

AGEO DELIVERABLE D4.2

STATUS REPORT ON THE STAKEHOLDER REQUIREMENTS ON THE USE OF COPERNICUS EMS IN THE PARTICIPATING REGIONS

PARTNER REPORT – LNEG

Authors (LNEG): Lídia Quental, Pedro Gonçalves and Susana Machado

WP4 leader - IGME

Title:	EAPA_884/2018 – AGEO
Lead beneficiary:	IGME
Other beneficiaries:	IST, APG, LPRC, UBO, BGS/GSNI, UCD, CEREMA, LNEG, ULL, LNEC, UMA, CML
Due date:	2021
Nature:	Public
Diffusion:	All Partners
Status:	Version 1
Document code:	

Diffusion List		
Partner name	Name	e-mail
Instituto Superior Técnico- Universidad de Lisboa.	Rui Pedro Carrilho Gomes	rui.carrilho.gomes@tecnico.ulisboa.pt
Associação Portuguesa de Geólogos	José Manuel Correia Romão	jromao@apegeologos.pt
La Palma Research Center	Ariadna Ortega Rodríguez	ariadna.ortega@lapalmacentre.eu
Instituto Geológico y Minero de España	Inés Galindo Jiménez	i.galindo@igme.es
Université de Bretagne Occidentale	Lucie Cocquempot	lucie.cocquempot@univ-brest.fr
United Kingdom Research and Innovation represented by its component body British Geological Survey	Kirstin Lemon	klem@bgs.ac.uk
University College Dublin	Gregory O'Hare	gregory.ohare@ucd.ie
Centre d'Études et d'Expertise sur les Risques Environnement Mobilité et Aménagement	LE DANTEC Nicolas	nicolas.le-dantec@cerema.fr
Laboratório Nacional de Energia e Geologia	Lídia Quental	lidia.quental@lneg.pt

Universidad de La Laguna	Juan Carlos Santamarta Cerezal	jcsanta@ull.es
Laboratório Nacional de Engenharia Civil	Laura Caldeira	laurac@lnec.pt
Universidade de Madeira	Fátima Maria Pereira Gouveia	fatimampgouveia@gmail.com
Camara Municipal de Lisboa	Cláudia Filipa Narciso Pinto	claudia.pinto@cm-lisboa.pt

Contents

1	INTRODUCTION	7
2	METHODOLOGY	8
3	RESULTS.....	8
3.1	Products available	8
3.2	REQUIREMENTS.....	9
4	DISCUSSION.....	10
5	CONCLUSIONS	12
6	REFERENCES	13
7	Appendix I –portfolio risk and recovery mapping (rrm)	14

FIGURES

Figure 1. Copernicus EMS in a nutshell: Preparedness, emergency response and recovery, time frame and associated products. (https://emergency.copernicus.eu/mapping/sites/default/files/files/CopernicusEMS-High_Level_Brochure.pdf)..... 8

EXECUTIVE SUMMARY

This work shows stakeholders requirements and needs related to the Copernicus data and products, focused on the Copernicus Emergency Management Service (EMS). The EMS is the space dedicated service for the management of natural or human-induced disasters and humanitarian crisis and provides a wealth of information to support all phases of the emergency management cycle gathering different actors. Among the several components for emergency response, the on-demand mapping component (EMSR) provides rapid maps for emergency response and risk and recovery maps (EMSN) for prevention and planning. Another component relates to the early warning and monitoring providing continuous alerts about fires, floods and drought.

In this work an overview of the various type of products in the EMS is given. The stakeholders impressions and requirements were gathered through different sources, including: a) open data and information available through public portals, b) country information acquired over time related to Copernicus data and services and national institutions, and c) interaction with stakeholders groups, e.g. national civil protection authority, researchers, and public bodies with competences in geohazard risk management, including thematic dedicated Copernicus sessions within the AGEO project.

Most of the impressions related to Copernicus EMS were gathered within specialised stakeholders related to geohazards, with or without experience in Copernicus services. From the experts, very few are involved in the development and implementation of any tool for these services.

The identified requirements are related to: 1) ACCESS TO DATA FOR ADDED-VALUE PRODUCTS, 2) SCALE, 3) InSAR /PSInSAR, 4) DELIVERY OF THE SERVICE, 5) NEAR REAL TIME INFORMATION, and 6) EDUCATIONAL CONTENTS. Some of these requirements can have a partial response by mechanisms within Copernicus EMS, but it implies the activation of the service, EMSR or EMSN, for 1), 2) and 3). In 5), the pre-tasking of the satellites, issued by an alert from EFAS concerning river floods and based on its potential impact, requires more interaction with national entities (EFAS partner and Civil protection authority) for more detailed comprehension of the workflow. Another possibility to minimise the time issues in 5) is to use UAV, already adopted in some activations.

Ongoing developments of other Copernicus services, as well as using information of those services, can benefit geohazards analysis and monitoring. The EU-Ground Motion Service has the main objective of measure ground displacements and deformation. The first product in the European space will be available to users in Q1 2022, providing a useful tool to support geohazards. The EU-Ground Motion Service can partially fulfil part of the stakeholders requirements, in 3), with a yearly update about the European space.

Concerning educational contents, in 6), there are dedicated platforms for knowledge and uptake of Copernicus data, but potentially could be developed more information related to geohazards.

1 INTRODUCTION

The Copernicus Emergency Management Service (EMS) is the dedicated service for the management of natural or human made disasters and humanitarian crisis throughout the world. Thus, it supports all phases of the emergency management cycle: preparedness, prevention, disaster risk reduction, emergency response and recovery. The Copernicus EMS provides all actors involved in the emergency management, *e.g.* Civil Protection Authorities and Humanitarian Aid Agencies, with timely and accurate geo-spatial information derived from satellite remote sensing and completed by available *in situ* or open data sources¹. It is composed of an on-demand mapping component providing rapid maps for emergency response and risk and recovery maps for prevention and planning (**A**), and of the early warning and monitoring component (**B**, **C** and **D**)² (Figure 1):

A. Copernicus EMS – Mapping

1. **Rapid Mapping (EMSR)** consists of the provision of geospatial information within hours or days from the activation in support of emergency management activities immediately following a disaster. Standardised mapping products are provided: *e.g.* to ascertain the situation before the event (reference product), to roughly identify and assess the most affected locations (first estimate product), assess the geographical extent of the event (delineation product) or to evaluate the intensity and scope of the damage resulting from the event (grading product).
 2. **Risk & Recovery Mapping (EMSN)** consists of the on-demand provision of geospatial information in support of Disaster Management activities not related to immediate response, *i.e.* in a non-rush mode. This applies in particular to activities dealing with prevention, preparedness, disaster risk reduction and recovery phases. There are three broad product categories: Reference Maps, Pre-disaster Situation Maps and Post-disaster Situation Maps.
- B. **The European Flood Awareness Systems (EFAS)** provides complementary flood forecast information to relevant stakeholders supporting flood risk management at national, regional and global level where overviews on ongoing and forecasted floods in Europe up to 10 days in advance³.
- C. **The European Forest Fire Information System (EFFIS)** provides near real-time and historical information on forest fires and forest fire regimes in the European, Middle Eastern and North African regions⁴.
- D. **The European Drought Observatory (EDO)**, which provides drought-relevant information and early-warnings for Europe.

The Copernicus EMS has been operational since 1st April 2012 implemented by the European Commission DG Joint Research Centre (JRC). The products generated by the service are usable as supplied and available (*e.g.* as digital or printed map outputs in several formats to any citizen⁵) at the portal of the EMS for the case of EMS Mapping (Figure 1). They may also be combined with other data sources (*e.g.* as digital feature sets in a geographic information system) to support geospatial analysis and decision making processes of emergency managers.

¹ https://www.copernicus.eu/sites/default/files/documents/Copernicus_EmergencyMonitoring_Feb2017_0.pdf

² <https://emergency.copernicus.eu/>

³The Portuguese partner of EFAS is Instituto Português do Mar e da Atmosfera (IPMA).

⁴The Portuguese partners of EFFIS are Instituto da Conservação da Natureza e das Florestas (ICNF) and Autoridade Nacional de Emergência e Proteção Civil (ANEPC).

⁵The general public users are not authorised to trigger the service, but can be informed of an activation request and access service outputs through the web portal accessible to all, excluding activations for which security restrictions apply.

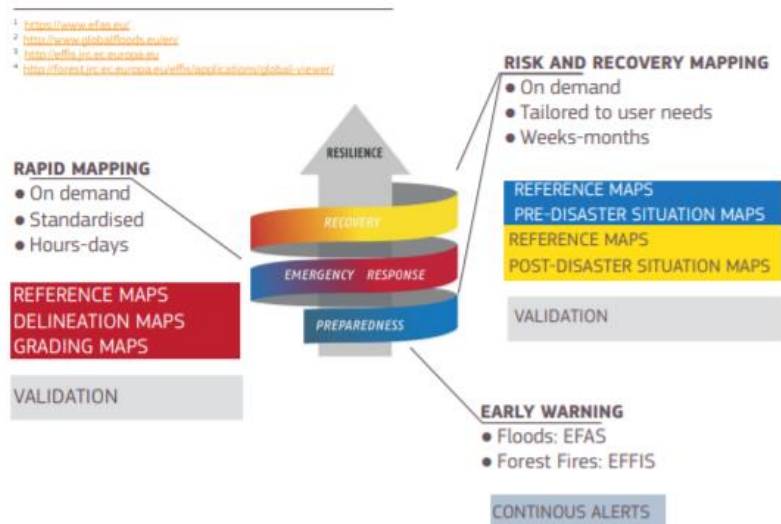


Figure 1. Copernicus EMS in a nutshell: Preparedness, emergency response and recovery, time frame and associated products. (https://emergency.copernicus.eu/mapping/sites/default/files/files/CopernicusEMS-High_Level_Brochure.pdf)

The EMS can be triggered only by or through an Authorised User (AU). The AU include National Focal Points (NFPs) in the EU Member States and countries participating in the Copernicus programme, as well as European Commission services and the European External Action Service (EEAS). The activation, after accepted by the Directorate General–Joint Research Centre (DG-JRC), follows a detailed workflow, including validation procedures aiming to continuously improve the quality of the service (MOP, 2018, QSG, 2016)

An overview of the impressions and stakeholders requirements are analysed taking into account the available Copernicus products.

2 METHODOLOGY

The approach to acquire knowledge about the impressions and stakeholders requirements concerning Copernicus EMS is based on:

- open data and information available through public portals, e.g. <https://emergency.copernicus.eu/>
- country information acquired over time related to Copernicus data and services and national institutions
- interaction with stakeholders groups, e.g. national civil protection authority, researchers, and public bodies with competences in geohazard risk management, including thematic dedicated Copernicus sessions within the AGEO project.

3 RESULTS

3.1 PRODUCTS AVAILABLE

The Copernicus EMS has been activated for Portugal with both components, EMSR (n=17) and EMSN (=7), in a total of n=24 until February 2021 (Quental and Machado, 2020, and updated with more 4 activations ([EMSR463](#), [EMSR462](#), [EMSR443](#) and [EMSR448](#))). The majority of the activations in Portugal were related to fires. Geohazards, in the s.s. as disasters of geological origin, whether related to internal

or external geodynamic processes, correspond only to 4 activations ([EMSN018](#), [EMSN020](#), [EMSN034](#) and partially [EMSN031](#)), and exceptionally floods, as mixed natural hazard, in [EMSR072](#).

The number of products derived from EMSR activations are dependent of: 1) the type of hazard and products requested (Figure 1), and 2) of the extent of the hazard (area and time frame). The mapping is derived by different types of imagery, optical and/or radar of high resolution or other, and ancillary data based on open data available or provided by other entities.

The EMSR component, typically gathers standardised products (Figure 1), compatible with short time delivery, and described in MOP (2018) and Dorati *et al.* (2018):

1. **Reference map:** is usually based on a pre-event image and consists of selected topographic features of the area affected by the disaster, in particular exposed assets and other available information.
2. **Delineation map:** is based on a post-event image and provides an assessment of the event's extent.
3. **Grading map:** is based on a post-event image and provides an assessment of the damage grade and its spatial distribution.

Another type of map is released for each activation the so-called **Activation Extent Map (AEM)**. For each activation an AEM is produced with the purpose of giving a quick overview of the areas of interest included in the activation. More updates and details about the EMSR are given in Joubert-Boitat *et al.* (2020). The products are also classified according to delivery time:

1. **Service Level 1 (SL1):** This is the fastest service, intended to provide products as soon as possible. The operational chain is 24/7/365.
2. **Service Level 2 (SL2):** This service is for cases of less urgency and which do not require working during the night. Request and handling of the image tasking are nevertheless 24/7/365. Production is executed during working days and hours, *i.e.* between 8.00 - 20.00 CET.

The EMSN has two type of products, **Risk and Recovery STANDARD** for a predefined set of standardized products and **Risk and Recovery FLEX** for tailor made studies (Appendix I). The stakeholders can formulate a request containing all the elements relevant to their requirements. The request can be related to natural or human-induced hazards and includes studies to support the different phases of the emergency management cycle.

3.2 REQUIREMENTS

Most of the impressions related to Copernicus EMS were gathered within specialised stakeholders related to geohazards, with or without experience in Copernicus services. From the experts, very few are involved in the development and implementation of any tool for these services. The connection with Copernicus is determined by legislation in the case of Nacional Authority for Civil Protection. Copernicus EMS is generically considered efficient and well implemented, as already highlighted in Qental and Machado (2020).

ACCESS TO DATA FOR ADDED-VALUE PRODUCTS

Besides the Sentinels built for the Copernicus programme, the contributing missions play a crucial role in delivering complementary data to ensure that a whole range of observational requirements is satisfied. These missions are subject to owner's copyright. The access to original data is a stakeholder requirement for further analysis and processing, combined with their own data and expertise to provide added-value products.

SCALE

Higher spatial resolution imagery is required for more local approaches, as Sentinel 2 with 10 m resolution, is considered insufficient taking into account the dimension of some geohazards, *e.g.* to assess and monitor rock falls.

InSAR /PSInSAR

Interferometric Synthetic Aperture Radar (InSAR) exploits the phase difference between two complex radar SAR observations of the same area, taken from slightly different sensor positions, and extracts distance information about the Earth's terrain. It measures the spatial extent and magnitude of surface deformation associated with fluid extraction and geohazards, *e.g.* earthquakes, volcanoes, and landslides. For geohazards InSAR/PSInSAR is identified as a specific requirement for several pilots within AGEO. One partner is using InSAR monitoring for the prevention phase, while another one is processing other AGEO pilots.

Another requirement was to consider SAR images to delineate burnt areas, in case of cloudy optical images. Or to extend the same criteria to eruptive plumes of volcanic eruptions, as in the case of [EMSR111](#), activated by Portugal.

DELIVERY OF THE SERVICE

For data Integration through data download and customization (generalization, symbology, etc.), it would be important to access the data via OGC compliant webservices.

NEAR REAL TIME INFORMATION

The need of near real time information was highlighted by stakeholders for an emergency response and mitigation of the risk.

EDUCATIONAL CONTENTS

AGEO is based on Citizen Science and Copernicus educational content is needed for uptake of the available information and subsequent interaction of citizens.

4 DISCUSSION

A wealth of information and products is available through the Copernicus EMS, via WEB, on both components EMSR and EMSN (Appendix I). The requirements expressed by the users can have a partial response within these products, or potentially through other Copernicus services, *i.e.* Copernicus Land Monitoring Service (CLMS). In fact, part of the products in Copernicus EMS integrate CLMS, or the same nomenclature is applied to a higher resolution data (*e.g.* Land Cover/Land Use, DEM, etc.). This will be dependent of the type, magnitude and extension of the geohazard.

Additional comments are given about some of the stakeholder`s requirements:

ACCESS TO DATA FOR ADDED-VALUE PRODUCTS

The European Commission follows open data policies for Copernicus data and products. When required data acquisition from contributing Missions for the services without open access, they can be made available for the public administration, research or academic activity ([CSDOFPA](#), 2016).

SCALE

The access to the contributing missions datasets can answer partially the need of higher resolution datasets ([CSDOFPA](#), 2016), if they were made available for the Copernicus program. It is worth notice that in the case of the Portuguese activation [EMSN034](#) (2017), the use of Unmanned Aerial Vehicle (UAV) from JRC, solved the scale issue by generating a very detailed digital surface model /digital terrain model with ground sampling distance (GSD) of 20 and 10 cm respectively and orthoimage with a GSD of 10 cm.

InSAR /PSInSAR

The Copernicus Land Monitoring Service (CLMS) is working in the development of the [EU-Ground Motion Service](#) based on Sentinel 1 data (EU-GMS, 2017). The service was designed for monitoring ground motion risks, surveillance of the marine environment (sea ice, wind, waves), maritime surveillance (ships, oil spills), support to crisis and emergency situations (floods) and land cover monitoring (mapping forests, water and soil). Of these, only the first has not yet become an operational Copernicus service, and so the potential of the Sentinel-1 data archive over Europe's land areas has not been fully and systematically utilized – even though the precision measurement of ground motion is a unique application of SAR that cannot be measured with other remote sensing techniques.

The [EU-Ground Motion Service](#) can partially fulfil the stakeholders requirements, proving a yearly update about the European space. The EGMS production phase kicked-off in January 2021. As a result, it is expected that the pre-operational (quality controlled) EUGMS Baseline product will be available to users Q1 2022. The EUGMS Baseline product will then be considered operational after it has been successfully validated against independent data. It is foreseen by Q3 2022.

NEAR REAL TIME INFORMATION

The Early Warning Systems linked to the Copernicus EMS, in this case through EFAS, can facilitate data acquisition by linking pre-tasking of satellite Images to the EFAS flood warnings without an official service activation. The procedure is expected to improve timeliness of Rapid Mapping, in particular by reducing the time required for obtaining post-event imagery and by optimising the acquisition time with respect to an event's evolution (flood peak time) (MOP, 2018). It is worth notice that the alert is given to the national partners of EFAS and are only issued for river floods and dependent of the estimative of the impact of an event. Another possibility is the use of UAV as occurred in [EMSN034](#) activation.

EDUCATIONAL CONTENTS

Platforms such as [Sentinel Playground](#), powered by [Sinergise](#), which is a web application for browsing, analysis and evaluation of Sentinel 2 images, are useful tools with dedicated tutorials. They provide easy access to simple search and finding the best acquisition conditions for a target area of interest, as well as combining bands to enhance characteristics of the images, *i.e.*, geology, soil moisture, fire, etc. Allows also to gather information about any rapid change event, *i.e.* geohazard, before and after that event. More educational resources are found [here](#) in Sentinel Hub. [EO Browser](#) is a more advanced tool, with a complete archive of Sentinel-1, Sentinel-2, Sentinel-3, Sentinel-5P data and other ESA's, archive (Landsat 5, 7 and 8, Envisat Meris, MODIS, Proba-V and GIBS products). This is also useful for more specialised stakeholders to quickly gather Copernicus and other imagery information.

Regarding educational contents, Copernicus Mooc is a great place to better know Copernicus platform, how to access Copernicus data and services and how it can be used in several key sectors such as renewable energy, security and management, resource management, land use and environmental monitoring. _It exemplifies how to integrate data from Copernicus with advanced techniques such as "AI" and machine learning and data mining and how to better harvest and extract useful information from the massive data archives available. The guidance on how to establish and create a new

service/product based in Copernicus data is also a great help for the most experienced used to further develop their ideas. There is also Research and User Support (RUS), created in 2016 and opened to public in 2017 aimed to provide free courses and seminars to promote the uptake of Copernicus data and services. This service provides several online and face-to-face seminars and a virtual machine for users to follow the educational activities. It's a very specialized educational service.

5 CONCLUSIONS

The Copernicus Emergency Management Service (EMS) is the space dedicated service for the management of natural or human-induced disasters and humanitarian crisis and provides a wealth of information to support all phases of the emergency management cycle gathering different actors.

Among the several components for emergency response, the on-demand mapping component (EMSR) provides rapid maps for emergency response and risk and recovery maps (EMSN) for prevention and planning. Another component relates to the early warning and monitoring providing continuous alerts about fires, floods and drought.

The stakeholders impressions and requirements gathered through different sources, included: a) open data and information available through public portals, b) country information acquired over time related to Copernicus data and services and national institutions, and c) interaction with stakeholders groups, *e.g.* national civil protection authority, researchers, and public bodies with competences in geohazard risk management, including thematic dedicated Copernicus sessions within the AGEO project.

Most of the impressions related to Copernicus EMS were gathered within specialised stakeholders related to geohazards, with or without experience in Copernicus services. From the experts, as stated before, very few are involved in the development and implementation of any tool for these services. The connection with Copernicus is determined by legislation in the case of Nacional Authority for Civil Protection. Copernicus EMS is generically considered efficient and well implemented, as already highlighted in Quental and Machado (2020).

The identified requirements are related to: 1) ACCESS TO DATA FOR ADDED-VALUE PRODUCTS, 2) SCALE, 3) InSAR /PSInSAR, 4) DELIVERY OF THE SERVICE, 5) NEAR REAL TIME INFORMATION, and 6) EDUCATIONAL CONTENTS. Some of these requirements can have a partial response by mechanisms within Copernicus EMS, but it implies the activation of the service, EMSR or EMSN, for 1), 2) and 3). In 5), the pre-tasking of the satellites discussed, issued by an alert from EFAS concerning river floods and based on its potential impact requires more interaction with national entities (EFAS partner and Civil protection authority) for more detailed comprehension of the workflow. Another possibility to minimise the time issues in 5) is to use UAV, already adopted in some activations closing the gap regarding spatial and temporal resolution.

Copernicus provides several resources to education and specifically to advanced users in the field of Earth Observation. One stakeholder referred that could be interesting to have more material and resources available, for example, for basic and secondary education students. Thus, teachers and Copernicus partners could have more material and information available regarding Copernicus, which allows to disseminate more information and generate interest and knowledge in this critical area.

As highlighted in Quental and Machado (2020), it is important to be aware of the ongoing developments on another Copernicus services, as well as using derived information of those. This is the case of the [Copernicus Land Monitoring Service](#) (CLMS) in which is developing the [EU-Ground Motion Service](#) based on Sentinel 1 (EU-GMS, 2017). The main objective is to measure ground displacement and deformation. The first product within European borders will be available to users in Q1 2022, providing a useful tool in the definition and support of geohazards. The [EU-Ground Motion Service](#) can partially fulfil part of the stakeholders requirements, 3), with a yearly update about the European space.

However, given the timeline of EU-GMS and the stakeholders needs of continuous monitoring in the prevention phase, but not only, the solution will be to process available datasets within or outside the AGEO consortium.

Concerning 6), there are dedicated platforms for knowledge concerning Copernicus data and uptake, but potentially should be developed more information related to geohazards.

6 REFERENCES

- CSDOFPA (2016). COPERNICUS SPACE DATA OFFER FOR PUBLIC AUTHORITIES DISTRIBUTED BY ESA.8 pp. <https://spacedata.copernicus.eu/documents/20126/0/Information+for+Public+Authorities+%282%29.pdf/fa1cb83c-e10b-685f-de66-9893ee2408c4?t=1582123399403> Accessed online 17-02-2021.
- Dorati, C., Kucera, J., Marí i Rivero, I., Wania, A. (2018). Product User Manual of Copernicus EMS Rapid Mapping, JRC Technical Report JRC111889. All images © European Union 2018.
- EU-GMS (2017). European Ground Motion Service (EU-GMS). A proposed Copernicus service element. White paper. <https://land.copernicus.eu/user-corner/technical-library/egms-white-paper> . Accessed 20/02/2021.
- Joubert-Boitat, I., Wania, A., Dalmaso, S. (2020). Manual for CEMS-Rapid Mapping Products, EUR 30370 EN, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-21683-4, doi:10.2760/29876, JRC121741.
- MOP (2018). Copernicus Emergency Management Service – Mapping. Manual of Operational Procedures Guidelines for EC Services, Service Providers and Authorised Users. European Commission DG JRC, DG GROW, DG ECHO
Version 1.3. 90 pp
https://emergency.copernicus.eu/mapping/sites/default/files/files/EMS_Mapping_Manual_of_Procedures_v1_3_final.pdf Accessed online 17-02-2021.
- QSG (2015). Copernicus Emergency Management Service Quick Start Guide. https://emergency.copernicus.eu/mapping/sites/default/files/files/CopernicusEMS-Quick_Start_Guide.pdf, 2pp Accessed online 17-02-2020.
- Quental, L., Machado, S. (2020). Status Report on the use of Copernicus EMS in the participating regions. Partner Report by LNEG for AGEO WP4. 26 pp.

7 APPENDIX I –PORTFOLIO RISK AND RECOVERY MAPPING (RRM)

(<https://emergency.copernicus.eu/mapping/ems/risk-and-recovery-mapping-portfolio#Portfolio%20risk%20and%20recovery%20STD>) , adapted, CC BY-SA 3.0)

1. STANDARD

Floods			
P04	Flood delineation	5-10 days	Download PDF [449 KB]
P05	Modeled flood extent for major events	5-10 days	Download PDF [458 KB]
P06	Temporal analyses of occurred flood events	2-5 days	Download PDF [435 KB]
Forest fires / Wildfires			
P07	Wildfire delineation and grading	5-10 days	Download PDF [405 KB]
P16	Post-disaster soil erosion risk assessment	5 days	Download PDF [349 KB]
P17	Post-disaster landslide risk assessment	5 days	Download PDF [336 KB]
Damage assessment and reconstruction monitoring			
P08	Detailed damage assessment analyses over affected areas	5-15 days	Download PDF [448 KB]
P09	Reconstruction monitoring	5 days	Download PDF [468 KB]
Impact assessment/exposure after disaster			
P14	Impact assessment/exposure analyses on asset and population	3 days	Download PDF [1365 KB]
P15	Detailed impact assessment/exposure analyses on selected aspect	3 days	Download PDF [469 KB]
Humanitarian crisis			
P10	City growth analysis	2-3 days	Download PDF [338 KB]
P11	Human footprint evaluation of cities through nightlight analysis	2 days	Download PDF [330 KB]
P18	Human settlements mapping	5-10 days	Download PDF [350 KB]
P19	Population displacement location/monitoring	5-10 days	Download PDF [278 KB]
Ground deformation			
P12	Ground deformation analyses	5-7 days	Download PDF [388 KB]
Reference data			
P02	Reference dataset	5-15 days	Download PDF [430 KB]
P03	Land use and land cover dataset	5-15 days	Download PDF [396 KB]
P20	Detailed reference dataset for high-importance areas	5-15 days	Download PDF [421 KB]
P01	Digital Surface Model	5-10 days	Download PDF [288 KB]
Map layouts for printing			
P13	Ready to print maps and map books for field campaigns	2-3 days	Download PDF [267 KB]

[Download printable version of all products' description](#) [PDF - 5391 KB]

2. FLEX

RRM is designed to allow users to request a range of products, based on their needs. In particular, the RRM service will support Member States with risk and recovery products in the context of the Union Civil Protection Mechanism and the Sendai Framework for Disaster Risk Reduction. By providing locally relevant information, the RRM products are relevant at city and regional level and can support processes such as cost-benefit analysis of major investment projects for disaster prevention and climate change adaptation and help effective investments under the European Structural and Investment Funds.

Users can formulate a [request](#) containing all the elements relevant to their requirements. The request can be related to natural or man-made hazards and include studies to support the different phases of the emergency management cycle.



RRM Service, list of hazards, type of analysis and targets covered (2012-2019).

Examples of RRM in Portugal are detailed in:

EMSN-018 (2016) Multiple natural hazard risk assessment - Planning and Recovery. Technical report. European Commission – Joint Research Centre Institute for the Protection and Security of the Citizen Global Security and Crisis Management Unit Ispra (VA), ITALY, 19.02.2016, 96pp.

EMSN020 (2016) Multiple natural hazard risk assessment - Planning and Recovery. Technical Report. European Commission – Joint Research Centre Institute for the Protection and Security of the Citizen Global Security and Crisis Management Unit Ispra (VA), ITALY, 19.02.2016, 100 pp.

EMSN034 (2017) Coastal flood risk analysis for population and assets, Caparica, Setúbal, Portugal. Final Report Summary. Indra, S.A. 113 pp

EMSN034 FS (2017) Coastal flood risk analysis for population and assets, Caparica, Setúbal, Portugal. Fac Sheet. Indra, S.A. 7pp

To consult other examples of the RRM service that have been conducted in the past follow the link <https://emergency.copernicus.eu/mapping/list-of-activations-risk-and-recovery>