to have a better alignment of these reference data to the Pan European layers. The objectives of this Reference data activity in the Pan European component are twofold and remain similar as in WP 2014. The first objective consists of the completion of the access to the hydrography and road themes and of the improvement of the access to other reference data theme in the series of priorities as identified from the 2013 services requirements analysis. The access node, initiated under the 2013 work programme, will continue in the 2015 work programme. An example could be, in WP 2015 and amongst others, exploring the possibility for accessing the geographic component of the national DBs constituting a generalised version of the Land Parcel Information System. The second objective is the interim update and the maintenance of the EU-HYDRO datasets involving the data custodians of national and/or regional hydrography datasets in the Member States and taking benefit of the appropriate linkage with National datasets. Emphasis is kept to EU integration of Member States' existing information when possible, with the aim to base the EU-Hydro dataset on national data, whilst maintaining homogeneity of the European product. This reference data work will be carried out in an INSPIRE-compatible framework.

In 2015, specifications for new products are also to be defined as a preparation for the implementation of these products. User consultations are proposed to complement and to refine the initial requirements. This includes, *inter alia*, consultations with the thematic Directorates-general of the Commission, the User Forum, national focal points of the EIONET, and National Reference Centres (NRC).

Products of this Pan-European component are particularly important at EC level for the European land monitoring purposes of the European Commission in the environment and climate domains. Concerning climate, elements of this work can support the reporting on Land Use, Land Use Change and Forestry (LULUCF), required under Decision 529/2013/EU⁴.

EXPECTED OUTPUT OF THE IMPLEMENTING MEASURE

The outputs will cover the 2nd part of the 2015 cycle: 2/3 of the pan-European coverage for the listed products are to be processed in 2015, complementing 2014 work and following the pace of the satellite image acquisition.

- 1) Post-processed space data and intermediate products extracted for the first third of the Pan-European coverage (bio-geophysical parameters);
- 2) Five thematic HRLs updated with land cover characteristics (artificial surfaces, forest areas, agricultural areas, permanent wetlands, small water bodies);
- 3) The HRL imperviousness time-series 2006-2009-2012 reanalysed , in a combined approach with the updating to the imperviousness 2015 status;
- 4) A pan-European HRL on green linear features using the combination of HR and VHR imagery;

⁴ Decision No 529/2013/EU of the European Parliament and of the Council on accounting rules on greenhouse gas emissions and removals resulting from activities relating to land use, land-use change and forestry and on information concerning actions relating to those activities

- 5) A first set of pan-European snow monitoring products;
- 6) LUCAS survey integrated into the HRL production line;
- 7) First semantic translations of sample areas in selected Member States processed from national data holdings into CORINE Land Cover-compliant data according to the EAGLE matrix methodology;
- 8) Improved use of national land cover/land use (LC/LU) initiatives in the Copernicus services;
- 9) An extension of the operational access to national hydrography databases and to a road network service and their inclusion of their national object IDs in the pan-European reference dataset;
- 10) A feasibility analysis to include generalised parcel information in a distributed reference data access mechanism;
- 11) The specifications for the new land monitoring products.

INDICATORS

- 1) Total area covered by cloud free mosaic of multi-temporal satellite imagery;
- 2) Total area covered by the high resolution bio-geophysical parameters;
- 3) Number and area of high resolution layers produced for each land cover characteristics theme;
- 4) Results of validation/quality control of products⁵;
- 5) Number of downloads and page views of the validated land cover datasets;
- 6) Results of user uptake and satisfaction evaluation;
- 7) Number of Member States' LC/LU databases transformed into the pan-European land database;
- 8) Number of countries for which hydrography data have been included in the reference data access node;
- 9) Performance and availability of a road network service for the Copernicus services;
- 10) A report on feasibility of including parcel information in the reference data access node.

IMPLEMENTATION METHOD

Indirect management in accordance with Art 58 (1) (c) of the Financial Regulation. This activity will be entrusted to a qualified body through a Delegation Agreement with the European Environment Agency (EEA), in line with the Commission's Delegation Decision⁶.

OPERATION TIMETABLE

MILESTONE DESCRIPTION	INDICATIVE QUARTER
Acceptance of the various lots of deliverables	Q1/2015-Q4/2015
Semestrial Implementation report	Q2/2015

⁵ The target of the expected overall accuracy for land cover products is 85% as expressed by user community

⁶ Reference to be inserted

Annual Service Performance Review	Q4/2015
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BUDGET

ACTIVITY	YEAR	BUDGET LINE	BUDGET
Pan-EU Coverage	2015	02.0601	7.000.000

3.1.2.2. Land Monitoring Service – European Local Land

The European Local Land component is part of the Land Monitoring Service. The main objective of this activity is to provide more detailed information complementary to the pan-European component on specific areas of interest (i.e. urban areas, riparian zones, coastal areas, Natura2000 sites, etc.). It will primarily be based upon the very high resolution images collected between 2014-2015 in combination with other available data-sets (high resolution and medium resolution images) acquired over the pan-European area.

The main objectives of the work programme 2015 consist of:

1. finalizing the local component on riparian zones to a full pan-European and full river hierarchy coverage of river-systems, for the purposes of biodiversity monitoring;
2. the continuation of the service to monitor the evolution in the Natura2000 sites and the threats to the sites due to changes in land cover/land use (LC/LU) practices in the fringe of the Natura2000 sites;
3. the start of a service to monitor the evolution of man-made activities reflected in changing LC/LU patterns in coastal zones, in the framework of integrated coastal zone management.

Coastal areas are among the most populated areas in the world. They are subject to an increasing pressure through further population expansion, tourism, exploitation of natural resources, aquaculture, fisheries, agriculture, shipping and on/off-shore wind energy production.

This leads to conflicts between the different interest groups. Furthermore, a destruction of habitats and a loss of biodiversity is the consequence. Coastal zones are also highly vulnerable to natural hazards (storms, flooding, erosion...) and climate change consequences such as sea level rise. Therefore, maritime spatial planning and integrated coastal management require a sound information basis. The coastal zone monitoring service will be shared among the marine and land services. In coordination with the Marine Environment Monitoring Service, the Land monitoring service will focus on the land side of the coastline, delivering a set of satellite derived parameters such as geomorphology and tailored land cover / land use mapping. Existing national databases will also be used in this context as much as possible.

4. Finally, the inclusion of height information in core urban areas of selected Functional Urban Areas (FUA) formerly known as Larger Urban Zones (LUZ) of the Urban Atlas will continue from very high resolution (VHR) stereo satellite imagery in view of improving population density disaggregation information. This activity will also include the access to in-situ data as appropriate including the assessment of relevant DEM if needed and the evaluation of the information available at Member States level. The selection of the Urban Atlas zones will be decided in coordination with DG REGIO.

Urban planning requires accurate estimates about population distributions and densities within a city. To improve the estimation of population densities in Functional Urban Areas (FUA), a three-dimensional approach is foreseen. For a number of FUA covered by the Urban Atlas product a digital surface model should be used and draped with the land cover data. For all buildings and building blocks, average elevation, building height and number of floors will be derived. Moreover, census information should be disaggregated for obtaining the population densities in these cities. The digital surface model could be obtained from available LIDAR/ stereo satellite/ InSAR data.

Products of this component are requested at Commission level for EU land monitoring and reporting activities of the European Commission in the domains of environment, agricultural policy (DG AGRI) and regional development (DG REGIO). Biodiversity monitoring should also be seen in the context of the support to the Mapping and Assessment of Ecosystems and Their Services (MAES) exercise.

EXPECTED OUTPUT OF THE IMPLEMENTING MEASURE

- 1) Land cover/land use maps for biodiversity monitoring, complementing the baseline of the 2012 local component on riparian zones;
- 2) Satellite image derived indicator maps on the status of Natura2000 sites, including maps on the surrounding threats on the Natura2000 sites;
- 3) LC/LU products delivered for Integrated Coastal Zone Management (ICZM) on the coastal zones along European coastlines, first geographical set of products;
- 4) Inclusion of height information in selected Urban Atlas down town areas.

INDICATORS

- 1) Total area covered by cloud free mosaic of multi-temporal VHR satellite imagery;
- 2) Extent and characterisation of riparian areas, Natura2000 and coastal zone sites;
- 3) Extent of height dimension information delivered for FUA of the Urban Atlas areas;
- 4) Results of validation/quality control of products;
- 5) Number of downloads and page views of the validated land cover datasets;
- 6) Results of user uptake and satisfaction evaluation.

IMPLEMENTATION METHOD

Indirect management in accordance with Art 58 (1) (c) of the Financial Regulation. This activity will be entrusted to a qualified body through a delegation agreement with the European Environment Agency (EEA), in line with the Commission's Delegation Decision⁷.

OPERATION TIMETABLE

MILESTONE DESCRIPTION	INDICATIVE QUARTER
Semestrial Implementation report	Q2/2015
Acceptance of the deliverables	Q4/2016

⁷ Reference to be inserted

BUDGET

ACTIVITY	YEAR	BUDGET LINE	BUDGET
Local Land	2015	02.0601	3.300.000

3.1.2.3. Land Monitoring Service - Global Land Coverage

In 2015, the evolution of the Global Land component will be in line with the activities of the 2013-14 work programme under the GMES Initial Operations and first year of Copernicus, and will thus ensure the continuity of the activities. Continuity and the temporal dimension are essential for most of the applications in the mid-resolution domain. The Copernicus Global Land component supports EU policies at international level and the European commitments under international treaties and conventions. The Global Land component is also a major contribution to the Global Earth Observation System of Systems (GEOSS) and more directly answering to the requirements for essential variables of some specific Societal Benefit Areas, i.e. Agriculture (GEOGLAM), Biodiversity (GEOBON) and Climate. In this context, national EU stakeholders and institutions should also be brought closer to the Global Land component of the Land Monitoring Service.

The main objectives of the Global Land component of the Land Monitoring Service will be the delivery in near real time of bio-geophysical terrestrial parameters which are of high priority for ensuring the continuity of support to EU policies. The activity will produce a set of biophysical parameters relevant for crop monitoring, crop production forecast, carbon budget, biodiversity and climate change monitoring at worldwide level, as well as additional biophysical parameters relevant for environmental monitoring purposes in Africa. In 2015, the Global Land component will also pursue the mid-resolution (300m) bio-geophysical parameters production and will extend the initial geographical coverage of the 300m resolution activity. New biophysical parameters will be proposed, such as vegetation phenology metrics, green feature detection, and cryosphere variables.

The products of this component are directly used, *inter alia*, for global land monitoring activities and near real time reporting carried out by the European Commission in the agricultural domain (Economic analysis and perspective) and development policy (Rural Development and Food Security). In addition, they can contribute to international developments in climate policy, related to global monitoring of efforts to reduce emissions from deforestation and forest degradation (REDD+) linked to GEO-GFOI initiative. They are also used by International Institutions, such as UN FAO and WFP.

EXPECTED OUTPUT OF THE IMPLEMENTING MEASURE

- 1) Space data acquired and internally archived;
- 2) Pre-processed mid-resolution space data, including composites;
- 3) Bio-geophysical variables produced in a timely manner (i.e. Fcover, FAPAR, LAI, NDVI, DMP, Soil Water Index, etc.);
- 4) Historical archive of bio-geophysical variable reprocessed;
- 5) Catalogue and archive of all generated products;
- 6) An improved website portal following Copernicus data distribution policy for Global Land data dissemination;
- 7) Production service maintained and service continuity ensured;

- 8) Service evolution to mid resolution sensors;
- 9) Independent validation and quality control of the service.

INDICATORS

- 1) Number of bio-geophysical parameters and product volume produced;
- 2) Service availability: number of on-time deliveries;
- 3) Results of the validation/quality control of the process;
- 4) Uptake and use of the parameters by institutional services and other institutions;
- 5) Results of user satisfaction evaluation.

IMPLEMENTATION METHOD

Direct management in accordance with Art 58 (1) (a) of the Financial Regulation.

OPERATION TIMETABLE

MILESTONE DESCRIPTION	INDICATIVE QUARTER
Acceptance of the deliverables	Q4/2015

BUDGET

ACTIVITY	YEAR	BUDGET LINE	BUDGET
Procurement	2015	02.0601	3.500.000

3.1.2.4. Land Monitoring Service - Global Land Hot Spot Monitoring

The Global Land Hot Spot monitoring activity is part of the Global Land component of the Land Monitoring Service. The main objective of this activity is to provide detailed land cover and thematic information of reference on specific areas of interest for EU outside the European Union territory, particularly in the domain of the sustainable management of natural resources. This information complements the bio-geophysical parameters of the Global Land coverage activity. The activity will directly support the identification, implementation, management and evaluation of projects developed by the EU in the framework of its international policies, and will complement existing or forthcoming activities, such as the GMES and Africa initiative. The activity is based on high and very high resolution images.

2015 will see a continuity of the 2014 activities dealing with protected areas in Africa. The list of protected areas of interest will be specified in collaboration with DG DEVCO following field activities currently carried out in this context. Member States may be involved in this definition. Where possible, this specification will take into account GMES and Africa priorities. It will not be restricted to Africa in the future. Tailored land cover and land cover change maps will be produced on protected areas and their surroundings, as well as, on request, specific thematic environmental products such as biomass estimates, land degradation and land cover fragmentation map.

The products will support the set-up of a reliable reference information system of protected areas which includes information on biodiversity and ecosystems, on pressure and threats to species and protected areas, and on ecosystem services provided by protected areas.

The products of this component will serve the biodiversity monitoring needs of the European Commission for environmental and development policies. The service will be used by DG DEVCO, DG ENV, and EU Delegations; EU Member States may also activate the services if needed in their field operations. They will also feed information needs related to climate policies, in particular in relation to third countries and in the context of adaptation and mitigation measures.

EXPECTED OUTPUT OF THE IMPLEMENTING MEASURE

- 1) High and very high resolution space data acquired and archived;
- 2) Space data pre-processed, including compositing and generation of bio-geophysical parameters;
- 3) Satellite image mosaics produced;
- 4) Tailored Land cover – Land use maps for biodiversity monitoring;
- 5) Herbaceous and woody biomass estimation maps;
- 6) Land cover and biomass change maps;
- 7) Earth observation derived parameters, such as land degradation, pressure and carrying capacity;
- 8) Catalogue and archive of all generated products;
- 9) Data and Product disseminated in line with Copernicus data policy;
- 10) Independent validation and quality control of the service.

INDICATORS

- 1) Number of Hot Spot monitoring request;
- 2) Total area covered by cloud free mosaic of satellite images;
- 3) Number of products developed;
- 4) Results of the validation/quality control of the products;
- 5) Number of downloads and page views of the validated land information;
- 6) Results of user uptake and satisfaction evaluation.

IMPLEMENTATION METHOD

Direct management in accordance with Art 58 (1) (a) of the Financial Regulation.

OPERATION TIMETABLE

Milestone description	Indicative quarter
Product delivery	Q1/2015 – Q2/2016
Annual Service Performance Review	Q4/2015

BUDGET

ACTIVITY	YEAR	BUDGET LINE	BUDGET
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Procurement	2015	02.0601	1.500.000
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3.1.2.5. Land Monitoring Service - Sentinel-2 Pre-Processing

This specific support activity will aim at the implementation of a service producing and delivering pre-processed Sentinel-2 data, as requested by a number of intermediate and final users from public and private sectors at European and national levels.

Sentinel-2 data are an essential source of information for most of the terrestrial applications. The provision of the data at Level 1C by the space component, under the remit of ESA, does not allow the direct exploitation of these data into many downstream processing lines.

The processing of Sentinel-2 data at Level 2 (atmospherically corrected) and Level 3 (spatial/temporal cloud-free composites) will allow the provision of data ready for end user applications. This is particularly critical for change detection analysis. Considering that the volume of Level 3 datasets is generally smaller than that of lower level datasets, this approach should also facilitate the dissemination of the data to a wide user community.

The interoperability and thus the possibility to combine Sentinel-2 data and LANDSAT mission data are also essential elements to be considered in this context and can serve many applications, including applications in the agriculture sector answering to the Common Agriculture Policy needs.

This activity should start in early 2015, at least 6 months before the launch of Sentinel-2, ensuring readiness of the processing chain at launch. During the first half of the year, the activity will be defined in close collaboration with ESA to ensure a coherent approach with the ESA Tool Box development, and in cooperation with NASA to allow interoperability of the Sentinel-2 products with LANDSAT products. The production of higher-level data (Level-2) will be examined together with ESA, as foreseen under the change-management process laid down in the Copernicus Agreement between the Commission and ESA. A study to clarify the way forward and the roles and responsibilities of the different actors should be concluded by July 2015.

EXPECTED OUTPUT OF THE IMPLEMENTING MEASURE

- 1) Space data acquired and archived;
- 2) Level 2 and Level 3 Sentinel-2 data produced in a timely manner;
- 3) Catalogue and archive of all generated products;
- 4) Data disseminated through an improved web site portal, in line with following Copernicus data policy;
- 5) Production service maintained;
- 6) Service evolution defined;
- 7) Independent validation and quality control of the service.

INDICATORS

- 1) Number of pre-processed scenes and data volume produced;
- 2) Service availability: number of on-time deliveries;
- 3) Results of the validation/quality control of the process;
- 4) Delivered volume of Level 2 and Level 3 data;

5) Results of user satisfaction evaluation.

IMPLEMENTATION METHOD

Direct management in accordance with Art 58 (1) (a) of the Financial Regulation.

OPERATION TIMETABLE

MILESTONE DESCRIPTION	INDICATIVE QUARTER
Acceptance of the deliverables	Q4/2015
Annual Seervice performance review	Q4/2015

BUDGET

ACTIVITY	YEAR	BUDGET LINE	BUDGET
Procurement	2015	02.0601	4.000.000

3.1.2.6. Land Monitoring Service – LUCAS 2015

The LUCAS survey is an important tool, linked to the implementation of different EU policies and strategies. Visual observations on the ground of a sample of geo-referenced points with a harmonized sampling methodology complement efficiently other methods of detection of changes in land cover and land use in European landscapes. The LUCAS activity is coordinated by EUROSTAT and is useful for the EU statistics, but has important other uses as well. LUCAS data collection is crucial also for the calculation of agro-environmental indicators (DG AGRI), for the preparation of LULUCF data in the context of Kyoto protocol implementation (DG CLIMA), for the reporting under the Birds, Habitats and Renewable Energy Directives (DG ENV), etc. LUCAS will be implemented compliant to the regulation. In the framework of the Copernicus programme, the use of LUCAS data is crucial for the verification and validation of the products, obtained from remote satellite observations and used in particular in the Land Service and applications. The LUCAS survey is accomplished consecutively every few years, the campaign in 2015 meets the needs of Copernicus programme as it corresponds to other Copernicus Land activities.

The 2015 LUCAS survey with the estimated cost of 12 MEUR will be co-funded by EUROSTAT and aforementioned Commission Directorates General (DG ENV, DG CLIMA, DG AGRI, and DG ENTR). DG ENTR participates with 3 MEUR due to the importance of the LUCAS survey data for Copernicus programme.

EXPECTED OUTPUT OF THE IMPLEMENTING MEASURE

1) Geo-referenced sample data integrated, validated and accessible in the LUCAS database.

INDICATORS

- 1) Timely provision of the LUCAS 2015 database;
- 2) Results of user satisfaction evaluation.

IMPLEMENTATION METHOD

Direct management in accordance with Art 58 (1) (a) of the Financial Regulation.

OPERATION TIMETABLE

Milestone description	Indicative quarter
Acceptance of the deliverables	Q2/2016

BUDGET

ACTIVITY	YEAR	BUDGET LINE	BUDGET
Procurement	2015	02.0601	3.000.000

3.1.3. ACTION No 3: Marine Environment Monitoring Service

In 2015, the transition from pre-operational activities to operational service provision will take place: The continuation of the service provision is ensured until end March 2015 through funding from Horizon 2020. Funding has already been committed in the 2014 Copernicus work programme in order to support ramp-up activities of the operational service, ready to take over operations. In 2015, Copernicus funding will serve to maintain the necessary structures corresponding to the chosen management mode as well as engineering tasks to enable the production status at operational level.

Main technical aspects of operationalization are:

- Organisation of routine hand-over between continuous model development/maintenance and operational implementation;
- Monitoring of production suites (input data acquisition, error handling, dissemination and archive);
- Maintenance of reference documentation for products (description, quality information);
- Consolidation of annual report for the description of ocean state for global ocean and the regional seas in support of environmental assessment;
- Consolidation and upgrade of the data dissemination tools and interfaces to meet the needs and technological readiness of users;
- Preparation of service performance reports based on statistical data, benchmarking and performance assessments.

In addition to the continued production of the established service portfolio under operational conditions, the following evolution of activities is envisaged:

- Ensuring the appropriate geographical coverage and resolution for improved monitoring and forecasting capacity in accordance with Member States' responsibility;
- Increased outreach and communications activities in liaison with key stakeholders of environmental community at national, EU and international level;
- Support of marine-specific end-user uptake of the Copernicus service across Europe;
- Capitalise on any sources of ancillary data that may be obtained free of charge to improve and extend the product portfolio, in response to user demands (e.g., wave and surface wind data);

- Integration of observational data, both test data and operational data stream, from Sentinel missions (Sentinel-1 and Sentinel-3).

ACTIVITIES

This action is composed of one main activity:

3.1.3.1. Marine Environment Monitoring Service – Phase I Operations

EXPECTED OUTPUT OF THE IMPLEMENTING MEASURE

- 1) Provision of data and products in an operational mode according to the product portfolio;
- 2) Maintenance of back-up systems and service recovery mechanisms;
- 3) Support of users through help-desk, documentation, and preparation of training;
- 4) Change management and corresponding continuous development work for the integration of newly available input data and response to user requests and findings from wider research activities; this includes the uptake of either test data sets or NRT data from Sentinel missions.
- 5) Activities to prepare future service evolution;
- 6) Communication and outreach to link existing and new users with the operational service.

INDICATORS

- 1) Technical quality of service provision;
- 2) Results of user satisfaction evaluation.

IMPLEMENTATION METHOD

Indirect management in accordance with Art 58 (1) (c) of the Financial Regulation. This activity will be entrusted to a qualified body through a Delegation Agreement with Mercator Océan, in line with the Commission's Delegation Decision⁸.

OPERATION TIMETABLE

MILESTONE DESCRIPTION	INDICATIVE QUARTER
Service Performance Review	Q4 2015

BUDGET

ACTIVITY	YEAR	BUDGET LINE	BUDGET
Phase I Operations	2015	02.0601	21.000.000

3.1.4. ACTION No 4: Atmosphere Monitoring Service

In 2015, the transition from pre-operational activities to operational service provision will take place: The continuation of the service provision is ensured until end March 2015 through

⁸ Reference to be inserted

funding from Horizon 2020. Funding has already been committed in the 2014 Copernicus work programme to support ramp-up activities of the operational service, ready to take over operations. In 2015 Copernicus funding will serve to maintain the necessary structures corresponding to the management mode as well as engineering tasks to enable the production at operational level.

Main technical aspects of operationalization are:

- Organisation of routine hand-over between continuous model development/maintenance and operational implementation;
- Monitoring of production suites (input data acquisition, error handling, dissemination and archive);
- Maintenance of reference documentation for products (description, quality information);
- Consolidation of the production of annual air quality re-analysis report (over EU) in support of air quality assessment;
- Upgrade of the data dissemination tools and interfaces to meet the needs and technological readiness of users;
- Preparation of service performance reports based on statistical data, benchmarking and performance assessments.

In addition to the production of the established service portfolio under operational conditions, the following evolution of activities is envisaged:

- Technical work for organising and strengthening the operational data feed from key in-situ data networks for validation and assimilation purposes;
- Increased outreach and communications activities in liaison with key stakeholders (EC, EEA, etc.);
- Start of a series of short competitive projects, focusing on end-use cases addressing developing application areas of the service, as well as uptake of service across Europe (local air quality, pollen and health, chemical weather forecast, Central, Eastern and Southern Europe, etc.);
- Start of the integration of Sentinel-5 precursor simulated data, and preparation of the related technical interfaces (expected to be available from Q4 2015; Sentinel-5P launch date is scheduled in January 2016).

ACTIVITIES

This action is composed of one activity:

3.1.4.1. Atmosphere Monitoring Service – Phase I Operation

EXPECTED OUTPUT OF THE IMPLEMENTING MEASURE

- 1) Provision of data and products in an operational mode according to the product portfolio;
- 2) Maintenance of back-up systems and service recovery mechanisms;
- 3) Support of users through helpdesk, documentation, and preparation of training;
- 4) Change management and corresponding continuous development work for the integration of newly available input data and response to user requests and findings from wider

research activities; this includes the uptake of either test data sets or actual data from Sentinel missions;

- 5) Communication and outreach to link existing and new users with the operational service.

INDICATORS

- 1) Technical quality of service provision;
- 2) Results of user satisfaction evaluation.

IMPLEMENTATION METHOD

Indirect management in accordance with Art 58 (1) (c) of the Financial Regulation. This activity will be entrusted to a qualified body through a Delegation Agreement with the European Centre for Medium-Range Weather Forecasts (ECMWF), in line with the Commission's Delegation Decision⁹.

OPERATION TIMETABLE

MILESTONE DESCRIPTION	INDICATIVE QUARTER
Service Performance Review	Q4/2015

BUDGET

ACTIVITY	YEAR	BUDGET LINE	BUDGET
Phase I Operations	2015	02.0601	14.940.000

3.1.5. ACTION No 5: Security Service

By aggregating space and in-situ data from global observations over land and seas, Copernicus services can make an important contribution to serve EU security needs. This has been demonstrated through a series of EU and national R&D projects, in particular in the domains of border surveillance (including maritime surveillance), humanitarian aid missions, conflict early warning and prevention, and others.

Progress in the definition of services has been consistent, based on lessons learned from R&D projects and discussions in GMES/Copernicus ad-hoc working groups.

ACTIVITIES

In 2015, this action is composed of three activities:

- 1) Border Surveillance
- 2) Maritime Surveillance
- 3) Support to EU External Actions

⁹ Reference to be inserted

3.1.5.1. Security Service – Border Surveillance

This action aims at including space observations into FRONTEX and Member State's border surveillance operations. Users have been extensively consulted and technical recommendations produced. A concept of operation was put in place to monitor South-European maritime and East-European land borders with the support of space data merged with other sources of information. FRONTEX will work with Member States and relevant actors in close cooperation with the Commission, making use of Earth Observation data and European industry capacities for increased border situation awareness and improved assessment of risk.

A pre-operational phase started early 2013 via FP7 funding in preparation of an operational service led by FRONTEX from 2015 onwards. In particular in support to EUROSUR, FP7 projects SAGRES and LOBOS have tested user uptake and delivered pre-operational services during 2014. A service portfolio was subsequently drafted by FRONTEX, with services grouped in three main categories: Land, Maritime and Environmental, all contributing to increasing situation awareness in South European and Western borders.

Activities for 2015 will concentrate mainly on strengthening data fusion capacities in FRONTEX and on the provision of operational space data for services as foreseen in the delegation agreement.

EXPECTED OUTPUT OF THE IMPLEMENTING MEASURE

- 1) Provision of data and products in an operational environment along the product portfolio;
- 2) Management of service provision contracts and infrastructure
- 3) End user support and adequate training;
- 4) Preparatory activities for service evolution.

INDICATORS

- 1) Seamless integration of Earth Observation derived information in Border surveillance operations
- 2) Quality of service provision;
- 3) Results of user satisfaction evaluation.

IMPLEMENTATION METHOD

Indirect management in accordance with Art 58 (1) (c) of the Financial Regulation. This activity is foreseen to be entrusted to a qualified body through a Delegation Agreement with the European Agency for the Management of Operational Cooperation at the External Borders of the Member States of the European Union (FRONTEX), in line with the Commission's Delegation Decision.

OPERATION TIMETABLE

MILESTONE DESCRIPTION	INDICATIVE QUARTER
Annual Service Performance Review	Q4/2015

BUDGET

ACTIVITY	YEAR	BUDGET LINE	BUDGET
Security Service – Border surveillance	2015	02.0601	3.000.000

3.1.5.2. Security Service – Maritime Surveillance

On maritime surveillance, an informal working group was set in April 2013 after the recommendations of the ad-hoc GMES/Copernicus User Forum held in June 2012. Discussions concluded that progress has been hampered by fragmentation of user communities. It was also recognised that, in addition to the activities being planned for Border Surveillance, Copernicus could provide added-value information for anti-piracy and anti-smuggling activities, fisheries control, monitoring of illegal dumping of waste, and also to the defence community.

The supply of GMES maritime surveillance services to those communities would benefit from a holistic approach to maritime surveillance, leveraging on lessons learned from R&D activities such as MARISS and FP7 projects, as well as the European Maritime Safety Agency (EMSA), EUSC and other stakeholders' operational experience in the maritime surveillance domain. Conclusions were reported to the Common Information Sharing Environment (CISE) Technology Advisory Group, to the Member State's Committees on Maritime Security (MARSEC) and to the Stakeholders Advisory Group on maritime security (SAGMAS).

Based on the work mentioned above, a portfolio of services has been defined and included in the list of tasks to be performed by EMSA as part of the delegation agreement for Copernicus Maritime Surveillance services, planned to become operation through the Agency as from 2015.

Activities for 2015 will concentrate on the mobilisation of user communities, validating their requirements and building up capacities in EMSA to supply services 2015 onwards.

EXPECTED OUTPUT OF THE IMPLEMENTING MEASURE

- 1) Provision of data and products in an operational mode according to the product portfolio;
- 2) Management of service provision contracts and infrastructure;
- 3) End user support and adequate training;
- 4) Preparatory activities for service evolution.

INDICATORS

- 1) Seamless integration of Earth Observation derived information in Maritime surveillance operations;
- 2) Quality of service provision;
- 3) Results of user satisfaction evaluation.

IMPLEMENTATION METHOD

Indirect management in accordance with Art 58 (1) (c) of the Financial Regulation. This activity is foreseen to be entrusted to a qualified body through a Delegation Agreement with the European Maritime Safety Agency (EMSA), in line with the Commission's Delegation Decision.

OPERATION TIMETABLE

MILESTONE DESCRIPTION	INDICATIVE QUARTER
Annual Service Performance Review	Q4/2015

BUDGET

ACTIVITY	YEAR	BUDGET LINE	BUDGET
Security Service – Maritime surveillance	2015	02.0601	2.500.000

3.1.5.3. Security Service – Support to EU External Actions (SEA)

The identification of application scenarios is on-going since 2010, through an ad-hoc working group¹⁰ and leveraging on the lessons learned from G-MOSAIC and other relevant activities. Based on the findings of the exercise, the projects G-NEXT and G-SEXTANT started in January 2013. G-NEXT has a pre-operational nature, while G-SEXTANT aims at bringing some applications up to a maturity level closer to operational user expectations. The validation of pre-operational services is taking place during 2013-14, allowing the refinement of specifications for operational services from 2015 onwards.

A portfolio of services was defined and activations enabled the analysis and exploitation of synergies with other services, in particular the Emergency Management Service (EMS). This work is still ongoing in 2014, and aspects of governance are also being analysed. First results indicate that there is the need to serve distinct communities with specific requirements regarding the provision and protection of information. At the same time, there are common functional requirements for EMS and SEA, which an operational set-up will have to take fully into account so as to avoid unnecessary duplications, responding to concerns raised by Member States in numerous occasions.

During 2015, capacities shall be put in place to ensure the provision of the services described in the SEA service portfolio, including both those provided by G-NEXT and those from G-SEXTANT with a degree of maturity to migrate to an operational level.

In particular, it will be necessary to:

- Implement a shared use of industrial processing capacity, fully exploiting synergies with EMS but complemented with specific SEA capacities, whenever needed;
- Create capacities to respond to CFSP/CSDP and other specific requirements (user interface, analysis of requests and provision of specific processing and analysis);
- Run the service complementary to the current EU capacities available outside the Copernicus perimeter (e.g. through EUSC core tasks) and coordinated with the EMS.

At this stage, it is not foreseen that Copernicus SEA products will be classified, but sensitivity of the products will be taken fully into account, taking into consideration (1) the sensitivity of the data and products along well-defined criteria, (2) selective information dissemination policy making the data available only to authorised users on a need-to-know basis. If there will be the need for classification, users can activate specific EU capacities outside the Copernicus framework.

¹⁰ SEA – Support to External Actions

It is foreseen that EUSC will play a key role in the provision of SEA, in close coordination with the EMS. Activities for 2015 should also aim at increasing user awareness and up-take, in particular within the European External Action Service, and in perfecting data sensitivity analysis and tasking, properly weighting the risks of information misuse against the added benefits of making value-added information available timely to authorised users.

EXPECTED OUTPUT OF THE IMPLEMENTING MEASURE

- 1) Capacities in place to operate services mid-2015 onwards.

INDICATORS

- 1) Timely establishment of operational service provision;
- 2) Technical quality of service provision;
- 3) Results of user satisfaction evaluation.

IMPLEMENTATION METHOD

Direct management in accordance with Art 58 (1) (a) of the Financial Regulation, in close coordination with the EEAS. Specific activities related to provision of services to CFSP/CSDP users are foreseen to be carried out by a qualified entity with specific competences in this domain, namely the European Union Satellite Centre (EUSC).

OPERATION TIMETABLE

MILESTONE DESCRIPTION	INDICATIVE QUARTER
Service Readiness Review	Q2/2015

BUDGET

ACTIVITY	YEAR	BUDGET LINE	BUDGET
Security Service – Support to EU External Actions	2015	02.0601	2.500.000

3.1.6. ACTION No 7: Climate Change Service

The mission of the Copernicus Climate Change (C3) Service is to build "an EU knowledge base in support of mitigation and adaptation". Its scope was elaborated at the Helsinki conference (16-17 June 2011) following recommendations exposed in an expert report. This proposal was then amended by Member States during the GMES User Forum held in November 2011. In line with the provisions of Article 5.1(d) of the Copernicus Regulation, the goal of the operational Climate Change service is therefore to provide reliable information about the current state of the climate and the more likely projections in the coming decades for various scenarios of greenhouse gas emissions and other climate change contributors.

The societal benefits from an operational Climate Change Service lie in its capacity to provide information about the most likely environmental changes to happen. This will support informed decision-making regarding possible mitigation and adaptation policies, as well as future regulations and investment decisions in a number of key industrial areas. Close attention will be paid to identified knowledge gaps at policy level, such as in the EU adaptation strategy. The Climate Change Service will capitalise on three main components: 1)

sustained networks of in-situ and satellite-based observations; 2) re-analysis of the Earth climate with a variety of models driven by observations; 3) modelling scenarios based on a series of climate projections. These three components will permit us deriving a range of climate indicators and climate indices for both the identified climate drivers and the expected climate impacts.

The functional view of the architecture of the C3 Service has been developed and presented to the GMES Committee of December 10, 2012 and the Climate Change workshop held on June 4, 2103. It is articulated around four complementary pillars: 1) a consistent Climate Data Store (CDS); 2) a Sectoral Information System (SIS); 3) an Evaluation and Quality Control (EQC) function; and 4) an Outreach and Dissemination (O&D) platform. This structure has been endorsed by the climate experts participating at a workshop dedicated to the Copernicus Climate Change service and convened by the European Centre for Medium-Range Weather Forecasts (ECMWF) on February 17-18 and June 25-26, 2014. These two-day workshops, attended by over 70 climate experts from ECMWF Member States and EU institutions, confirmed the Commission's initial suggestions and provided further recommendations regarding the role, scope, functions and content of the operational C3 Service.

In 2015, the Climate Change Service will continue to benefit from sustained research and innovation activities, in particular in relation to the development of improved modelling capabilities at various timescales. These research and innovation activities will be mainly carried out in Horizon 2020, through actions in the "Climate action, environment, resource efficiency and sustainable supply of raw materials" and in the "Space" areas.

The Climate Change Service will be established and its performance routinely assessed according to common practice for an operational service. The success of the implementation of the proposed service largely relies on the quality of the information flow and the overall coordination between the various blocks and actors. Series of precise, well-defined and operational procedures have to be established so that the information delivered to the end-user is fully traceable, quality controlled and disseminated within the most appropriate time frame, from the production in the consistent Climate Data Store (CDS) to the Outreach and Dissemination (O&D) platforms. The articulation between the main elements and bodies of the C3 Service is a critical element of the service and probably the one requiring most attention in the preparatory phase. It will indeed involve different national and international public institutions and the private sector through the entire production chain.

Activities in 2015 will support the continuation of activities to be completed at stage 0 that was initiated in year 2014. These activities will enable achieving a proof of concept of the service, perform preliminary testing of some operational functionalities, and activate the CDS and SIS building blocks.

The main goals for 2015 are thus to set up the required building blocks and to establish the series of procedures to ensure effective communication between the contributing entities. This implies the expansion of existing infrastructures as well as the scientific, technical and administrative actions needed to identify key partners that will support and contribute to the four building blocks at the earliest stage of the service. A full proof of concept is expecting to take place in order to identify early enough the possible weaknesses of the implementation model. The related activities should prepare the ground for the upcoming pre-operational phase. Case studies, initiated at a very early stage, will be instrumental in checking the proof-of-concept of various elements of the Service.

The proposed detailed work plan assumes no administrative, financial and/or political delays with respect to the timing imposed by the application of the usual procedures.

ACTIVITIES

This action is composed of one main activity:

3.1.6.1. Climate Change Service – Stage 0

Stage 0 will address the following areas for each of the building blocks:

- 1) CDS: Expanding the Climate Data Store (CDS) infrastructure and support facilities: The delegated body's existing data centre infrastructure will progressively be adapted and customised to allow efficient climate data services for users. This will involve some expansion of hardware: storage media, servers and technical support. Adequate capacity needs to be ensured for selection/acquisition/archiving of climate data records, implementation of traceable data services for climate observations as well as gridded climate data records, and development of new climate information products (data and visual) to serve the Sectoral Information System and end users of the Climate Change service. An estimated budget of 11,8 MEUR is foreseen to perform these activities. More specifically, activities will encompass:
 - i) The implementation of a climate monitoring facility and observation feedback archive that will be scaled to host an increasing number and variety of observations and ECV products, and to serve a growing number of users including SIS and science users. Computing and data handling services will be expanded accordingly. These services will also cater for supporting global and regional reanalysis productions.
 - ii) The provision of resources to start supporting coordination and definition of seasonal forecasting products capitalizing on current European capabilities. This support will include at the minimum monitoring and diagnostic activities.
 - iii) The support for climate projections (global and regional) will be initiated. Starting these activities at an early stage are particularly important to ensure a timely contribution to CMIP6.
 - iv) The hosting of a number of climate datasets based on in-situ and satellite data records, including data rescue, collection and consolidation activities. A global data rescue registry will be established to support further operational activities.
 - v) The ingestion of mature ECV products in the CDS and the support for operationalization of the production of these ECVs.
- 2) Sectoral Information System: The delegated body shall organize a preparatory analysis to identify possible knowledge gaps with engagement of relevant national, European and international bodies (e.g., EEA, DG CLIMA, DG RTD, the Joint Programming Initiative of Member States "Connecting Climate Knowledge for Europe" (JPI-Climate), GEO and downstream applications). This should materialise into a plan for implementation of the SIS, including the protocols and requirements for seamless CDS-SIS interactions. A total cost of 5,2 MEUR is estimated to support this activity.
 - i) A few case studies (covering 2-3 sectors ultimately envisaged) will be completed to demonstrate the value chain from the raw climate observations to the sectoral specific applications. These case studies will help identifying the gaps in data availability, methodologies, tool box facilities and data flows. This activity will be supported by the EQC functions that will also be initiated early in the process.
- 3) Evaluation and Quality Control (EQC) platform. The overall budget of EQC is estimated to be 6,0 MEUR.

- i) The Commission together with the delegated body will refine the perimeters of the various sub-functions.
 - ii) The EQC function will establish the list of common and sound practices 1) to assess the fitness for purpose of the service, 2) to perform the validation of the products against the specified requirements and 3) to guarantee the functioning of the service and delivery of the information as planned and expected.. This activity may require organizing dedicated workshops and consultations and will benefit from targeted calls to identify the expertise needed for the tasks.
 - iii) The EQC internal sub-function will identify the tasks to be achieved in order to guarantee the functioning of the service and delivery of the information as planned and expected. This activity may then be implemented via specific calls.
 - The EQC function will in particular contribute to the case studies activities for the SIS such that a large fraction of the EQC sub functions can be activated and tested;
 - Continued consultation and engagement with the climate community, from the User and Producer side, will be initiated at an early stage via dedicated workshops and /or consultation procedure.
- 4) Outreach and Dissemination (O&D) platform. The budget for the O&D platform is estimated at 2,0 MEUR.
- i) Early in the process, an extensive survey of national outreach initiatives and capabilities, including in the private sector, will be conducted.
- 5) The development of a C3 service website will be initiated.
- i) A communication function will be established at a very early stage by the delegated body to actively promote the C3 Service products and services and to interface with national and international climate outreach activities.
 - ii) A comprehensive plan for publicising C3 service via conferences, summer schools and other any other appropriate means will be established.

EXPECTED OUTPUT OF THE IMPLEMENTING MEASURE

The proposed activities encompass a range of administrative actions as well as engineering tasks to expand the initial set-up of the infrastructure needed for the service operations. The expected outputs thus include actions covering:

- 1) The setup of the administrative capacity needed to operate the service, including the establishment of an organisational structure and procedures ensuring seamless information flows;
- 2) The setup of agreements with third parties and plans for procurement of the required tasks (scoping of individual contributions and distribution of tasks), including the creation of networks to best capitalise on current national observational and archiving capacities;
- 3) The expansion of IT resources needed for future production under pre-operational conditions and the increase of hardware for large scale data streaming and archiving.

INDICATORS

- 1) Share of the required hardware ready to run by the 4th quarter after the start of Phase 0;
- 2) Initial administrative and procedural capacities in place, with organisational plans for the expansion of the service to pre-operational stage.

IMPLEMENTATION METHOD

Indirect management in accordance with Art 58 (1) (c) of the Financial Regulation. This activity will be entrusted to a qualified body through a Delegation Agreement with the European Centre for Medium-Range Weather Forecasts (ECMWF), in line with the Commission's Delegation Decision.

OPERATION TIMETABLE

MILESTONE DESCRIPTION	INDICATIVE QUARTER
Service Stage 0 Readiness Review	Q4 2015

BUDGET

ACTIVITY	YEAR	BUDGET LINE	BUDGET
Climate Change Service – Stage 0	2015	02.0601	25.000.000

OBJECTIVE 2: SPACE COMPONENT

The Commission holds the overall responsibility for the Copernicus Programme and for the coordination among its different components, including the activities concerning the Copernicus Space Component (CSC) described in the following actions. The implementation of most of these actions will continue to be delegated to ESA and EUMETSAT through the respective Agreements concluded with both organizations in October 2014. For the sake of simplicity, this Work Programme details only the activities themselves and does not generally describe to which specific entity they are delegated, since some are shared between ESA and EUMETSAT, some are delegated to one entity with the support of the other, etc. The activities will be coordinated between ESA and EUMETSAT via a separate joint management plan.

In this context, the milestones displayed in the space component section of this document are based on the official dates and figures which are currently available.

In order to fulfil its basic obligations under the Treaty on European Union and the Treaty on the Functioning of the European Union, and in line with the Regulation Establishing the Copernicus Programme and with the Financial Regulation, the Commission will oversee and closely monitor the implementation of the delegated activities throughout the entire period covered by the Agreements with ESA and EUMETSAT. This will be based on a) the established specific monitoring mechanisms and bodies, as well as reporting mechanisms; b) on full access to documentation related to the delegated activities; c) on participation in all meetings and reviews pertinent to the monitoring of progress of these activities; and d) on ad hoc progress and problem information. The Commission may request additional clarification and/or raise objections to any design or procurement choices that may lead to a sub-optimal usage of EU funds.

3.1.7. ACTION No 1: Construction and launch services

DESCRIPTION

This activity includes all activities related to the Copernicus Space Component (CSC) construction, launch (including initial operations up to the end of the In-Orbit Validation (IOV) and the achievement of the IOV milestone to qualify space-, ground- and user-segments through extensive in-orbit/on-ground tests and operations), as well as the space segment evolution, where necessary.

3.1.7.1. Launch services

According to the latest inputs received from ESA, two Copernicus satellites (Sentinel-2A and Sentinel-3A), along with Jason-3, are foreseen to be launched in 2015, while launch preparation activities will be on-going for the launches of the rest of the B units of Sentinels 1-2-3, as well as Sentinel-5P (a gap-filler precursor mission for Sentinel-5). Under the previous EC-ESA Agreement¹¹, the launches of Sentinel-2B, -3A, and -5P are funded from EU Framework Programme (FP7) provisions, thus no budgetary provisions are included for these launches in this work programme. Launch service procurements for Sentinel-1B, Sentinel 2A and Sentinel-3B are partly funded from the GMES Initial Operations (GIO) budget and partly from the MFF 2014-2020 budget.

¹¹ Consolidated version of the agreement on the implementation of the Space Component of Global Monitoring for Environment and Security (GMES) concluded on 28 February 2008

The activities in 2015 with relevance to MFF (2014-2020) funding are:

- 1) Sentinel-1B: continuation of launch service procurement and phase E1 activities¹²;
- 2) Sentinel-2A: continuation of launch service procurement and phase E1 activities;
- 3) Sentinel-3B: continuation of launch service procurement and phase E1 activities;
- 4) Sentinel-5P: continuation of launch service procurement and phase E1 activities.

BUDGET

ACTION	YEAR	BUDGET LINE	BUDGET
Launch services	2015	02.0602	31.000.000

3.1.7.2. Space Segment construction

In the field of satellite construction, 2015 activities will continue to cover the preparation of the construction of the recurrent units, and in particular the start of construction phase D¹³.

- Procurement of Sentinel-1/-2/-3 C and D Units. Activities in 2015 are concentrated on:
 - the preparation, issuing and evaluation of Invitations to Tender (ITTs);
 - the selection of prime contractors and signature of contracts;
 - the definition of consortia, and
 - the kick-off of production activities.
- *Pro memoria: The development of Sentinel-4A and Sentinel-4B instruments, as well as of Sentinel-6A (Jason-CS A), is not covered from the MFF 2014-2020 budget;*
- Development of Sentinel-5B and Sentinel-5C instruments: activities planned in 2015 include the activation of the contractual option (following Sentinel-5A PDR), the financial commitment for the contractual option, and the kick-off of production activities;
- Construction of Sentinel-6B (Jason-CS B) satellite: activities planned in 2015 include the financial commitment for the contractual option for the instrument, as well as the kick-off of production activities.

EXPECTED OUTPUT OF THE IMPLEMENTING MEASURE

- 1) Pursuit of construction of satellites and instruments, as well as management of launch services, through procurement contracts;
- 2) Launch and in-orbit commissioning of Sentinel-2A;
- 3) Launch and in-orbit commissioning of Sentinel-3A.

¹² Phase E1 includes the transportation of the spacecraft to the launch-site, performance-verification and software-maintenance activities during the launch campaign, system commissioning, support to operations during LEOP, analysis of instruments and data anomalies during LEOP, and commissioning up to IOCR.

¹³ Phase D includes the following major tasks: manufacturing, assembly and testing of the flight unit, qualification testing and associated verification activities, hardware / software and associated ground support, complete interoperability testing between the space-and the ground-segment, prepare acceptance data package.

INDICATORS

- 1) Number and quality of ITTs;
- 2) Number and volume of contracts;
- 3) Number of satellites flying and operating;
- 4) Number of recurrent missions in preparation.

OPERATION TIMETABLE

MILESTONE DESCRIPTION
FAR of Sentinel-1B
QAR of Sentinel-2A
Launch of Sentinel-2A
IOV of Sentinel-2A
QAR of Sentinel-3A
Launch of Sentinel-3A
Kick-off of Sentinel-2B phase E1 activities
Kick-off of Sentinel-3B phase E1 activities
Kick-off of Sentinel-5P phase E1 activities
Kick-Off of S-5 B/C Instruments contract
Kick-Off of S-6 B satellite contract
Sentinel-1 C/D: finalization of tender and contract process, selection of prime-contractor and definition of consortia, and kick-off of production phase
Sentinel-2 C/D: finalization of tender and contract process, selection of prime-contractor and definition of consortia, and kick-off of production phase
Sentinel-3 C/D: finalization of tender and contract process, selection of prime-contractor and definition of consortia, and kick-off of production phase

IMPLEMENTATION METHOD

The Commission will implement the budget through an indirect management mode in accordance with Art 58 (1) (c) of the Financial Regulation.

BUDGET

In order to provide ESA with the necessary financial float to procure the next recurrent units from 2016-2017 onwards, construction costs will be broken down into annual instalments; the 2015-instalment will amount to 173,9 MEUR. This stays within the ceilings of the MFF Regulation and allows the Commission to monitor the progress made on a yearly basis up to the procurement and signature of the contracts; and, on the other hand, ESA to make provisions for the total expenditure.

ACTION	YEAR	BUDGET LINE	BUDGET
Construction	2015	02.0602	173.900.000

3.1.8. ACTION No 2: Operations

DESCRIPTION

Sentinel Operations (including maintenance activities) begin immediately after the successful In-Orbit Validation (IOV). The activities included here encompass the operations of both the Space Component and the Ground Segment (up to the production of Sentinel core data by the Sentinel Core Ground Segment facilities), as well as the Ground Segment enhancement activities. Sentinel 1-A was launched on 3 April 2014, and the IOV phase is scheduled to be completed in Q4 2014, following which, the Satellite will have reached its full operational capacity. Its operations in 2015 will be funded from the Copernicus budget.

Other Sentinel launches are foreseen in the coming years, and concern in particular for the period 2015-2016 Sentinel-2A (May 2015), Sentinel-3A (Q.3 2015), Sentinel-5P (Q.2 2016) and Sentinel-1B and 2B (both Q.2 2016). ESA and EUMETSAT (for Sentinel-3A satellite control and the processing of the marine part of its payload data) will continue to prepare Copernicus Space Component operations through the timely preparation and/or improvement of the necessary organisational and management procedures and actions, including the further reinforcement of the Ground Segment.

In line with the Commission-ESA Agreement, ESA will ensure the technical overall coordination of the Copernicus Space Component (CSC) and will carry out the related end-to-end management, implementation, monitoring and reporting tasks. EUMETSAT will carry out a series of operational activities, as laid down in the Commission-EUMETSAT Agreement.

The operational activities will include the following tasks in 2015:

- a. Sentinel Space Segment operations;
- b. Flight Operations Segment (FOS) operations;
- c. Post-launch Space segment maintenance operations;
- d. Overall end-to-end system operations;
- e. Copernicus Space Component Mission Management;
- f. Operations and strengthening of the PDGS facilities (e.g. Copernicus Ground Stations, Processing and Archiving Centres, Mission Performances Centres, Precise Orbit Determination service);
- g. Sentinel PDGS facilities service operations;
- h. The operation and strengthening of network infrastructure needed to interconnect the different Ground Segment centres to provide data circulation capacity;
- i. Calibration of on-board and on-ground configuration data in order to meet product quality requirements;
- j. Validation of the quality of the data products derived from the system outputs. Validation functions provide input for algorithm evolution and processor upgrades;
- k. *Pro memoria*: Operation of the EDRS service for Sentinel-1A and -2A;
- l. Maintenance activities of the Copernicus Space Component (overall system maintenance, space segment maintenance and ground segment maintenance);
- m. Minor system enhancements/modifications detected during commissioning and initial ramp-up phase;

In addition, the Ground Segment evolution remains a key activity for 2015 since the capability to make available the increasing volume of Sentinel data is directly related to the development of the Ground Segment Core Infrastructure.

It is noted that EUMETSAT is able to contribute to the work of the CEOS Climate Change Working Group.

EXPECTED OUTPUT OF THE IMPLEMENTING MEASURE

- 1) Effective and efficient management of Copernicus Space Component operations through procurement contracts and staff recruitment for Sentinel-1A and Sentinel-2A, Sentinel-3A, Sentinel-5P and Jason-3;
- 2) Production, calibration, validation, processing, archiving and dissemination Copernicus data and products, in line with user requirements.

INDICATORS

- 1) Percentage of data volume acquired on ground stations with regard to the theoretical volume;
- 2) Percentage of data volume processed by productions facilities with regard to the volume of acquired data;
- 3) Adherence to requirements expressed in the Mission Requirement Document;
- 4) End-to-end continuity of the service, for each mission.

OPERATION TIMETABLE

MILESTONE DESCRIPTION
Operations of Sentinel-2A started Operations preparations for Sentinel-3A, -5P, -1B and -2B started
Operations of Jason-3 started

IMPLEMENTATION METHOD

The Commission will implement the budget through an indirect management mode in accordance with Art 58 (1) (c) of the Financial Regulation.

BUDGET

The total budget for operations to be delegated to ESA amounts to 90,4 MEUR. This amount covers:

- Copernicus Space Component (CSC) core functions;
- the operations of Sentinel-1A, -2A, -3A (Land component) and -5P;
- PDGS enhancements;
- Studies, Analysis and Communication for the evolution of the CSC.

The total budget for operations to be delegated to EUMETSAT amounts to 13.400 MEUR. This amount covers:

- management costs for EUMETSAT Copernicus activities;
- maintenance of the CSC and evolution of the GS capabilities;
- remaining recruitment and training of the Sentinel-3 and Jason-3 operational teams;
- support to ESA for the commissioning of Sentinel-3A;
- preparation of GS processing of Sentinel-3 data (for marine applications);
- setting up of DUACs support for cross-calibration of Sentinel-3 products;

ACTION	YEAR	BUDGET LINE	BUDGET
Operations	2015	02.0602	104.478.000

3.1.9. ACTION No 3: Management and Dissemination of Sentinel Data

DESCRIPTION

The dissemination of Sentinel core data is handled by the CSC Ground Segment, operated by ESA and EUMETSAT. This action shall support:

- The procurement, operation and reinforcement of the necessary IT infrastructure for data management and dissemination, as well as the provision of access to external users;
- The provision of related IT services through service operation contracts.

In addition to the Copernicus operational services, a broad community of users will benefit from the core data and products:

- Copernicus Core Users: European Union institutions and bodies, national, regional or local authorities;
- International Scientific community, including universities or other research organisations;
- Commercial and private users;
- Any other third party.

The data dissemination structures and processes shall ensure that the Sentinel data are accessible on an equal footing to users in the Participating States (with the highest priority given to Copernicus Services), each category of users having access to data of interest through an associated access/distribution mechanism.

Work on the enhancement of data dissemination solutions for users shall be pursued by the Commission together with appropriate partners.

In 2015, work in this area will consist on the further enhancement of the existing structures for data dissemination and will concentrate on the CSC Ground Segment and its expansion. In addition, new structures will be designed to improve the delivery of information, enhance the processing power, initiate the work on hosted processing services, and promote the widespread use by the downstream services.

The following tasks shall be performed or initiated:

- 1) Dissemination and Network Services with further enhancements as necessary to serve Copernicus users;
- 2) Set-up, maintenance and extension as necessary of the relevant Copernicus infrastructure for data reception, processing, dissemination, and archiving;
- 3) Support of the diverse user community and exchange of lessons learned, in particular concerning data access for researchers, SMEs and the interested public.

EXPECTED OUTPUT OF THE IMPLEMENTING MEASURE

- 1) Routine operations of data dissemination;
- 2) Analysis of access and use enhancement definition.

INDICATORS

- 1) Volume of data made available;
- 2) Percentage of data volume available on time for users with regard to volume of produced data;
- 3) Continuity of the dissemination service.

OPERATION TIMETABLE

MILESTONE DESCRIPTION
Baseline dissemination server in place
Data dissemination enhancement specified
Data from operational Sentinels is used by the Copernicus services and distributed to users

IMPLEMENTATION METHOD

The Commission will implement the budget through indirect management mode in accordance with Art 58 (1) (c) of the Financial Regulation.

BUDGET

ACTION	YEAR	BUDGET LINE	BUDGET
Data Dissemination	2015	02.0602	5.400.000

3.1.10. ACTION No 4: Access to Data from Copernicus Contributing Missions

DESCRIPTION

This action is intended to ensure to the Copernicus users, and in particular to the Copernicus operational services, the seamless provision of space-borne data from Copernicus Contributing Missions (CCM). The data from the Copernicus Contributing Missions should, where affordable, be made available also to Horizon 2020 projects supporting the development and evolution of Copernicus Services.

The requirements of the Copernicus services and other users are captured in the Commission document entitled "Data Warehouse" (DWH). In the past, ESA has conducted the procurement of such commercial data and the Union has funded the acquisition of licensing rights for users via the GIO budget. Following the end of this scheme in November 2014, the Copernicus budget will fund the enhancements/changes needed for routine Copernicus operations and ensure the seamless transition to the CCM data provision following the latest DWH definition exercise. Service continuity is a key aspect of this activity as Copernicus is benefiting from archived data, platform solutions and professional experience developed under the previous exercises.

Since the consolidation of data need requirements undertaken in 2013 and captured in the Commission document Data Warehouse v2.0, ESA has conducted in 2014 calls for tender to procure the necessary commercial data and has negotiated with the associated data providers the conditions for using the CCM data in Copernicus according to the Data Warehouse requirements document. In 2015, the Copernicus budget will continue to fund the acquisitions of data and associated licensing rights.

EUMETSAT will continue to contribute to this activity by providing public mission data from partner agencies, in particular to meet the needs of the Marine Environment Monitoring and Atmosphere Monitoring services. For the acquisition of these data sets, budgetary provision is not generally required for user licences, but remains necessary to cover associated marginal costs as set out in the Agreement of October 2014.

These activities include:

- Maintenance of the Data Access Portfolio, generated by ESA in response to the Data Warehouse document and management of the contracts with contributing missions concerning data and licenses;
- Service continuity ensured by adequate funding of data procurement contracts;
- Management, maintenance and operations of the Coordinated Data Access system (CDS), as well as development/enhancement of platform software modules as necessary;
- Integration of new missions within the CDS;
- The continued provision of products based on Suomi-NPP data (previously funded via a Grant Agreement) in response to the continued requirements (communicated via the EC) of the Marine Environment Monitoring Service and the Atmosphere Monitoring Service.

EXPECTED OUTPUT OF THE IMPLEMENTING MEASURE

- 1) Provision of CCM data to the Copernicus Services and other users.

INDICATORS

- 1) CM Data availability;
- 2) CCM Data consumption;
- 3) User satisfaction of the CDS.

OPERATION TIMETABLE

MILESTONE DESCRIPTION	INDICATIVE QUARTER
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Implementation of the data warehouse requirements 2.0, in particular through the Tender organised by ESA for the access to commercial missions. Development of new interface GSC-DA v.3 through an ITT or organised by ESA. Access by new operational services to the Contributing Mission data.	2 nd quarter 2015
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IMPLEMENTATION METHOD

The Commission will implement the budget through an indirect management mode in accordance with Art 58 (1) (c) of the Financial Regulation.

BUDGET

ACTION	YEAR	BUDGET LINE	BUDGET
Service continuity: Procurement of data under the DWH v 2.0 Procurement of GSCDA-CDS v3 Other non-data-buy contributing missions (e.g. via EUMETSAT)	2015	02.0602	36.932.000

3.1.11. ACTION No 5: Internal costs of ESA and EUMETSAT

DESCRIPTION

This action will provide the necessary funds for the remuneration of ESA and to cover for EUMETSAT's internal costs, in line with the relevant provisions of the respective Delegation Agreements concluded in Oct./Nov.2014.

EXPECTED OUTPUT OF THE IMPLEMENTING MEASURE

- 1) Remuneration of ESA and EUMETSAT in respect of their internal costs;

IMPLEMENTATION METHOD

The Commission will implement the budget through indirect management mode in accordance with Art 58 (1) (c) of the Financial Regulation.

BUDGET

ACTION	YEAR	BUDGET LINE	BUDGET
Internal costs of ESA and EUMETSAT	2015	02.0602	41.903.700

3.1.12. ACTION No 5: Pre-financing of payments to ESA and EUMETSAT for Q1/2016

DESCRIPTION

The Delegation Agreements with ESA and EUMETSAT foresee a second request for payment, representing the revised need of funds for 2015 and including fund needs for the fourth quarter of 2015 and the first quarter of 2016.

EXPECTED OUTPUT OF THE IMPLEMENTING MEASURE

1) Provision of necessary funds for operational activities in Q.1 2016.

IMPLEMENTATION METHOD

The Commission will implement the budget through an indirect management mode in accordance with Art 58 (1) (c) of the Financial Regulation.

BUDGET

ACTION	YEAR	BUDGET LINE	BUDGET
Pre-financing of payments for Q1 2016	2015	02.0602	29.300.000
- for ESA			21.000.000
- for EUMETSAT			8.300.000

3.1.13. Contingency margin

The Commission will make provisions for contingencies that may require additional funding. It covers unexpected price fluctuations or unforeseeable market evolutions, as well as *inter alia* the replacement of equipment, updated technologies which cannot be priced in advance but lead to an increase of the price paid by ESA in their procurements or in the amendments to their contracts or work orders.

The contingency margin was calculated based on the risk evaluation and mitigation measures needed. This amount is committed on a multi-annual basis, as foreseen in Article 8(5) of the Copernicus Regulation, on top of the cash-flow needs but has no payment appropriations associated with it.

If none of the contingencies materialise or, if they do, do not require any additional payments, the amount committed will remain until the end of the implementation period of the agreements with ESA and EUMETSAT. If the contingencies do materialise, the required amount shall be transferred to the respective budget heading of ESA's or EUMETSAT's budget and inscribed as an action in the Commission's work programme.

Before 31 December 2020, any unused amounts shall be de-committed unless the programme can use the appropriations to fund operational tasks.

BUDGET

	YEAR	BUDGET LINE	BUDGET

Contingency margin	2015	02.0602	10.106.300
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3.1.14. ACTION No 6: Framework for User requirements for next generation Sentinels

DESCRIPTION

The Commission will be in charge of adopting, and providing to ESA by mid-2017, a user-driven requirements framework that will drive the design and development of the next generation Copernicus infrastructure. Bearing in mind the timescale for the development by ESA of the next generation Sentinel missions, the evolution of the user requirements, service specifications and service data requirements, and their translation into observational requirements for future missions should be addressed in 2015/2016, taking into account additional inputs (e.g. the use of Sentinel data) as they become available.

To achieve this objective, a suitable external partner has been identified in 2014 through a call for tender for a framework contract. This activity complements, and draws on the methodology from, the "GMES PURE" (Partnership for User Requirements Evaluation) project funded from FP-7 and coordinated by EUMETSAT. GMES PURE has delivered the future user requirements for the Copernicus Marine Environment Monitoring and Atmosphere Monitoring services.

In 2015, similar user-driven activities will be undertaken via specific contract(s) to cover the other Copernicus service domains and start collecting the inputs for the next generation Copernicus Space Component.

Expected output of the implementing measure is:

- Further definition of future user requirements, service specifications and service data requirements for the next generation of Sentinels, in support of all Copernicus service domains.

EXPECTED OUTPUT OF THE IMPLEMENTING MEASURE

- 1) Definition of future user requirements, service specifications and service data requirements for the next generation of Sentinels.

INDICATORS

- 1) Quality and timeliness of the work of the Service provider.

MAIN MILESTONES

- Placing a contract for the activity: 1st quarter 2015;
- Contract kick-off: 1st quarter 2015 (includes preliminary payment);
- Contract progress reviews: 2015 various (depends on the number of specific contracts let in parallel which is yet to be decided).

IMPLEMENTATION METHOD

The Commission will implement the budget through direct management mode in accordance with Art 58 (1) (a) of the Financial Regulation.

BUDGET

ACTION	YEAR	BUDGET LINE	BUDGET
Procurement	2015	02.0602	2.500.000

3.1.15. ACTION No 7: Contribution to the Space Surveillance and Tracking (SST) support framework

DESCRIPTION

In the Copernicus Regulation, the protection of satellites against the risk of collision taking into account the Union space surveillance and tracking (SST) support framework is foreseen among the activities of the Copernicus Space Component. Decision No 541/2014/EU¹⁴ foresees the establishment of a space surveillance and tracking support framework. Part of the funding of the SST support framework will originate from the Copernicus programme¹⁵, since the SST services will contribute to the protection of the Space component of the Programme against the risk induced by space debris.

This action specifically aims at:

- 1) supporting the pooling of national resources on the SST objectives outlined in the SST Decision and coinciding with the activities related to the Copernicus Space Component, and
- 2) achieving significant economies of scale by adding related Copernicus resources to this joint effort.

In 2014, the procedure for the constitution of the SST Consortium has been defined in the Commission Implementing Decision C(2014)6432 of 12 September 2014¹⁶. Moreover, this Implementing Decision has defined *inter alia* the evaluation rules and key selection requirements, such as ownership of relevant assets like telescopes, radars, or a data processing facility and provision of an action plan.

In 2015, the SST Consortium is expected to be established. The contribution of the Copernicus programme to the SST support framework will be realised through a grant to a predefined beneficiary, which will be the consortium resulting from the implementation of the SST support framework for the emergence of a SST capacity at European level. A grant agreement with the aforementioned consortium is to be concluded in 2015 in the context of the SST support framework.

¹⁴ Decision No 541/2014/EU of the European Parliament and of the Council of 16 April 2014 establishing a Framework for Space Surveillance and Tracking Support (OJ L 158 of 27 May 2014, p. 227–234)

¹⁵ In line with recital 24 of Decision No 541/2014/EU and articles 129 of the Financial regulation and 193 of its Rules of Application (Commission Delegated Regulation (EU) No 1268/2012 of 29 October 2012 on the rules of application of Regulation (EU, Euratom) No 966/2012 of the European Parliament and of the Council on the financial rules applicable to the general budget of the Union) this action may be financed jointly from separate source programmes.

¹⁶ Commission Implementing Decision C(2014)6342 of 12.9.2014 on the procedure for participation of the Member States in the Space Surveillance and Tracking Support Framework

Expected output of the implementing measure

- 1) Start of EU SST activities

Indicators

- 1) Joint monitoring of the activities through Commission Services

MAIN MILESTONES:

- Budget request submitted by the consortium resulting from the implementation of the SST support framework by Q3/Q4 2015

IMPLEMENTATION MODE

The Commission will implement the budget through direct management mode by means of a grant to a predefined beneficiary, which will be the consortium resulting from the implementation of the SST support framework for the emergence of a SST capacity at European level.

BUDGET

ACTION	YEAR	BUDGET LINE	BUDGET
Space surveillance and tracking (SST)	2015	02.06.02	4.600.000

3.2. OBJECTIVE 3: CROSS-CUTTING AND SUPPORT ACTIVITIES

3.2.1. ACTION No 1: In-situ Coordination

The in-situ component is implemented in two tiers: within the Copernicus services, provisions are made for the direct access to reference and in-situ data by the respective service operators as an integrated part of their workflows. These data are obtained in direct response to the service needs and the technical interface is implemented by the service operator. A second tier is needed to make further data accessible through appropriate agreements at programme level. This second tier is also capitalising on the existing relations mentioned above, enhancing the effective use and the benefit stemming from those data, exploiting synergies between in-situ data use wherever possible.

This activity aims at linking in-situ data providers and Copernicus service providers, and is intended to propose sustainable mechanisms for in-situ data delivery/access, based on existing information capacities (e.g. national systems, European networks). Based on the results of the previous GMES In-Situ Coordination (GISC), this activity is to build up and maintain a framework of agreements, tools and methods necessary for an efficient and sustainable interface between in-situ data providers and the Copernicus services. This activity will be engaged in with the European Environmental Agency (EEA) as activity coordinator.

There are four tasks foreseen as a part of the 2015 WP cross-cutting in-situ data coordination activity to be implemented by the EEA:

1. Establishing and maintaining an overview of the state of play of in-situ data for Copernicus services based on 3 elements. Firstly addressing the demand side for in-situ data, secondly maintaining the offer side on in-situ data and thirdly the crossing of demand and offer in order to identify priorities of action:
 - A detailed overview of the in-situ data requirements for Copernicus service production;
 - A meta-database comprising an overview of already available and used in-situ data including their accessibility and web-service performance as indicated by the Copernicus service operators and
 - An overview of the crossing demand and offer for in-situ, in order to identify gaps, priorities and the potential for improvement of in-situ data access.

The database of already available and used in-situ data will be established/completed in close cooperation between the EEA as a cross-cutting in-situ coordinator and the service operators. Service operators may be enabled to contribute to, access and update the database. Appropriate structure for database priority/access will be established.

The database will serve as a tool for in-situ data coordinators (cross-cutting and in-service) to have a complete overview of the existing in-situ data availability, quality (where available), requirements and access conditions. The decisions for actions on in-situ data provision and requests, new partnerships set-ups and data gap filling will be made on the basis of the precise information provided. Exchange of information among services, use of in-situ data from the same providers in different services etc. will be supported and facilitated.

Based on the concept and structure of the database set previously, the implementation will follow as part of the 2015WP.

2. Operational provision of cross-cutting in-situ data, including access to reference data, for Copernicus services through:
 - The establishment of an in-situ data node for Copernicus services at EEA, collecting, transforming, completing and providing access to full coverage, as harmonised as feasible in-situ data through a single point of access, using INSPIRE compliant web services;
 - The node will as well address improved access to selected national reference datasets;
 - Completion of gaps, and integration in a full coverage service with parts of European products;
 - Facilitating access to in-situ via EIONET (e.g. NRT air quality data);

Based on the concept and the design of the in-situ data node already set, the deployment will follow as part of the 2015 WP.

3. Managing partnerships with in-situ data providers to improve access and use conditions of in-situ data for Copernicus services.

EEA will continue the coordination in maintaining and extending partnerships with in-situ data providers at European and global level when considered appropriate as an alternative for accessing national and regional data sources. It will identify and engage new partners that can contribute to the long term provision of quality in-situ data to meet cross-cutting needs and to share for free with Copernicus services. Thematically, this will cover different areas of in-situ data provision: environment, meteorology, civil protection, mapping, geology, statistics etc. When establishing partnerships, property rights and different restrictions on the use of data which may be in place will be taken into account. Efforts shall be made in particular to improve/adapt data policies and licensing conditions for data provision. Open and free data policy in accordance with the GEO principles will be promoted. In this context, EEA shall therefore continue to work on the coordination of access agreements on national and regional in-situ data for inclusion in the above node, in cooperation with data custodians; on structuring partnerships and the means for their formal approval in the form of bilateral agreements, MoUs or other binding documents, including the Commission as signatory where relevant.

4. Supporting the European Commission and Copernicus Service providers/entrusted entities when seeking for solutions for providing in-situ data needed.

EEA will support the European Commission and services in structuring the in-situ component in Copernicus, including support related to in-situ data in the framework of GEO/GEOSS. When needed, EEA will coordinate involvement of stakeholders in different cross-cutting actions, organize discussion and meetings, organize events for the visibility of Copernicus in-situ component to attract potential in-situ data providers etc. EEA will also collaborate with Copernicus services in seeking for solutions for filling the in-situ data gaps identified.

EXPECTED OUTPUT OF THE IMPLEMENTING MEASURE

- 1) Meta-database of available and already used in-situ data tailored on service requirements;
- 2) In-situ Data Node deployed and operational;
- 3) Memoranda of Understanding with relevant in-situ data provides;
- 4) In-situ data access for Copernicus services facilitated.

INDICATORS

- 1) Number of hits on the node;
- 2) Number of MoUs agreed.

IMPLEMENTATION METHOD

Indirect management in accordance with Art 58 (1) (c) of the Financial Regulation in case of the in-situ coordination. This activity is foreseen to be entrusted to a qualified body through a Delegation Agreement with the European Environment Agency (EEA). Its ability to implement this service was assessed with regard to its specific expertise, mandate, operation and management capacity. As shown by the experience with the FP7 activity GISC, EEA has demonstrated its capacity to manage and deliver this in-situ service coordination and its ability to fulfil the minimal requirements within the domains of programme management, engineering, communication and outreach.

BUDGET

ACTIVITY	YEAR	BUDGET LINE	BUDGET
In-situ coordination	2015	02.0601	2.300.000

3.2.2. ACTION No 2: Cross-cutting Activities

A number of cross-cutting activities will be addressed in order to support and foster the success of the Copernicus implementation of Objectives 1 and 2.

In 2015, the following activities will be engaged in:

- Communication and dissemination activities;
- Users and potential capacity building activities including human capacity building activities (education and training activities);
- Activities to support the uptake of Copernicus data and products;
- Taking stock of Copernicus uptake and the evolution of Copernicus programme;
- Assessing integration of heterogeneous user interface facilities into a central data access portal and large data distribution options;
- Ex-post evaluation of GIO.

3.2.2.1. Communication activities

Communication activities and dissemination activities will be funded to raise awareness and increase the knowledge of users and public alike on the full, open and free-of-charge availability of Copernicus data and services. In 2015, communication activities could include:

- General programme-level communication, promoting Copernicus through active participation at major European events and international conferences, serving scientific and operational communities with presentations;
- The elaboration of communication material dedicated to users, maximising the use of already existing communication packages (video, press pack, ...);
- The promotion of Copernicus through social media, using multimedia (TV spots, YouTube and internet) using (animated) demonstrators.

3.2.2.2. Users and potential users training activities

At the most basis level, user uptake can be fostered by raising awareness of how best to access Copernicus data, and providing typical use cases of Copernicus products. Users will have to be acquainted with state of the art working methods and good practices for integrating Copernicus data, requiring activities fostering the development of skills, hands-on training activities, and train-the-trainer activities. All activities should be developed in close cooperation with the relevant user groups, including national users. In 2015, such uptake activities could include:

- Organisation of workshops to disseminate information on the Copernicus services, to demonstrate the usefulness of the open Copernicus products to various communities at national, regional or European level, and to train Copernicus users using existing and upgraded training materials. This should be closely linked and coordinated with existing thematic or regional networks or user groups;
- The organisation of user workshops and Copernicus presentations/events at national/regional/local level to support Copernicus coordination activities upon request of national Copernicus coordination bodies (User Forum);
- Upgrade of existing training materials for Copernicus users, including e- learning materials;
- Development of an open user uptake portal (an open repository) for the provision of different materials related to user uptake activities (training materials, good practices, demonstrators, open protocols,..). Identification and definition of suitable case studies would be user driven, involving the different user categories including stakeholders such as User Forum, EIONET network, national civil protection authorities and others. Any preparation of test cases would include a definition and implementation phase;
- Preparatory studies to identify appropriate organizations/Universities that would be interested to develop and implement courses of the following nature:
 - Copernicus summer courses or specific Copernicus sessions (in already existing training courses) at European and in particular at national and regional level (generic or thematic), building on existing material and experience;
 - University courses that includes Copernicus-related earth observation themes, e.g. selected topics in space technology deployment, environmental monitoring, disaster management and the Copernicus Earth Observation programme.

3.2.2.3. Activities to support the uptake of Copernicus services

Specific activities for relevant user segments will be developed to demonstrate and support the integration of Copernicus data, information, products in real-world applications, services, (work) processes to enhance the existing knowledge. The Copernicus products will also be integrated in international geo-information sources relevant to EU policies as appropriate, such as GEOSS (Global Earth Observation System of Systems). Specific provision of expertise accompanying these processes should be made available to interested authorities. Such activities could include the elaboration of specific real-world test cases, which may demonstrate specific solutions as well as point the way towards good practices in Copernicus.

Actions in 2015 aim to implement specific measures which are essential to stimulate and facilitate the integration of Copernicus products, data and information by the intermediate user and the end-users, and also aim to enhance the interfaces between the Copernicus services and the user-specific environment/information flows. These measures will be addressed at the public user sector both at EU and at national level and possibly at some regional level, at the level of the SMEs and research. This action will also be closely linked to the User Forum. Existing standards and data models will be taken into account appropriately.

These activities will aim to support the integration of Copernicus services in user specific environments and organisations, and could include:

- the support to functional workflow integration, formatting or conversion toolboxes, and information-exchange open protocols needed for users to access the open Copernicus services and to be ready for an operational use of the service deliveries in support of their activities;
- distribution of tools developed in Copernicus related projects funded by the EU in context of Horizon 2020, etc.;
- support to integration of user data assets to enhance service outputs (e.g. topographic, cartographic data sets, or other user specific datasets);
- establishment of a Copernicus uptake network (clusters), providing users with advice and linking users to expertise available on integration of Copernicus products and tools, as well as good practices, business practices.

Funding will be extended to proposals with a clear potential of sustainability as well as enabling the widest possible distribution of results among user community. If the target user community is of a local, regional or downstream nature, support may be considered on the basis that a clear added value for service provision at European level exists (such as open access to data, interface realisation, harmonisation).

3.2.2.4. Taking stock of Copernicus uptake and evolution

The performance of Copernicus service provision in relation to serving users will be evaluated, and could include:

- monitoring the use and performance of the services, collection of user feedback on the adequacy of the Copernicus service/products, assessment of service provision quality. The performance of the service will be measured in terms of timeliness of delivery, product usefulness and quality of the products. The user feedback could be gathered through a range of means, such as a series of interviews, the collection of 'Frequently Asked Questions' or by organising specific technical workshops, user groups' discussions, etc.
- studying the obstacles experienced at user level which inhibit effective uptake;
- review of deliverables, solutions and results, as well as assessment of implementation measures proposed or carried out by the operators of the Copernicus programme;
- taking stock of the current developments to provide access to Earth Observation data implemented in the context of the GEO initiative and more specifically to build the GEO Common Infrastructure (GCI);
- examination of the role which Horizon 2020 can play to prepare an evolution of Copernicus service provision;

- providing technical expertise in the implementation and evolution of the Copernicus Programme and its different components;
- studying the size and structure of public and private user markets for the Copernicus data and products, and possibly identifying good practices for the private sector to access these user markets.

3.2.2.5. Evolution of Copernicus data distribution and user access

As a result of activities implemented under the GMES Initial Operations (GIO) programme and also related activities implemented under the FP7 framework, the current (summer 2014) user access to Copernicus data and information sources is spread through a heterogeneous collection of interfaces that have been put in place – or are planned – by the various actors. It is a requirement of the EC that a Copernicus data and information portal is developed under the "*copernicus.eu*" domain which will provide access to an interface that integrates (or otherwise federates) all of the existing interfaces into one. In support of this action further work will be performed in 2015 by an expert external entity to analyse the possible approaches and propose a methodology for integrating all interface into this portal. The study shall focus on the present situation, but shall also consider future scenarios in which data volumes will increase significantly. Special attention needs to be given to also facilitate the discovery and use of products relevant for important cross-cutting themes that lack explicit representation in the existing thematic service portfolio of Copernicus, in particular fresh water, ecosystems, biodiversity and energy.

The outcome of this study will be used as guidance for the development of the Copernicus data and information portal. The portal shall present a common interface to users for registration and shall offer functionality to enable the presentation of spatial data sets and shall contain tools to facilitate associated user queries on spatial data.

The increasing size of data sets and the resulting products pose an issue for the widespread usage of Copernicus data and service products and for the development of a downstream service segment. Complementary to the activities under the Copernicus space component, the development and deployment of advanced distribution and exploitation mechanisms for large scale data aims to facilitate the utilisation of very large data volumes by distributed and remote processing. This will require only more targeted and less voluminous data sets to be transmitted and aims at enabling the access to these data and products by small entities, which would otherwise stay excluded from downloading and processing concurrently huge data amounts due to lack of computing and connectivity resources. These advanced technical solutions, if shown to be efficient, may also serve the needs of bigger users, including Member States, in view of the provision or availability of advanced facilities they may be offering.

Based on the 2014 study and user feedback the initial version of the Copernicus service product dissemination portal will be developed and deployed to meet the needs of a fully operational programme. The Copernicus data and service information has to be discoverable, accessible, understandable, manageable, and useable. This activity will in particular encompass the implementation of the appropriate interface with the various Copernicus services production and archiving facilities established at their side, as well as the integration of the data access concept across the various services (single logon, common catalogue, visual identity). Further any possible recommendations from the study regarding data mining or hosted computing will be considered.

3.2.2.6. Ex-post evaluation of GIO

The GIO Regulation (Regulation (EU) No 911/2010) requires that the European Commission conducts and Interim Evaluation of the GIO activities by 31 December 2012 and an ex-post Evaluation by 31 December 2015. Having completed the Interim Evaluation in due time, activities will be required in 2015 to implement the ex-post Evaluation. To that end an external entity shall be engaged to perform the study in 2015 and deliver the associated report.

3.2.2.7. Acquisition of indefeasible rights of use on the high-bandwidth transatlantic submarine telecommunication cable

This activity concerns the acquisition through a lump-sum payment of indefeasible rights of use (IRU) on a Europe to South-America transatlantic submarine cable between Lisbon and Fortaleza (Brazil). The future deployment of this cable will significantly strengthen our capacities to disseminate a high volume of Copernicus data and information towards South-America, and to access South-American space data (e.g. from INPE, Brazil). The only direct telecommunications submarine cable between Europe and South-America is currently saturated and the traffic goes mainly through US networks. Acquiring such IRU on the new direct cable for the exchange of Earth observation data makes political and economic sense as the offer allows high bandwidth connection at a fraction of the current cost. The availability of Sentinel data in general and of Sentinel-1 radar images in particular, is of particular interest to Brazil and other countries in their fight against illegal logging. This is also in the EU's interest and will support our strategic climate and environment objectives. Finally, other Commission Services will co-finance this initiative, too, with a view to supporting their specific objectives in the area of research (such as the GEANT network, ESO observatory in Atacama), development cooperation, regional policy, etc. This enhanced network access will thus provide the basis for a strong partnership with South-America. This activity may also provide better bandwidth access between Europe and the space port in Kourou if a connection between the space port and the underwater cable is established. The IRU in question is for non-commercial activities.

EXPECTED OUTPUT OF THE IMPLEMENTING MEASURE

Copernicus communication activities; user training; increased awareness and use of Copernicus data and products; users' show cases; facilitated in-situ data provision. The acquisition of IRU on the submarine cable will lead to the reinforcement of Copernicus data and information dissemination in South-America and the access to the available South-American Earth observation data and information, as well as the establishment of strong relationship with South-American Earth observation national institutions.

INDICATORS

- 1) Number of awareness events organized;
- 2) Number of good practices;
- 3) Number of hits/downloads from the user uptake portal;
- 4) Level of the uptake of Copernicus services by users;
- 5) Reinforcement of Copernicus data and information dissemination in South-America and the access to the available South-American Earth observation data and information.

IMPLEMENTATION METHOD

Direct management in accordance with Art 58 (1) (a) of the Financial Regulation.

BUDGET

ACTIVITY	YEAR	BUDGET LINE	BUDGET
<p>Framework Contract on User uptake, training, mainstreaming, and communication signed in Q4/2014;</p> <p>Support of User uptake through grant mechanism (e.g. vouchers), and studies to define suitable indicators for (e.g. market and jobs related) uptake objectives.</p> <p>Evolution of Copernicus data distribution and user access.</p> <p>Development and implementation of Copernicus data and information portal</p>	2015	02.0601	8.450.000
Acquisition of indefeasible rights of use on the high-bandwidth transatlantic submarine telecommunication cable	2015	02.0601	3.560.000
Final evaluation of GIO	2015	02.0602	100.000

3.2.3. ACTION No 3: Expert Support & Assessment

The Commission will make use of experts to support the Copernicus Units in:

- 1) The assessment of the technical and scientific feasibility of the objectives of the Copernicus programme and the proposed solutions in all the programme's components;
- 2) The technical and scientific validation and review of the deliverables, solutions and results supplied by the operators of the Copernicus programme;
- 3) The assessment of the implementation measures proposed or carried out by the operators of the Copernicus programme.

In assessing the objectives and solutions under paragraph a), the experts will consider the transition from research-funded projects to operational services and infrastructure and the evolution from the Initial Operations phase of GMES. Experts will be asked to render recommendations on the work programmes, plans and scenarios or any decision concerning the objectives to be achieved by the Copernicus programme. A preliminary opinion on the results and achievements of GMES/Copernicus during its Initial Operations phase (GIO) may also be requested. In this case, the funding will be in addition to the budget foreseen herein and be invoiced separately by the JRC once the Copernicus Unit in charge has approved the provision of such preliminary finding.

The validation and review of deliverables under paragraph b), solutions and results shall provide the concerned Copernicus Units with technically and scientifically sound reliable opinions on the work carried out by the operators, including by their service providers along the delivery chain. These opinions will support the concerned Copernicus Units with their decisions to pass for payment the requests submitted by the operators.

The assessment to be provided under paragraph c) will support the Copernicus Units in the adoption of the work or implementation programmes submitted by the Copernicus operators and will feed back into the setting and review of the programme objectives in paragraph a).

These experts may also be used to provide advice in other relevant areas, including the evaluation and assessment of Copernicus products and services as well as inter-comparison with other global efforts and with initial emphasis on the Copernicus Climate Change Service support, support for the definition of requirements for the Data Warehouse, support for the definition and implementation of the Copernicus Web Portal, in particular on the subject of spatial data and information acquisition, processing and possible standardisation. Furthermore, the experts may be asked to develop a forward vision on the challenges of the 'Big Data era' (possibly in concert with related H2020 projects and Linked Open Data technologies).

EXPECTED OUTPUT OF THE IMPLEMENTING MEASURE

Analysis, advice and recommendations in the form of written reports.

INDICATORS

- 1) Number of experts solicited;
- 2) Number of person/days contracted.

IMPLEMENTATION METHOD

Direct management in accordance with Art 58 (1) (a) of the Financial Regulation.

BUDGET

ACTIVITY	YEAR	BUDGET LINE	BUDGET
Expert support & assessment	2015	02.0601	500.000

ANNEX 1: IMPLEMENTATION PLAN FOR THE COPERNICUS PROGRAMME

General objectives of the Copernicus Programme

According to Article 12 of the Copernicus Regulation, the Commission shall adopt an annual work programme for Copernicus including a forward-looking implementation plan. This present document describes the actions needed to implement Copernicus over the period of 2014-2020 and takes into account evolving user needs and technological developments. In particular, the implementation plan defines and updates as necessary the scope, architecture, governance and technical portfolios of the Copernicus services. It should also take into consideration, where appropriate, elements of the Long-Term Scenario (LTS) which is prepared and updated by ESA in coordination with EUMETSAT and which establishes an overall framework for the Copernicus space component, including the potential tasks of ESA and EUMETSAT, and of the Union.

1. SERVICES COMPONENT

The objective of the Copernicus Service Component is to provide timely and reliable added-value information and forecasting on a wide set of geo-referenced parameters. To this end, it combines observations from satellites (largely those stemming from the Copernicus Space component) and in-situ infrastructures (such as ground, air, ship or buoy based sensors), as well as reference and ancillary data, and assimilates them into a wide set of models.

To respond to the user demands, the Copernicus Service Component is organised into six thematic services, namely the Atmosphere Monitoring Service, Marine Environment Monitoring Service, Land Monitoring Service, Climate Change Service, Emergency Management Service, and Security Service. These Copernicus services support a wide range of downstream applications in various public and commercial domains.

A set of cross-cutting activities will be carried out, such as fostering the user uptake of Copernicus data and products, the coordination of the in-situ data provision, development and deployment of advanced distribution and exploitation mechanisms for large scale data, and communication activities.

Lastly, an expert mechanism will be set-up to provide independent technical and scientific assessment of the work programmes and plans of the Copernicus programme, of the implementation measures proposed or carried out, as well as of the solutions and results provided by the programme.

1.1. Thematic services

1.1.1. Description

1.1.1.1. The Emergency Management Service

The **Emergency Management Service** will focus on four priority activities defined by the Emergency Response Core Service Implementation Group and guidance from the User Forum. It will be based on existing operational activities at European and national level, in particular the experience built-up in the 2011-2013 GMES Initial Operations (GIO) phase.

The first activity is to ensure the continuity of the operational mechanism for delivering emergency mapping products during the emergency response phase, i.e. (i) emergency response maps produced in rush mode to show the impact, assess the damage and follow the evolution of the disaster in the hours and days after the crisis, and (ii) geographic reference maps made available in rush mode providing basic topographic maps on areas affected by the disaster, in particular on infrastructure and the key natural resources.

The second activity is to support the other phases of the crisis management cycle and the validation work, i.e. the prevention, preparedness and recovery phases, inside or outside EU, by providing pre-disaster or post-disaster mapping products, including refugee/IDP (Internally Displaced Person) maps under a non-rush mode. The validation of the results of these two priority areas will continue in the same way as in the GIO programme.

A third activity is to carry out two targeted studies in support of the operational set-up of the rush mode service. The first study is related to the use of reference data, which was a separate activity in previous work programmes. The second study is for a pilot activity to probe the role of (un)manned aerial platforms as an alternative source of post-event imagery in emergency situations that require very high spatial resolution or real-time follow-up of events when available satellite images cannot provide it (e.g. earthquakes, urban flooding, forest fires). Both actions are aimed at testing their integration in the operations, for possible scale up in the post-2014 period.

A fourth activity is to build up an operational early warning capacity in Europe. Its first building block will be 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 to the Emergency Response Coordination Centre of DG ECHO. EFAS gives unique overview products of on-going and forecast floods in Europe more than 3 days in advance. EFAS information can also contribute to timely activation of the rush mode of Mapping for an improved flood extent monitoring. A second building block will be the European Forest Fire Information System (EFFIS), to support the services in charge of the protection of forests against fires in the EU and neighbour countries, and also to provide the EC services and the European Parliament with information on forest fires in Europe.

The action will also comprise validation of the services and products provided. External expertise may be employed to support this process. Further, outreach activities on service level will be carried out specifically to the related scientific and professional communities.

1.1.1.2. Land Monitoring Service

The **Land Monitoring Service** provides users in the field of environment and other terrestrial applications with high quality information based on space data combined with other sources of data. It addresses a wide range of policies such as environment, agriculture, regional, development, transport, energy as well as climate change, at EU level and also at Global level considering European commitments to International Treaties and Conventions. The Land Monitoring Service focuses on the priorities already defined by a broad consultation amongst key users: on EC side (DG ENV, DG JRC, DG DEVCO, DG AGRI, EEA, UN...), within the Copernicus User

Forum, the EIONET National Focal Points (NFPs), the Reference Centres (NRCs) and the International stakeholders. Four specific components (pan-European, local, global and global hot spot) are proposed for the land service along the following logic: a continuation of the information time series started in the GIO phase and the start-up of new land monitoring information products.

- (a) **Pan-European Land Coverage:** In the Pan-European component, it is envisaged that the High Resolution Layers (HRLs) on thematic characteristics of land cover will be updated in a 3-yearly cycle; Corine Land Cover-Land Use will be updated in a 6 yearly cycle, this will allow land cover and land use change analysis. The first full series (imperviousness, forestry, permanent grasslands, wetlands and small water-bodies) was deployed along the reference year 2012. The first update should thus be with the reference year 2015. These layers provide intermediate and complementary information to the CORINE Land Cover dataset that has a 6-yearly update frequency. LUCAS data will also be used during the production process for calibration and validation purposes. Product update cycle, as well as product delivery time, may be reviewed and improved based on the performance of the SENTINEL data acquisition system and processing chains. The possibility of a continuous product update mechanism could be envisaged on the mid-term vision. Additional and complementing HRL land cover-use mapping products may also be foreseen to answer to specific policy needs, including the “Greening” Policy requirements.
- (b) **Local Land:** The main objective of the local land component is to provide more detailed information complementary to the Pan European component on specific areas of interest. The component should continue to cover and to focus on the mapping and change analysis of urban areas following the Urban Atlas exercises of 2006 and 2012 (3 yearly update cycle), and on the mapping and monitoring on a regular basis of high potential and endangered biodiversity areas, i.e. coastal zones, riparian areas, NATURA 2000 sites, specific areas at risk (such as alpine domain, desertification and drought prone regions).
- (c) **Global component producing bio-geophysical variables at worldwide level on near real time every ten days, including archive maintenance and reprocessing.** The objective of the Global Land component is primarily to support EU policies, including development policies, at international level and the European commitments under international treaties and conventions. The Global Land component will also be a major EU contribution to the Group on Earth Observations (GEO) and to the Global Earth Observation System of Systems (GEOSS), this includes the specific support with essential variables to the GEO Societal Benefit areas, i.e. GEOGLAM (Agriculture), GFOI (Climate-Forest) and GEOBON (Biodiversity) main initiatives. The component will generate input products the drought observation systems and for the global crop monitoring systems set up to support the implementation of the EU Common Agricultural policy (DG AGRI) and the implementation of the Food Security policy (DG DEVCO).
- (d) **Global Hot Spot monitoring.** The main objective is to provide detailed land information on specific areas of EU interest outside the European Union territory, particularly to support activities linked to the sustainable management of natural resources and biodiversity. This information will complement the bio-geophysical parameters of the Global Land coverage. The activity will directly support field projects developed by EU in the framework of the EU international policies, and the set-up of reliable reference information systems for protected areas and areas of high biodiversity value.

Further to these four components a specific support activity will aim at the implementation of service producing and delivering high pre-processing level Sentinel-2 data, as requested by a number of intermediate and final users, from public and private sectors, at European and National levels. Copernicus Sentinel-2 data are an essential source of information for most of the terrestrial applications. The provision of the data at Level 1C unfortunately does not allow an easy use and a direct exploitation of these data into many downstream processing lines. A processing chain of Sentinel-2 data at Level 2 (atmospherically corrected) and Level 3 (spatial/temporal cloud-free composites) will allow the provision of data ready for end user applications. This is particularly critical for change detection analysis. Considering that the volume of Level 3 datasets is generally smaller than that of lower level datasets, this approach should also facilitate the dissemination of the data to a wider community. The interoperability and thus the possibility to combine Sentinel-2 data and LANDSAT mission data are also essential elements to consider in this context and can serve many applications, including applications in the agriculture sector answering to the Common Agriculture Policy needs.

In the development of the activities of the four components, the contributions and expertise of the Member States will maximise in compliance with the subsidiarity principle and in a cost efficiency manner using, when possible, a decentralised implementation approach.

The evolution of the service with new activities will be based on the results of pre-operational research projects and should be defined through a transparent user consultation process, according to both EC and national user requirements. With the future availability of SENTINEL data, potential new activities include, without being exhaustive, the development of products designed for Arctic areas monitoring, in the raw material domain, for inland water monitoring (including water quality, quantity and illegal water abstraction) and to support surveillance and environmental inspection.

The action will also include the validation of the services and products provided, meeting international quality insurance, certification and standard systems. External expertise may be employed to support this process. Further, outreach activities on service level will be carried out specifically to the related scientific and professional communities.

1.1.1.3. Marine Environment Monitoring Service

The **Marine Environment Monitoring Service** provides regular and systematic reference information on the physical state and dynamics of the ocean and marine ecosystems for the global ocean and the European regional seas. This capacity encompasses the description of the current situation (analysis), the prediction of the situation a few days ahead (forecast), and the provision of consistent retrospective data records for recent years (re-analysis).

The Copernicus Marine Monitoring Service assimilates earth observation data as well as in-situ data into 4-D models. Main parameters calculated and provided are currents, temperature, salinity, sea level, sea ice and biogeochemistry. These parameters support marine and maritime applications and related EU policies, e.g. in the field of maritime safety, marine and coastal environment, marine resources and weather, seasonal forecasting and climate.

The following buildings blocks are distinguished:

- (a) Thematic Assembly Centres: Four processing centres provide 1) multi-satellite products for sea level, 2) multi-satellite products for ocean colour, 3) multi-satellite products for ocean sea ice, and 4) in-situ data for physical and bio-chemical variables (in cooperation with existing networks, such as the European Marine Observation and Data Network (EMODnet). All products are provided on global and regional scale and serve as crucial input to further assimilation by the marine forecasting centres.
- (b) Marine Forecasting Centres: Seven processing centres are generating model-based products on the ocean physical state and biogeochemical characteristics covering the Global Ocean as well as six regional seas (Arctic Ocean, Baltic Sea, North Atlantic West Shelf, North Atlantic Iberic-Biscay-Irish area, Mediterranean Sea and Black Sea).
- (c) Central Information System: A central system component ensures management and organisation of the products and information originating from a distributed landscape reflecting the expertise and capacity within member states across the EU.
- (d) Outreach: A strong and effective user interface consisting of central contact points for inquiries and error reporting, sound and coordinated response activities, and training based on user demand and feedback are essential. The service itself must also be capable of developing new products and services in response to demands from users. Besides interaction with expert stakeholders the outreach to the public will be of equal importance for increasing and maintaining awareness of marine environmental issues.

The following phases are distinguished:

- Ramp-up: Activities are required to enable service delivery under full operational conditions. These activities will establish administrative processes corresponding to the chosen management mode as well as engineering tasks to enable production under operational conditions (as of month 6 after start and possibly up to month 10 for justified cases).
- Phase-I: Services will be running in operational mode and system upgrades will concentrate short term measures in order to enhance quality, system performance and user interaction. Analysis and testing is performed regarding new user needs and corresponding arising methodologies (until 2.5 years after Ramp-up). A proposal will be developed to fine tune the multiannual strategy (1.5 year after start).
- Phase-II: A service upgrade is foreseen following previously analysed user needs and results from corresponding development work (3 years after start). Prioritisation and selection of the actions will depend on the previously established.

The action will also comprise validation of the services and products provided. External expertise may be employed to support this process.

1.1.1.4. Atmosphere Monitoring Service

The **Atmosphere Monitoring Service** provides the capacity to continuously monitor the composition of the Earth's atmosphere at global and regional scales. This service capacity encompasses the description of the current situation (analysis), the

prediction of the situation a few days ahead (forecast), and the provision of consistent retrospective data records for recent years (re-analysis). It generates geophysical products which can be input to further technical processing, as well as high level information in various forms for further expert assessment in support of decision making.

By monitoring atmospheric composition, the Atmosphere Monitoring Service supports applications in the domains of air quality, climate forcing, ultraviolet radiation, and solar energy with special focus on the EU regions. It therefore provides products and information on the distribution and long-range transport of greenhouse gases, aerosols and reactive gases as well as regarding the input data itself in particular emissions. Products and information are provided at the global and EU regional scales. The finer EU regional scale products are complemented by a quantitative assessment of the uncertainty based on an ensemble of several regional modelling systems.

The next table briefly outlines the main following buildings blocks of the activity (besides management):

Building blocks	<i>Brief description of main activities</i>
<i>In Situ observation</i>	<i>Technical work allowing operational feed from main in situ data sources</i>
Development: global production	<i>Continuous development of global assimilation and modelling system: greenhouse gases; aerosols; reactive gases.</i>
Development: regional production	<i>Continuous development of regional air quality assimilation and modelling systems (including ensemble processing).</i>
Global production	<ul style="list-style-type: none"> ▪ <i>Input data acquisition</i> ▪ <i>Global model maintenance and updates</i> ▪ <i>Operations of global suites</i> ▪ <i>(Bulk) global data services</i> ▪ <i>NRT verification and monitoring (global)</i> ▪ <i>Help desk</i> ▪ <i>First-level user support (global products)</i>
Regional production	<ul style="list-style-type: none"> ▪ <i>(Additional) Input data acquisition over European domain</i> ▪ <i>Regional models maintenance and updates</i> ▪ <i>Operations of regional models and ensemble suites</i> ▪ <i>(Bulk) regional data service</i> ▪ <i>NRT verification and monitoring (regional)</i> ▪ <i>First-level of user support (regional products)</i>
Value-added service	<ul style="list-style-type: none"> ▪ <i>Products for policy users (“green scenarios”, source</i>

production	<p><i>apportionment and annual assessment reports...)</i></p> <ul style="list-style-type: none"> ▪ <i>Solar radiation products</i> ▪ <i>Greenhouse gas fluxes</i> ▪ <i>Aerosol climate forcing</i>
Validation and activities in support of production	<ul style="list-style-type: none"> ▪ <i>Anthropogenic emissions (also a product)</i> ▪ <i>Fire emissions (also a product)</i> ▪ <i>Ad hoc satellite data processing (retrievals)</i> ▪ <i>Validation (quarterly reports)</i>
Users' interaction, training and communication	<ul style="list-style-type: none"> ▪ <i>Second-level (specialised) user support</i> ▪ <i>Dedicated data services (WCS/WMS, tailored presentation..).</i> ▪ <i>Training</i> ▪ <i>Communication</i> ▪ <i>User interaction uptake/awareness events</i> ▪ <i>User interaction management.</i> ▪ <i>Use cases (short projects of downstream nature)</i>

The following phases are distinguished:

- Ramp-up: Activities are required to enable service delivery under full operational conditions. These activities will establish administrative processes corresponding to the chosen management mode as well as engineering tasks to enable production under operational conditions (as of month 6 after start, and possibly up to month 10 for justified cases).
- Phase-I: Services will be running in operational mode and system upgrades will concentrate short term measures in order to enhance quality, system performance and user interaction. Analysis and testing is performed regarding new user needs and corresponding arising methodologies (until 2.5 years after Ramp-up). A proposal will be developed to fine tune the multiannual strategy (1.5 year after start).
- Phase-II: A service upgrade is foreseen in particular regarding the resolution of the global component. At this stage further evolution can be phased in following previously analysed user needs and results from corresponding development work (3 years after start).

The action will also comprise validation of the services and products provided. External expertise may be employed to support this process.

1.1.1.5. Security Service

The objective of the **Security Service** is to provide information in support of the security challenges of Europe improving crisis prevention, preparedness and response capacities, in particular for border and maritime surveillance, but also

support for the Union's external action, through detection and monitoring of trans-regional security threats, risk assessment and early warning systems, mapping and monitoring of border areas. The Security Service consists of three main service domains:

The *border surveillance* service domain is designed to be interlinked with and to support the European Border Surveillance System (EUROSUR) to reinforce the control of the Schengen external border, especially the southern maritime and eastern land borders. EUROSUR will provide Member States with a common technical (infrastructure) and operational framework (workflow) in order to increase the situational awareness at their external borders and improve the reaction capabilities of their national authorities surveying the EU borders. One of the objectives agreed is to set up a common application of surveillance tools (satellites included) having the European Agency for the Management of Operational Cooperation at the External Borders of the EU (FRONTEX) as a facilitator. The Agency promotes, coordinates and develops European border management.

For the Copernicus service domain of border surveillance, the active cooperation of FRONTEX is instrumental. The need for FRONTEX to rely on Copernicus for those activities is recognised in the Commission's proposal for the EUROSUR Regulation. The requirements for Copernicus support have been closely examined in cooperation with FRONTEX and Member States, and the draft service specifications presented in a Concept of Operations document (CONOPS). User up-take and service validation is on-going through two R&D projects SAGRES and LOBOS, running for the period 2013-2014. In 2015, it is planned that services will be operated by FRONTEX. During 2014, it will be necessary for the Agency to start building up capabilities so that services can be successfully transferred to operations in 2015.

As for the *maritime surveillance* service domain, EMSA, the European Maritime Safety Agency, is mandated for some responsibilities in maritime security and will assist the Commission in related activities. EMSA has a widely recognised expertise in the implementation of CleanSeaNet, a maritime safety operational programme relying on Earth observations, and runs SafeSeaNet, established by the Directive 2002/59/EC¹⁷, as amended, with data that is complementary to space observations for Maritime Domain Awareness. It is also actively involved in several R&D activities on maritime surveillance, aligned with the Copernicus Security service requirements in the maritime domain. During 2013, a Copernicus working group on Maritime Surveillance has analysed the requirements of maritime communities identified in the Common Information Sharing Environment (CISE) concept. This will allow the detailed specifications of the services to be implemented at operational level as from 2015. As such, during 2015, it will be necessary for EMSA to start building up capabilities for operating those services.

The *Support to the External Actions* domain (SEA), through its access to Earth observation capacities and services, will comprise services to detect and monitor trans-regional security threats to enhancing risk assessment and early warning. The services will also contribute towards improving crisis prevention, preparedness and response capacities. There are also strong synergies with the Emergency Services. In cooperation with the EEAS, other potential users and relevant stakeholders, the identification of application scenarios is on-going since 2010, through an ad-hoc working group and leveraging on the lessons learned from the FP7 project G-

¹⁷ Directive 2002/59/EC establishing a Community vessel traffic monitoring and information system, OJ L 208/10, of 5.08.2002

MOSAIC and other relevant activities. In particular, service implementation in the period 2015-2020 is intended to draw on the specific expertise and competences of the European Satellite Centre (EUSC) and on synergies with Copernicus Emergency Management Service (EMS). Lessons are also still being learned through two R&D projects, G-NEXT and G-SEXTANT, running in the timeframe 2013-14. During this period, synergies between SEA and EMS need to be clarified and governance aspects carefully analysed before planning an operational set-up.

The action will also comprise validation of the services and products provided in all three service domains. External expertise may be employed to support this process. Further, outreach activities on service level will be carried out specifically to the related professional communities.

1.1.1.6. Climate Change Service

The objective of the **Climate Change Service** is to build an EU knowledge base in support of mitigation and adaptation policies. The Copernicus Climate Change Service shall capitalize on three main components: sustained networks of in-situ and satellite-based observations, re-analysis of the Earth climate with a variety of models driven by observations, and climate projections based on a series of modelling scenarios. These three components will permit us to derive a number of climate indicators (e.g. temperature increase, sea level rise, ice sheet melting, warming up of the ocean...) and climate indices (e.g. based on records of temperature, precipitation, drought event) for both the identified climate drivers and the expected climate impacts.

Climate indicators of drivers and impacts are essential for climate policy, both on mitigation and adaptation. In particular for adaptation robust information is needed on the observed and projected impacts of climate change, for various time scales and under different climate scenarios. Such information is of direct interest to the European Commission (including DG Climate Action), but also to transnational, national and local bodies in charge of policy making and implementation. Information on climate impacts, vulnerability and adaptation measures is currently disseminated via the Climate-ADAPT platform, hosted by the European Environment Agency. The Copernicus Climate Change service should contribute to further expanding the knowledge base, and thus also contributing with information to Climate-ADAPT.

The architecture of the Climate Change service should be organized around four complementary blocks: A consistent Climate Data Store, a Sectoral Information System, an Evaluation and Quality Control platform and, finally, an Outreach and Dissemination platform.

- (a) The first building block of the Copernicus CC service will be a consistent Climate Data Store (CDS) that contains series of geophysical climate variables and indicators, most being listed as Essential Climate Variables or Thematic Climate Data Records, needed to monitor routinely the climate drivers and climate change impacts. This Data Store will also include series of derived Climate Change Indicators. All data and products available from the Data Store must be spatially and temporally consistent, traceable and with documented uncertainties. While it will build on, and reinforce, existing operational efforts such as the Copernicus earth domain services (land, atmosphere, marine), and benefit from existing observation and data networks, it will also draw on

ongoing national, international and global activities, capitalizing on existing research and operational projects across institutions (e.g., ESA CCI, FP7 Calls, EUMETSAT SAF, etc.) benefiting from products which can be specified to comply with stringent Climate Change user requirements.

- (b) The second building block of the Climate Change service will be a Sectoral Information System (SIS) that contains information tailored to fit the needs of end users and customers of the service for various EU sectoral policies or other Societal Benefit Areas (SBAs). It will be sustained primarily by the CDS and, where appropriate, by ancillary data sets that will prove useful when addressing, for instance, climate impacts at regional, or even local, time and space resolutions in various policy sectors.
- (c) The third block concerns the Evaluation Quality Control (EQC) function in charge of the quality control and evaluation of the Climate Change service. The EQC function comprises a component to evaluate the quality of the products and the fitness-for-purpose of the service mainly with regard to users' information needs and requirements, in addition to another component to document the quality of service delivery in terms of operational requirements.
- (d) The EQC function will as well collect the evolving requests from the end users and will be tasked to translate the end users' inputs and comments into sets of technical recommendations. The EQC platform will also be the natural vector for bridging the operational segments of the service with its R&D components.
- (e) The fourth block will be dedicated to the Outreach and Dissemination (O&D) activities to ensure the dissemination of the climate related information, both from the Copernicus Climate Change Data Store and Sectoral Information System, to the end users, including e.g. public authorities, businesses, researchers and the general public as appropriate.

The development of the Climate Change service goes beyond the scientific and technical processing of data at global scale and at regional scales, in particular over Europe, to address the requirements for information at high resolutions and thus support European and national policies. The success of the implementation of the proposed service will largely rely on the quality of the information flow and the overall coordination between the various blocks. Series of precise, well-defined and operational procedures have to be defined and established so that the information delivered to the end-user is fully traceable, quality controlled and disseminated within the most appropriate time frame all the way from the production in the CDS to the O&D platforms. The articulation between the operating entities involved in the Climate Change service is a critical aspect of the service and probably the one requiring most attention in a preliminary phase. It will indeed involve different public national and international institutions as well as the private sector through the entire production chain.

Different stages shall be identified to favour a proper ramping up of the service and its gradual evolution over the duration of the programme. The various blocks will progressively cope with an increasing number of products and deliverables in the following four complementary stages:

- The first stage (from year 0 to year 2.0) shall be dedicated to a proof of concept and testing of the overall architecture envisaged so far. This preliminary step should help to consolidate the links between various

contributing blocks, to fine-tune their perimeters of actions and to ensure a seamless flow of information.

- The second stage (from year 2.0 to year 3) shall be pre-operational. It thus constitutes the first test to generate the requested information on an operational basis that is, with proven and extensive tests of the ensemble of operational procedures prevailing inside each of the building blocks and between them as well.
- The third stage (from year 3 to year 4) is associated with the start of the operational phase where products will become available to the public. This phase shall include at least a selected subset of about 20 ECVs and multiple climate indicators pertaining to the atmosphere, the ocean and the land compartments. These quantities should provide support to at least 6 different Societal Benefit Areas and European sectors through the production of approximately 15 sectoral climate indices or more.
- The fourth stage (from year 4 onwards) shall essentially correspond to an increase in the generated amount of information such that, by the end of the funding period, the Climate Change service shall be in a position to document a significant fraction of the ECVs listed by GCOS and over 20 sectoral climate indices that will be of direct relevance to at least 8 Societal Benefit Areas and European sectors.

The action will also comprise validation of the services and products provided. External expertise may be employed to support this process.

1.1.2. Services Milestones

2014	<ul style="list-style-type: none"> - Operational arrangements renewed for Land Monitoring Service and Emergency Management Service - Delegation Agreements (as applicable)
2015	<ul style="list-style-type: none"> - Atmosphere Monitoring Service ramp-up and start phase I - Marine Environment Monitoring Service ramp-up and start phase I - Security Service components (a) EUROSUR-Border Surveillance, (b) Maritime Surveillance, and (c) Support to External Actions¹⁸ operational
2016	<ul style="list-style-type: none"> - Climate Change Service entering pre-operations (stage I)
2017	<ul style="list-style-type: none"> - Atmosphere Monitoring Service – start phase II - Marine Monitoring Service – start phase II
2018	<ul style="list-style-type: none"> - Climate Change Service entering operations (stage II)
2019	<ul style="list-style-type: none"> - Climate Change Service entering operations (stage III)

¹⁸ Pending decisions to be taken in 2014/early 2015.

2. SPACE COMPONENT

The objective of the Copernicus Space Component is to fulfil the space-based observation requirements in response to EU policy priorities and Copernicus users' needs. It shall ensure:

- a) Continuity of operational observations until and beyond 2020. This drives the nature of the observations and the type of missions;
- b) Frequency of observations, which drives the number of simultaneous spacecraft in orbit for each class of observations; and
- c) Evolution of the Space Component based on user needs, which accounts for the demand for new services and products, demand for new observations and technology improvements.

The Copernicus Space Component is comprised of two types of satellite missions, dedicated Sentinels and missions from other providers, called Copernicus Contributing Missions. A distributed ground segment, through which the data are received, processed, archived and made available for the Copernicus Services and Copernicus users, completes the Space Component.

The activities described in this Implementation Plan are in accordance with the Long-Term Scenario prepared and updated by ESA, in coordination with EUMETSAT.

In this context, the milestones displayed in the space component part of this document are based on the dates currently officially available.

2.1. Copernicus Space Component (CSC) development

This activity includes all activities related to the CSC design, construction, launch (including initial operations up to the end of the In-Orbit Validation phase), as well as space segment evolutions.

2.1.1. Description

In order to meet the user needs, the Copernicus Space Component programme includes the construction of a series of two spacecraft of the Sentinel-1, Sentinel-2 and Sentinel-3 missions, one spacecraft of Sentinel-5 precursor, the Sentinel-4, Sentinel-5 instruments on board the EUMETSAT-owned MTG and MetOp-SG satellites, and the Jason satellites of the High Precision Ocean Altimetry programme. These missions carry a range of technologies, such as radar and multi-spectral imaging instruments for land, ocean and atmospheric monitoring; they are developed by ESA specifically to meet the Earth Observation needs of Copernicus services and Copernicus users.

The deployment of the constellation composed of the six missions as described above starts with the development of the satellites and continues with the procurement until the launch and in-orbit validation phase.

Sentinel-1, -2 and -3 fulfil the relevant service requirements only when two spacecraft of each family are operating simultaneously in orbit. It is foreseen that two units of each type will be operated simultaneously at any given time (starting with the deployment of the B units). Therefore, each series of Sentinel-1, -2 and -3 will consist

of 4 units, grouped as two sets of two spacecraft. The Sentinel C and D units will be procured together as part of the same Invitation to Tender so as to take advantage of economies of scale. They will fulfil the requirements of continuity and revisit frequency. In this framework, the C and D units will respond to the same user requirements as the A and B units, and will be perfectly equivalent both in terms of performance and operational characteristics.

The Sentinel C and D units will be developed in parallel for launch readiness in the period 2020/21 and 2021/22, respectively, to replace the A and B units. Therefore, the Sentinels-1/2/3 D unit are foreseen to be launched during the next MFF (2021-2027). As the C and D units are assumed to be procured together, they will be built during the current MFF (2014-2020). The Sentinel-1/2/3 C/D units will be followed by the Next Generation Sentinels (Sentinel-NG), which will respond to evolving user needs.

From the C unit Sentinels onwards, all Sentinels should be ready for launch one year before the end of the nominal lifetime of the unit that it is planned to replace.

As expressed by the oceanography, meteorology and climate change communities worldwide, long-term availability of High Precision Ocean Altimetry (HPOA) observations from space for global monitoring of sea levels is essential for climate Services. The continuity of the Jason family of satellites will be guaranteed by the development of Sentinel-6A (Jason-CS A) unit and its follow-on B unit. The HPOA programme thereby responds to essential user needs of Marine and Climate Change Services. The procurement of the Proto-Flight Model (A unit) and the follow-on (B unit) of Sentinel-6 could be synchronised. The launch of Sentinel-6A is currently foreseen for 2020 with Sentinel-6B some 5-6 years later. Consideration will be given to a next generation of Jason satellites which may be expected to be launched around 2030. The nominal lifetime of the Sentinel-6 satellites is 5.5 years. Before Sentinel-6, the Jason-3 satellite will be launched in 2015 within a EUMETSAT/NOAA/NASA/CNES cooperation framework but with the operations of the satellite funded by the Commission.

The Proto-Flight Model and the two follow-on units of Sentinel-5 will address the requirements for the Monitoring Atmospheric Composition and Climate Service.

The development activities will end with the full operational capacities of the satellites, i.e. the beginning of the routine operations phase.

The Copernicus Constellations Deployment Schedule can be found in Annex at the end of this document.

2.1.2. *Milestones and accomplishments*

2014	Successful launch of Sentinel-1A on 3 April 2014 Successful IOV of Sentinel-1A expected end-September 2014
2015	Launch of Sentinel-2A and 3A IOV of Sentinel-2A and 3A
2016	Launch of Sentinel-1B, 2B and 5P IOV of Sentinel-1B, 2B and 5P FAR of Sentinel-3B

2017	IOV of Sentinel-3B
2018	
2019	
2020	Launch of Sentinel-6A IOV of Sentinel-6A
2021	Launch of Sentinel-4A Launch of Sentinel-5A

2.2. Copernicus Space Component Operations

In general, Sentinel Operations (including maintenance activities) begin immediately after the successful In-Orbit Validation. The activities included here encompass the operations of both the Space Component and the Ground Segment, up to core data production.

2.2.1. Description

The Sentinel Operations will cover an end-to-end monitoring and reporting of the Sentinel Ground Segment and Operations, as well as the production of data at a processing level, in a timeliness and format as specified in the baseline documents.

The operations shall include on a routine basis the following:

- a) Payload Data Ground Segment Facilities, e.g. Stations, Processing and Archiving Centres, Mission Performance Centres, Precise Orbit Determination service,
- b) Payload Data Management Centre activities, including e.g. Mission Planning of Sentinels and complementary requests to Contributing Missions,
- c) Flight Operations Segment,
- d) Mission Management,
- e) Ground Segment Maintenance,
- f) Data circulation, dissemination (which is specifically discussed in the next section) and network security,
- g) Payload Data Ground Segment adaptation and technical enhancements,
- h) *Pro memoria*: European Data Relay Satellite (EDRS) activities for the Sentinel-1 and 2 missions.

These activities shall apply to the satellites (including those of the HPOA programme) flying during the 2014-2020 period, which are comprised of:

- a) Sentinel-1, -2 and -3 (Land + Marine) operations, all with A and B units,
- b) Sentinel-5P operations,
- c) Jason-3 and Sentinel-6 operations.

The Copernicus Space Component Ground Segment architecture is distributed and includes EUMETSAT and ESA receiving stations and processing centres.

2.2.2. Milestones and achievements

2014	<ul style="list-style-type: none">- Operations of Sentinel-1A started- Ramp-up phase of Sentinel-1A achieved six to nine months after the IOCR- Routine operations of Sentinel-1A
2015	<ul style="list-style-type: none">- Operations of Sentinel-2A and 3A started- Ramp-up phase of Sentinel-2A and 3A achieved six to nine

	<p>months after the IOCR</p> <ul style="list-style-type: none"> - Routine operations of Sentinel-2A - Routine operations of Jason-3
2016	<ul style="list-style-type: none"> - Operations of Sentinel-2B and 3B started - Ramp-up phase of Sentinel-1B, 2B and 5P achieved two to four months after the IOCR - Routine operations of Sentinel-1B, 2B, 3A and 5P
2017	<ul style="list-style-type: none"> - Ramp-up phase of Sentinel-3B achieved two to four months after the IOCR - Routine operations of Sentinel-3B
2018	<ul style="list-style-type: none"> - Routine operations for already flying satellites
2019	<ul style="list-style-type: none"> - Routine operations for already flying satellites
2020	<ul style="list-style-type: none"> - Operations of Sentinel-6A started - Ramp-up phase of Sentinel-6 A achieved six to nine months after the IOCR - Routine operations of Sentinel-6 A

2.3. Data dissemination

The dissemination of Sentinel core data will be handled by the CSC Ground Segment. The related activities also include the enhancement of the Ground Segment as necessary.

2.3.1. Description

The use of Sentinel data is primarily for Copernicus Core Services and users in the Participating States, with Copernicus Core Services having the highest access priority.

The data dissemination process will ensure that the Sentinel data are accessible on an equal footage for the Member States in EU. Further to these primary users, and in accordance with the data policy, the Sentinel data will also be available for the wide community of users as stated in the Copernicus Regulation:

- a) Copernicus core users: Union institutions and bodies, European, national, regional or local authorities,
- b) research users: universities or any other research organisations;
- c) commercial and private users;
- d) any other third party,
- e) Taking into account the volume of the data produced by the CSC ground segment and to be disseminated, some enhancements will be made to address the needs of the users. These actions will be conducted by the Commission together with ESA and EUMETSAT and in coordination with the Member States' initiatives when appropriate.

2.3.2. Milestones and achievements

2014	<ul style="list-style-type: none"> - Baseline dissemination server in place - Data dissemination enhancement specified - Sentinel-1A data used by the Copernicus services and distributed for users
2015	<ul style="list-style-type: none"> - Data dissemination enhancement in progress - Sentinel-2A data used by the Copernicus services and distributed for users - Baseline dissemination server fully operational - Jason-3 data used by the Copernicus services and distributed for users
2016	<ul style="list-style-type: none"> - Data dissemination enhancement implemented - Sentinel-1B, 3A, 2B and 5P data used by the Copernicus services and distributed for users
2017	<ul style="list-style-type: none"> - Sentinel-3B data used by the Copernicus services and distributed for users
2018	
2019	
2020	<ul style="list-style-type: none"> - Sentinel-6A data used by the Copernicus services and distributed for users

2.4. Access to Data from Copernicus Contributing Missions (CCM)

2.4.1. Description

A number of ESA, national, EUMETSAT, international or commercial missions are operating or being developed. These missions primarily serve their respective operators' priorities but are also of high interest to Copernicus. The Contributing Missions consist of existing and planned Earth observation satellites from European, national or commercial organisations. They are operated by national agencies or commercial entities within ESA's or EU Member States, EUMETSAT or other third parties.

The Contributing Missions have been providing a wealth of data to Copernicus Services during the GIO programme, and will continue to fulfil Copernicus satellite data needs not covered by the Sentinels when these dedicated satellites will be in orbit. The requirements on the data from the Contributing Missions for Copernicus services and other users are captured in the 'Commission Data Warehouse Requirements' document. This activity started under GMES Regulation 911/2010 and even before under a different format. Service continuity is seen as a key aspect of this activity as Copernicus is benefiting from archived data, platform solutions and professional experience developed under the previous exercises. The Data Warehouse is evolving with the Copernicus space component and the Contributing Missions themselves.

The evolving constellation of Contributing Missions, with their own ground segment, needs to be interfaced with a dissemination system to ensure the harmonised provision to the Copernicus Services of data from the Contributing Missions as well as from the dedicated Sentinels missions.

The level of integration of the Contributing Missions data into the Copernicus data portfolio is driven by requirements stemming from Copernicus services and by parameters linked to the Contributing Mission data licensing conditions and delivery scenarios.

The Commission Data Warehouse requirements document, which is regularly updated, defines two main types of data from Contributing Missions covering the different needs of Copernicus Services:

- a) A fixed part called ‘CORE datasets’ which are typically well defined large datasets; and
- b) A flexible part called ‘ADDITIONAL datasets’, which typically are of an on-demand or ad hoc nature.

This dual approach is expected to be flexible enough to accommodate additional or specific requirements, which are not covered by the CORE datasets and are not known in advance. Modifications to the Data Warehouse document to better suit user needs may bring additional types of data beyond CORE and ADDITIONAL datasets.

Beyond licensing procurement, this activity entails IT platform developments and operational services.

2.4.2. Milestones and achievements

2014	Ensuring the continuity of provision under the Data Warehouse v1.9. requirements exercise until November 2014 (continuity of services). Implementation of the Data Warehouse v2.0 requirements, in particular through a Call for Tender organised by ESA for the access to commercial missions. Development of new interface GSC-DA v.3 through a Call for Tender organised by ESA. Access by new operational services to the Contributing Mission data.
2015	Provision of core and additional data sets to Copernicus services under Data Warehouse v2.0. Reference year (N 0) for the acquisition campaign for the land service (pan-European and local) using the new contributing mission contracts implementing the Data Warehouse requirements v2.0. Progressive deployment of the new modules for the GSC-DA.
2016	Provision of core and additional data sets to Copernicus services under Data Warehouse v2.0. N+1 Reference year: completion of acquisition campaign for the land service (pan-European and local) Progressive deployment of the new modules for the GSC-DA. Update of the Data Warehouse document v2.0 for the second period of the MFF.
2017	Provision of core and additional data sets to Copernicus services under Data Warehouse v2.0. N-1 Reference year for the acquisition campaign for the land service: pan-European, Corine Land Cover, local, urban atlas. Deployment of the new modules for the GSC-DA. New contracts in place according to the updated Data Warehouse document v2.0.

2018	Provision of core and additional data sets to Copernicus services under Data Warehouse v2.0. Reference year for the acquisition campaign for the land service: pan-European, Corine Land Cover, local, urban atlas.
2019	Provision of core and additional data sets to Copernicus services under Data Warehouse v2.0. N+1 Reference year: completion of acquisition campaign for the land service (pan and local). Preparation of the Data Warehouse document v3.0 capturing new service requirement for the new period. Definition of platforms needs for GSC-DA.
2020	Implementation of the Data Warehouse requirements v3.0 in particular through a Call for Tender organised by ESA for the access to commercial missions. N-1 Reference year: acquisition campaign for the land service (pan-European and local).

2.5. Share of responsibilities

In line with the Delegation Agreements concluded with both organizations, the Commission will over the 2014-2020 period delegate key activities to the European Space Agency (ESA), and the European Meteorological Satellite Organisation (EUMETSAT). The share of responsibility being:

- a) ESA will perform all satellite development activities, including launches and early orbit phases, until in-orbit validation of the satellites;
- b) The operation of the satellites will be shared between ESA and EUMETSAT as shown below. This also includes the preparation, maintenance and evolution of the relevant Ground Segment, the maintenance and evolution of the system baseline, and the maintenance of the relevant satellites;
- c) ESA will implement the operations of Sentinel-1, Sentinel-2, Sentinel-3 application Ground Segment for Land monitoring applications, and Sentinel-5P;
- d) EUMETSAT will implement the operations of Sentinel-3 satellite and the application Ground Segment for Marine monitoring applications, along with the operation of Sentinel-4, Sentinel-5 and the High Precision Ocean Altimetry missions;
- e) The overall Sentinel-3 mission operations would be co-managed by ESA and EUMETSAT;
- f) EUMETSAT will support the procurement and launch of recurrent missions to the extent necessary to prepare the operations of these missions;
- g) ESA will continue the operations of the existing Data Access System, and ensure the provision of all third party data that involve a procurement (data buy) activity;
- h) EUMETSAT will implement the provision of third party data, primarily in response to the needs of the Copernicus Marine and Atmosphere monitoring services, through existing agreements and mechanisms with other meteorological satellite operators. ESA and EUMETSAT will coordinate the complementary access to relevant data for Copernicus from own and third party missions (no data buy) via a joint management process.

2.6. Space surveillance and tracking (SST)

In the Copernicus Regulation, the protection of satellites against the risk of collision taking into account the Union space surveillance and tracking support framework is foreseen among the activities of the Copernicus Space Component. The SST Decision foresees the establishment of a space surveillance and tracking (SST) support framework. Part of the funding of the SST support programme will originate from the Copernicus programme, since the SST services will contribute to the protection of the Space component of the Programme against the risk induced by space debris.

This action specifically aims at:

- i. supporting the pooling of national resources on the SST objectives outlined in the SST Decision and coinciding with the activities related to the Copernicus Space Component, and
- ii. achieving significant economies of scale by adding related Copernicus resources to this joint effort.

3. CROSS-CUTTING AND SUPPORT ACTIVITIES

The activities in this chapter follow the schedule and, thus, the milestones of the activities in the service and the space component. No specific milestones are mentioned here.

3.1. In-situ Component

3.1.1. Description

The Copernicus in-situ component shall provide coordinated access to in-situ data (meaning ground-based, airborne and seaborne earth observation data) as needed by the operational Copernicus services for Emergency management, Land monitoring, Marine environment monitoring, Atmosphere monitoring, Security and Climate change. The provision of in-situ data will draw on different data sources, including EU member states' data sources, third party in-situ data sources at the international level and other relevant data sources. The Copernicus in-situ component will rely mainly on existing data sources and capacities. It will include different types of data, either regular and frequent in-situ measurements and observations data (e.g. near real-time data), periodically compiled data (e.g. regular reporting data) or one-time action data (e.g. reference data).

The in-situ component shall include the following activities:

- a) access provision to in-situ data directly from in-situ operators at the national and international level, including in support on calibration and validation activities,
- b) access provision to in-situ data collected through different EU-funded and other international networks,
- c) access provision to in-situ data from the EU reporting network (EIONET) of the EEA,
- d) in-situ data coordination, aiming at making the links between data providers and service providers, as well as access to the data more efficient and effective, and proposing mechanisms for sustainable and quality in-situ data delivery and access.

The in-situ data coordination, as defined above, will include:

- a) establishing partnerships with international and national organisations and initiatives with the aim of assuring sustainable and long-term provision of in-situ data for the Copernicus services,

- b) preparing and collecting long term plans and proposals for operational and R&D activities in the field of in-situ monitoring on national and international level, in collaboration with Copernicus services, to help assure sustainable data provision and enable gap analyses,
- c) collecting of the service needs and maintaining inventories of in-situ data requirements, solutions and providers,
- d) harmonisation of the collection, provision and quality assurance of in-situ data,
- e) identification of data gaps; proposing and (where necessary) preparing and procuring long-term solutions for data provision.

The day-to-day operational management and ingestion of the in-situ data and pre-processing will be provided by the services themselves, allowing also for exchanges between services to avoid duplication. The organisation of this process will depend on the internal structure of the particular service (e.g. in-situ thematic assembly centre of the Marine environment monitoring service). The in-situ data coordination for Copernicus services will be done at two levels: inside the services themselves and, when necessary, an overall coordination on the level of the Copernicus programme as a whole will be provided by the European Environment Agency.

This overall in-situ data coordination by the European Environment Agency will be provided whenever a common approach should be ensured (rationality and standardisation reasons), when coordination and partnership with one data provider/network should be established and maintained for different services of the Copernicus programme (e.g. meteorological or environmental data for Climate change, Atmosphere monitoring and Marine environment monitoring service) etc. The EEA will base its work on efforts done within the FP7 GISC (GMES In-Situ Coordination) project. Through GISC, a Copernicus in-situ data requirements database has been elaborated, some partnerships and agreements have been established for free data access for Copernicus and also some successful operational solutions have been demonstrated for the in-situ data provision (examples are NRT data for the atmosphere service via EIONET reporting, reference data for the emergency service, data for GIO Land via cooperation with Member States, additional data from Euro-Argo buoys for marine service). These partnerships and activities should be maintained and developed further. The Agency shall collaborate with services, data providers and other stakeholders to effectively add value to the implementation of the Copernicus in-situ component.

3.2. Cross-Cutting Activities

3.2.1. Description

A set of cross-cutting activities will be carried out, such as fostering the user-uptake of Copernicus data and products, the coordination of the in-situ data provision, development and deployment of advanced distribution and exploitation mechanisms for large scale data, communication activities.

The *user uptake* activities aim at improving the links of the Copernicus programme into the various user communities and to further increase the awareness for Copernicus data, products and services. Specific activities for relevant user segments will be developed to achieve the optimum involvement of the lead players and to address any specific barriers they may face in introducing Copernicus into their workflow. This activity will as well aim at stimulating the networking between national and regional user organisations where applicable.

The increasing size of data sets and the resulting products poses an issue for the widespread usage of Copernicus service products and for the development of a downstream service

segment. Complementary, to the activities under the Copernicus space component, the development and deployment of *advanced distribution and exploitation mechanisms* for large scale data aims to facilitate the utilisation of huge data sizes by distributed and remote processing. This will require only more targeted and less voluminous data sets to be transmitted and aims at enabling the access to these data and products by small entities, which would otherwise stay excluded from downloading and processing concurrently huge data amounts due to lack of computing and connectivity resources. These advanced technical solutions, if shown to be efficient, may as well serve the needs of bigger users including Member States in view of the provision or availability of advanced facilities they may be offering. This cross-cutting activity may lead to the implementation of advanced platform solutions for the access and use of Copernicus data and information.

The *communication activity* will support programme level communication and be complementary to the domain specific outreach activities done under the responsibility of the thematic services.

3.3. Expert Support & Assessment

3.3.1. Description

The Commission will make use of experts to support the Copernicus Units in:

- a) The assessment of the technical and scientific feasibility of the objectives of the Copernicus programme and the proposed solutions in all the programme's components;
- b) The technical and scientific validation and review of the deliverables, solutions and results supplied by the operators of the Copernicus programme;
- c) The assessment of the implementation measures proposed or carried out by the operators of the Copernicus programme.

In assessing the objectives and solutions under paragraph a), the experts will consider the transition from research-funded projects to operational services and infrastructure and the evolution from the Initial Operations phase of GMES. Experts will be asked to render recommendations on the work programmes, plans and scenarios or any decision concerning the objectives to be achieved by the Copernicus programme. A preliminary opinion on the results and achievements of GMES/Copernicus during its Initial Operations phase (GIO) may also be requested. In this case, the funding will be in addition to the budget foreseen herein and be invoiced separately by the JRC once the Copernicus Unit in charge has approved the provision of such preliminary finding.

The validation and review of deliverables under paragraph b), solutions and results shall provide the concerned Copernicus Units with technically and scientifically sound reliable opinions on the work carried out by the operators, including by their service providers along the delivery chain. These opinions will support the concerned Copernicus Units with their decisions to pass for payment the requests submitted by the operators.

The assessment to be provided under paragraph c) will support the Copernicus Units in the adoption of the work or implementation programmes submitted by the Copernicus operators and will feed back into the setting and review of the programme objectives in paragraph a).

These experts may also be used to provide advice in other relevant areas, including the evaluation and assessment of Copernicus products and services as well as inter-comparison with other global efforts and with initial emphasis on the Copernicus Climate Change Service

support, support for the definition of requirements for the Data Warehouse, support for the definition and implementation of the Copernicus Web Portal.

ANNEX 1: COPERNICUS BUDGET PROFILE 2014-2020

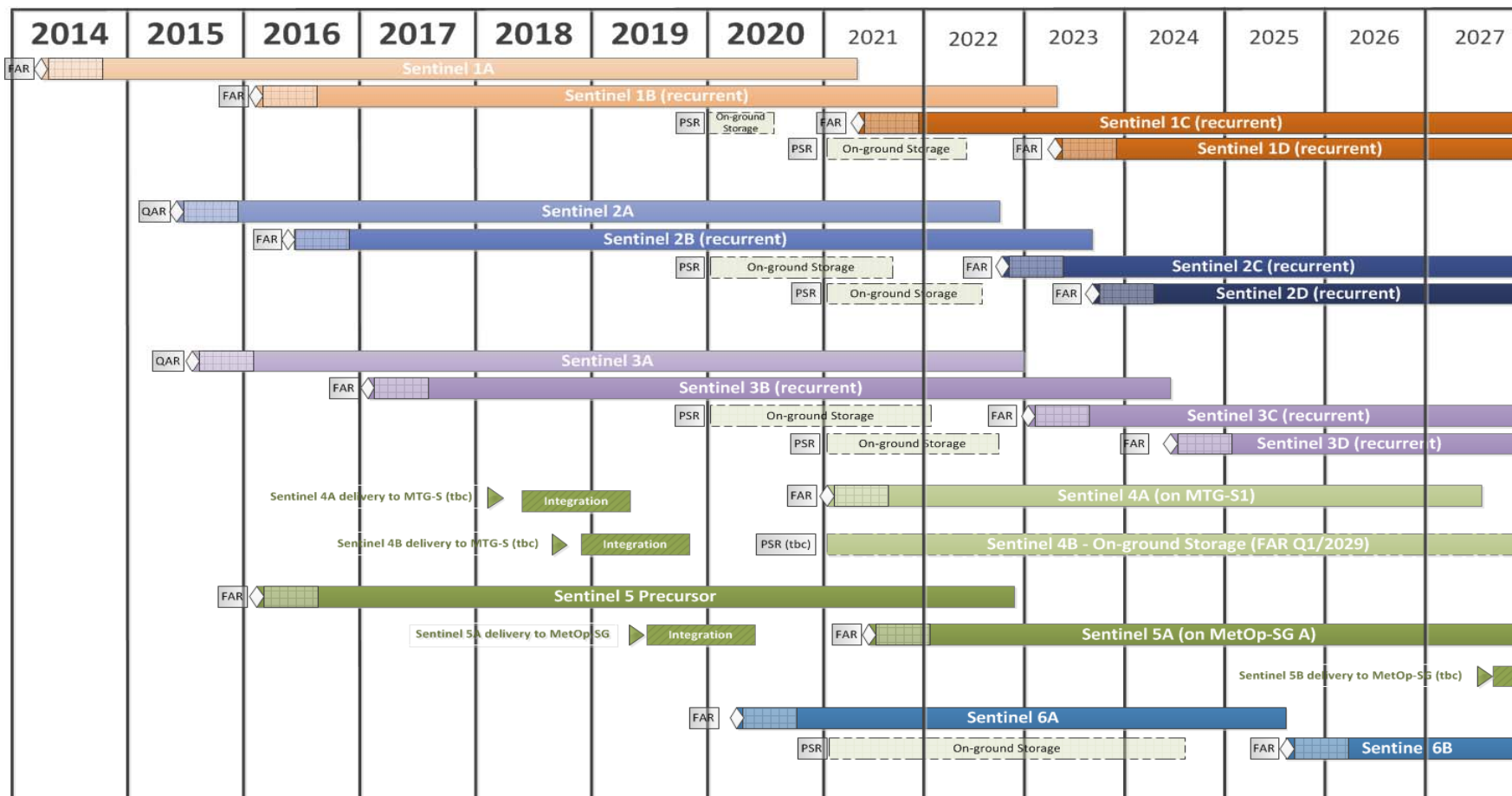
Services (02.0601)	2014	2015	2016	2017	2018	2019	2020	Total
Commitment	44.433	113.650	122.353	128.269	135.664	187.755	136.356	868.480

Space (02.0602)	2014	2015	2016	2017	2018	2019	2020	Total
Commitment	316.000	440.220	461.214	481.563	506.997	686.215	511.291	3.403.500

ANNEX 2: INDICATIVE SENTINEL DEPLOYMENT SCHEDULE



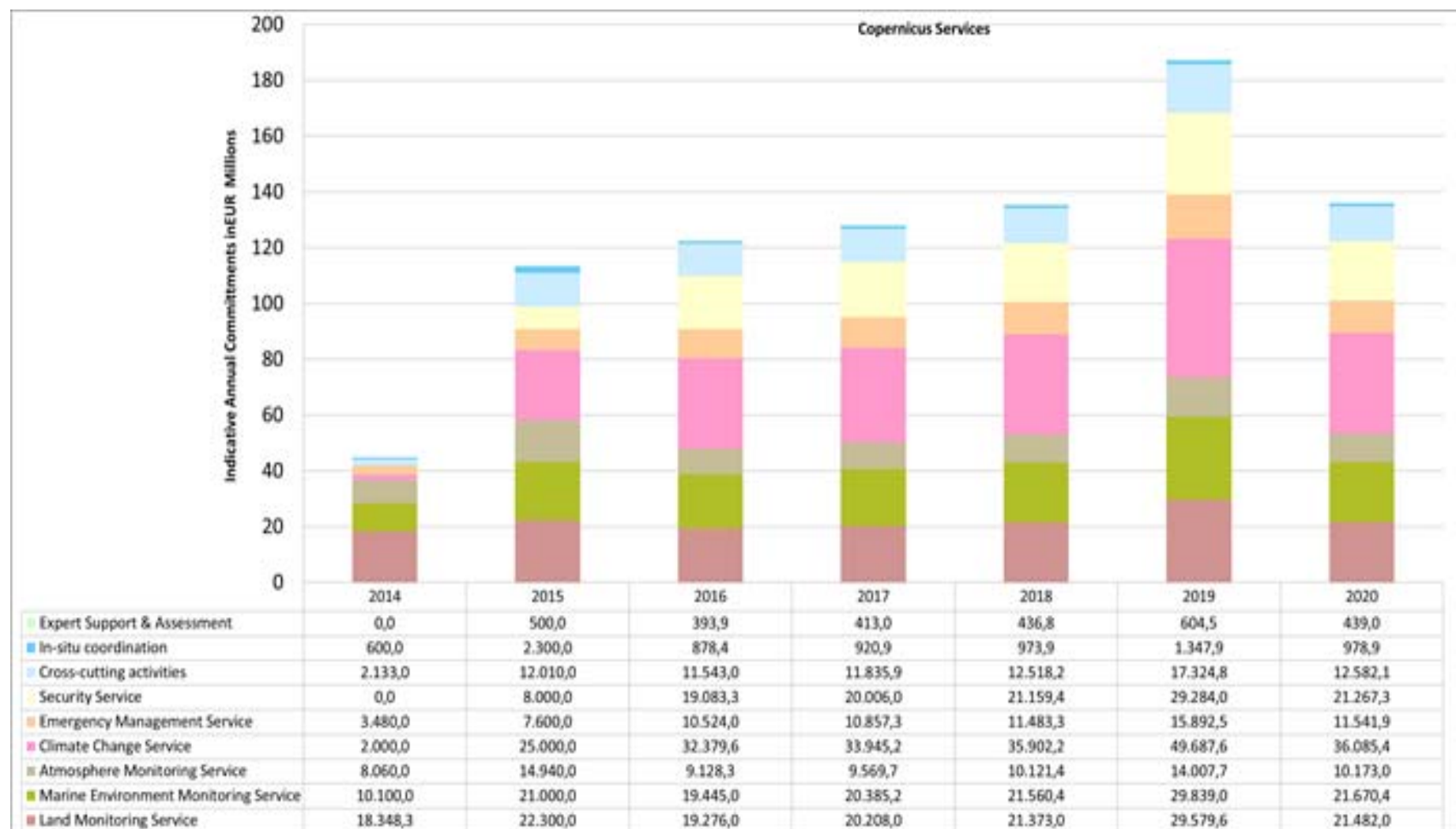
Sentinel Deployment Schedule



Legend: Qualification Acceptance Review (QAR) On-ground Storage Tentative launch date In-orbit Commissioning Flight Acceptance Review (FAR) or PreStorage Review (PSR) Integration

Status: Sep 11, 2014

ANNEX 3: INDICATIVE BUDGET EVOLUTION OF COPERNICUS SERVICES



ANNEX 4: INDICATIVE SERVICES DEPLOYMENT SCHEDULE

