EuroGeographics Extraordinary General Assembly

May 15th, 2018

Copernicus EMS – (Rapid) Mapping component

The European Authoritative In situ Data Within the Copernicus Emergency Management Service – Rapid Mapping

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SUMMARY

Copernicus EMS

- Products and Services
- Rapid Mapping

CEMS - Rapid Mapping

- Workflow
- In situ data requirements
- Why do we need in situ data?
- NMCA Dataset
- Case study

Challenges and opportunities

- CORDA
- ELS

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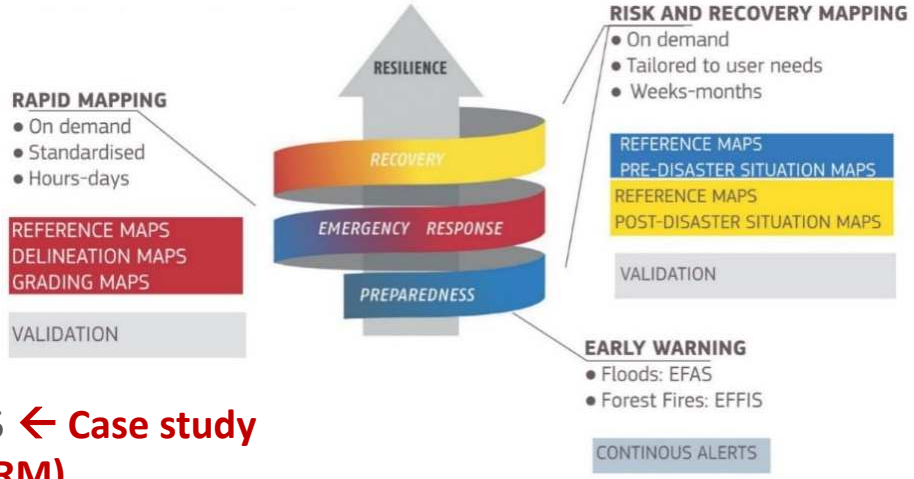
Copernicus EMS

Copernicus Emergency Management Service (CEMS) provides information for emergency response in relation to different types of disasters, including meteorological hazards, geophysical hazards, deliberate and accidental man-made disasters and other humanitarian disasters as well as prevention, preparedness, response and recovery activities

Two components:

- **EMS Mapping**
- **EMS Early Warning**



The EMS Mapping Component provides two service modules:

1. **Rapid Mapping (RM)**: 24/7/365 ← **Case study**
2. **Risk and Recovery Mapping (RRM)**

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Copernicus EMS - Rapid Mapping

CEMS – Rapid Mapping provides On-demand and fast (within hours or days) geospatial information in support of emergency management activities immediately following an emergency event such as: natural & man-made disasters globally

283
rapid mapping activations

3.000+
maps

2.500.000+
kmq delivered

50+
Countries worldwide

24/7

9h from activation
Pre-event maps

3h from satellite data availability
1st Post-event maps

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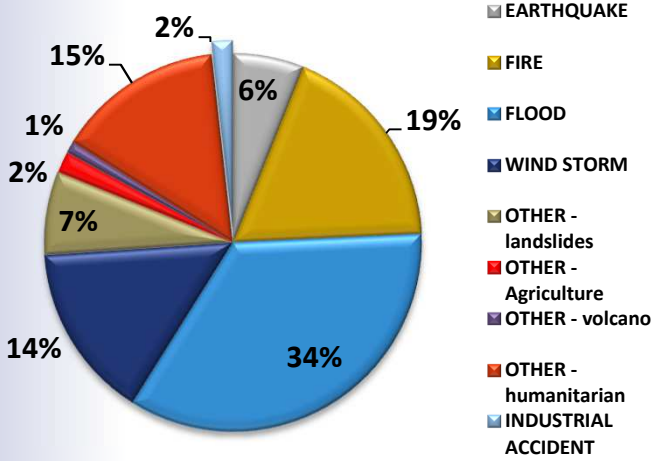
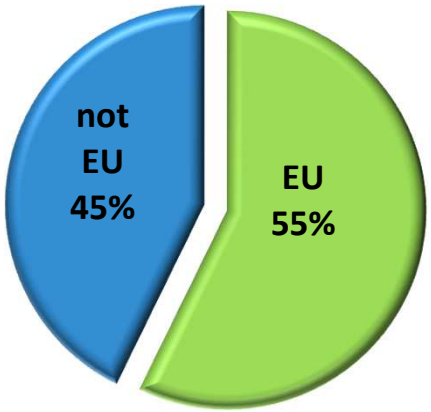
Copernicus EMS - Rapid Mapping

DISASTER TYPE



GEOGRAPHIC AREAS



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Copernicus EMS RM – Workflow

OFF-LINE WORK

In situ Data collection

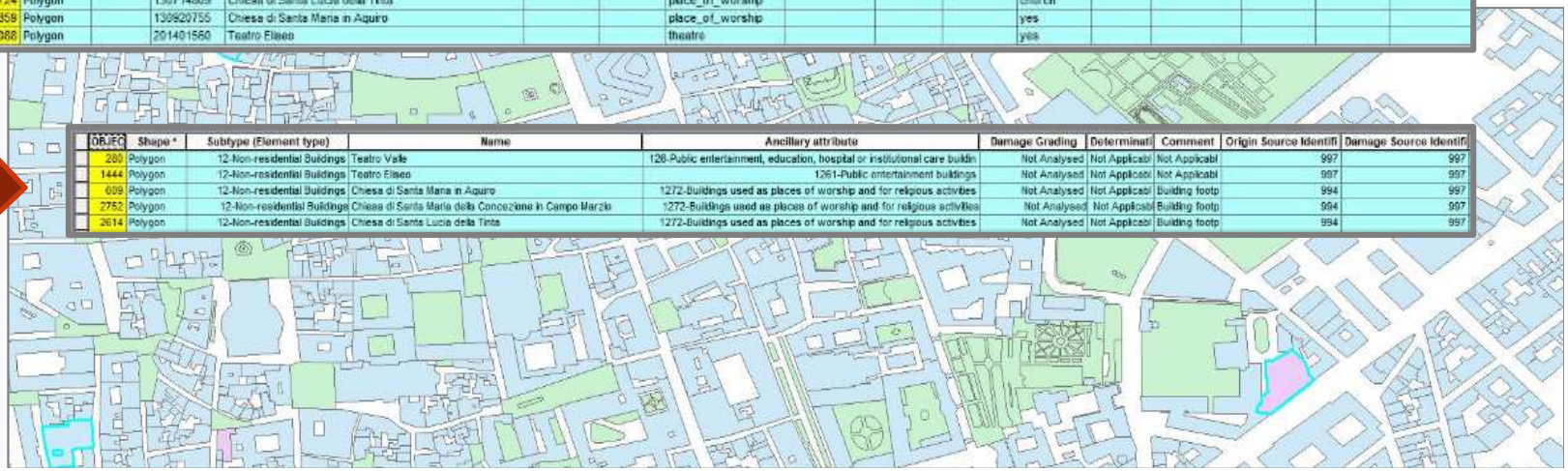
- ✓ Check of available data
- ✓ Setting of **EXTRACT, TRANSFORM, LOAD (ETL)** rules (Geometry, Thematic, Attributes) to harmonize the data according to the RM Data Model used during the production

EFFORT & TIME CONSUMING

ETL

FID	Shape	osm_id	osm_way_i	name	type	aeroway	amenity	admin_leve	barrier	boundary	building	craft	geological	historic	land_area	landuse
218	Polygon	2710922		Teatro Valle	multipolygon		theatre				yes					
375	Polygon		89985362	Chiesa di Santa Maria della Concezione in Campo Marzio			place_of_worship				church					
724	Polygon		130714809	Chiesa di Santa Lucia della Tinta			place_of_worship				church					
859	Polygon		130920755	Chiesa di Santa Maria in Aquiro			place_of_worship				yes					
1088	Polygon		201401560	Teatro Eliseo			theatre				yes					

OBJECTID	Shape *	Subtype (Element type)	Name	Ancillary attribute	Damage Grading	Determinati	Comment	Origin Source Identifi	Damage Source Identifi
280	Polygon	12-Non-residential Buildings	Teatro Valle	126-Public entertainment, education, hospital or institutional care buildin	Not Analysed	Not Applicabl	Not Applicabl	997	997
1444	Polygon	12-Non-residential Buildings	Teatro Eliseo	1261-Public entertainment buildings	Not Analysed	Not Applicabl	Not Applicabl	997	997
609	Polygon	12-Non-residential Buildings	Chiesa di Santa Maria in Aquiro	1272-Buildings used as places of worship and for religious activities	Not Analysed	Not Applicabl	Building footp	994	997
2752	Polygon	12-Non-residential Buildings	Chiesa di Santa Maria della Concezione in Campo Marzio	1272-Buildings used as places of worship and for religious activities	Not Analysed	Not Applicabl	Building footp	994	997
2614	Polygon	12-Non-residential Buildings	Chiesa di Santa Lucia della Tinta	1272-Buildings used as places of worship and for religious activities	Not Analysed	Not Applicabl	Building footp	994	997



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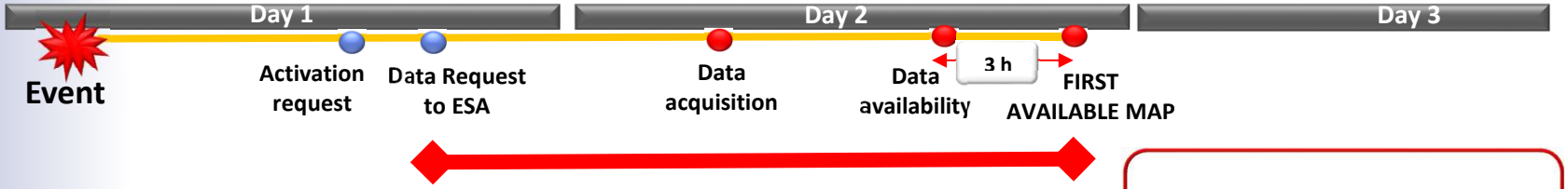
Copernicus EMS RM – Workflow

DURING AN EMERGENCY ACTIVATION



Activation Set-up

- ✓ Identification of Areas of Interest and Acquisition of satellite imagery for ***PRE*** and ***POST-EVENT analysis***
- ✓ ***Download*** of in situ data in the current Data Model → ***ETL***
- ✓ ***Check*** of **COMPLETENESS** and **CONSISTENCY** of downloaded reference data
- ✓ If necessary, the reference data are completed manually by the Production Specialists
- ✓ When the post-event is available, the affected areas are identified and the severity of damages are classified

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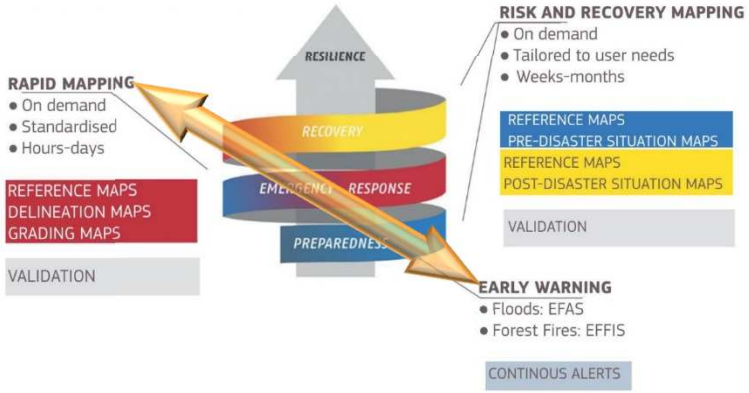
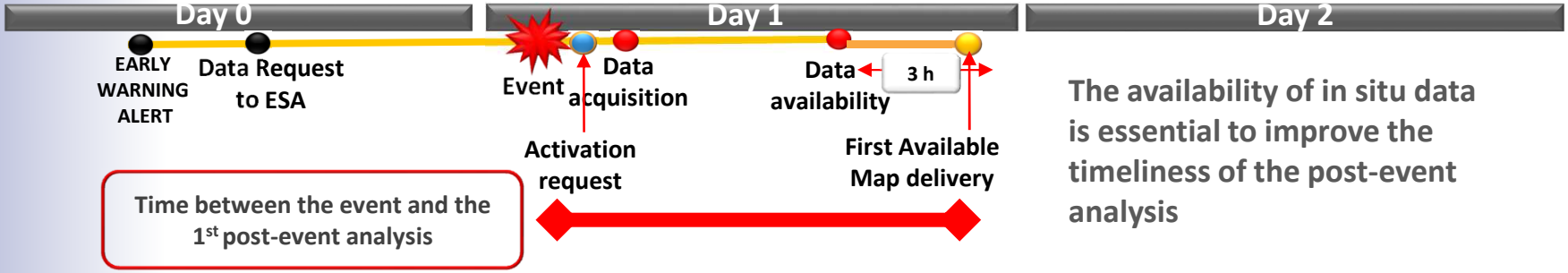
Copernicus EMS RM – Workflow 2.0

Floods and **storms** are types of disasters where **EARLY WARNING** and **TIMELY ALERT** are critical for the full success of the EMS Rapid Mapping activations



Improvement in the TIMELINESS of analysis with the connection between EARLY WARNING and RAPID MAPPING SERVICES



The availability of in situ data is essential to improve the timeliness of the post-event analysis

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Copernicus EMS RM – Workflow

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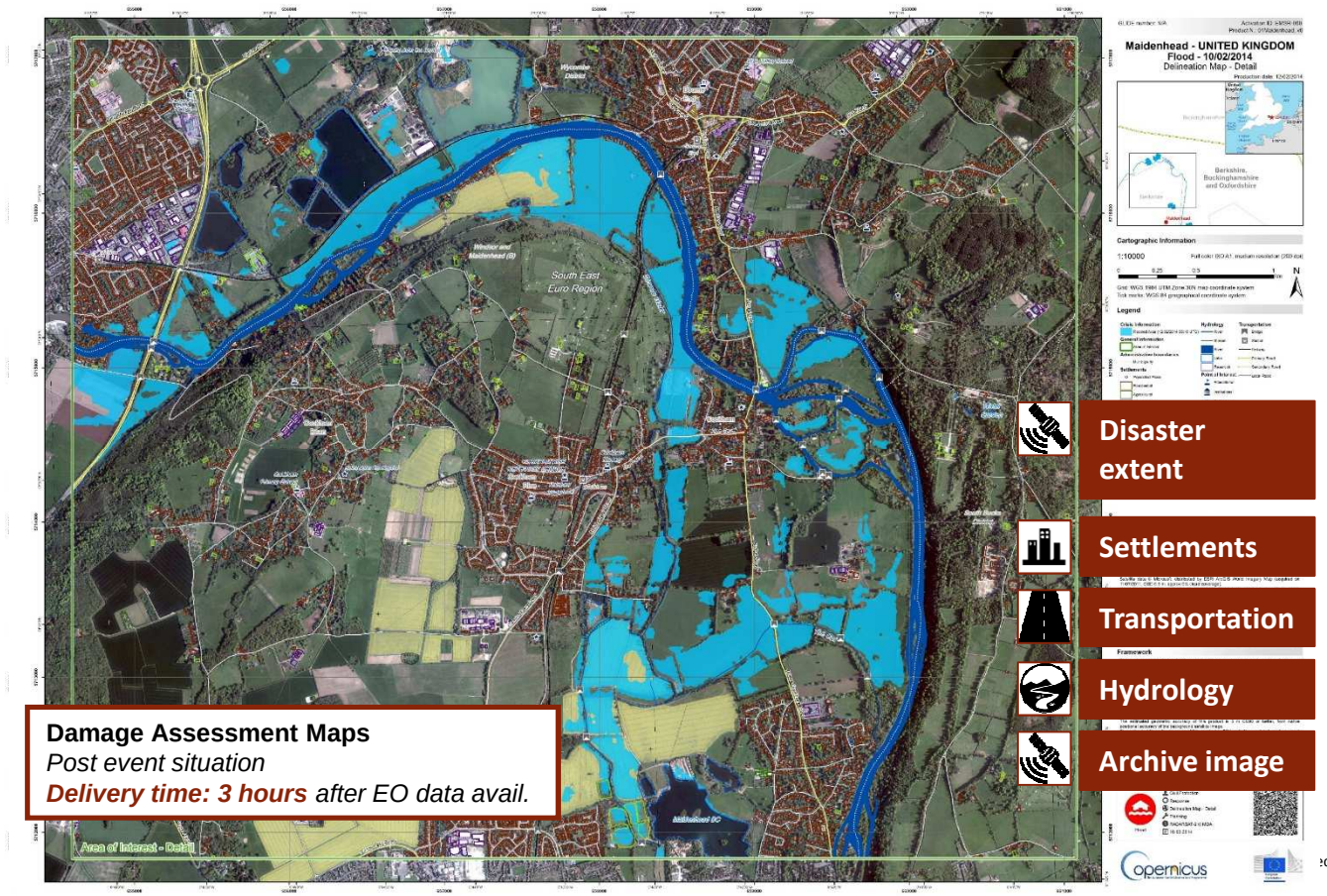

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Copernicus EMS RM – In situ data requirements

The main data source used for the map production are:

- ✓ Settlements
- ✓ Industry and Utilities
- ✓ Hydrography
- ✓ Transport infrastructure
- ✓ Elevation
- ✓ Land cover
- ✓ Population/Census
- ✓ Toponyms

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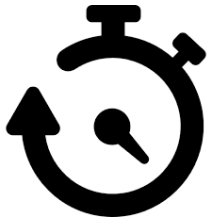
Copernicus EMS RM – Why do we need the in situ data?

The in situ data are paramount for the Service to:

1. **Reduce** the **delivery time**
2. **Increase** the **thematic and geometric accuracy of the products**
3. **Facilitate** the **integration of the data and information produced by the Service within the Users' environment**



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Copernicus EMS RM - NMCA DATASETS

High quality datasets produced by NMCAs

ISSUES → availability vs usability

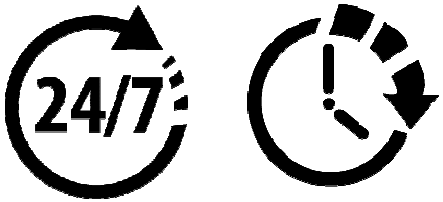
- **Special authorisation and/or human interaction** required to access them
- **Data harmonization** into Rapid Mapping service component databases

Both takes up **too much time** with respect to the RM requirements, making these valuable datasets actually **unusable**

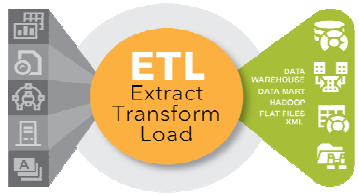
Copernicus EMS RM - NMCA DATASETS

…Yet the main CHALLENGE is

- Accessing and exploiting **NMCA datasets within emergency management timeframe:**
  - ✓ Granting streamlined and timely access to reference data is of essential importance for the effectiveness of these services, exploiting standard WEB Services and allowing interactive spatial search and query tools to easily identify the available data groups.



- The use of a **common harmonized NMCA data model at EU level** (***ELS-like solutions***):
  - ✓ To avoid the Copernicus service providers to build a time consuming task on ad-hoc ETL procedures on a country-by-country basis.



Copernicus EMS RM – Use of NMCA datasets – Case study

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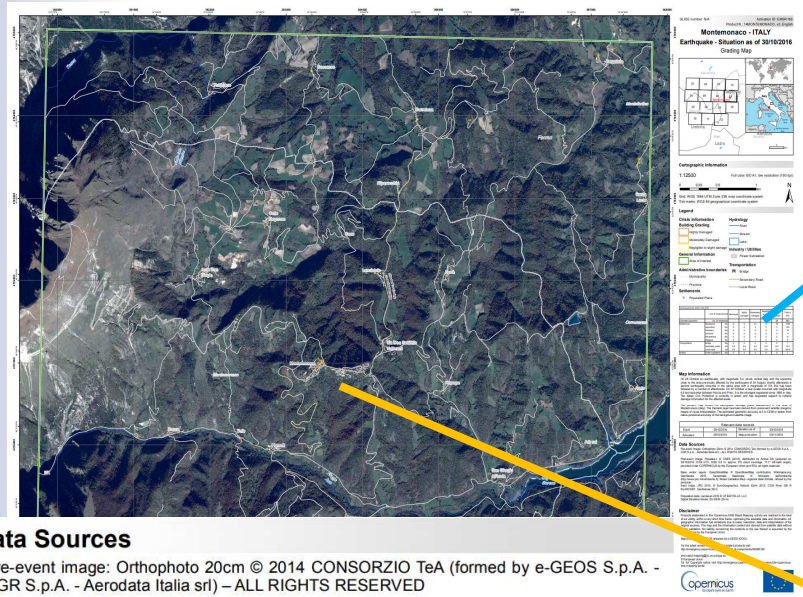
Earthquake in Central Italy



Data Sources

Pre-event image: Orthophoto 20cm © 2014 CONSORZIO TeA (formed by e-GEOS S.p.A. - CGR S.p.A. - Aerodata Italia srl) – ALL RIGHTS RESERVED

Post-event image: Pleiades-1 © CNES (2016), distributed by Airbus DS (acquired on 30/10/2016 10:00 UTC, GSD 0.5 m, approx. 0% cloud coverage, 17.7° off-nadir angle), provided under COPERNICUS by the European Union and ESA, all rights reserved.

Base vector layers: OpenStreetMap © OpenStreetMap contributors, Wikimapia.org, GeoNames 2015, Geoportale Nazionale © Ministero dell'Ambiente (http://www.pcn.minambiente.it), Italian Cadastral Map - Agenzia delle Entrate, refined by the producer.
Inset maps: JRC 2013, © EuroGeographics, Natural Earth 2012, CCM River DB © EUJRC2007, GeoNames 2013.

Population data: Landscan 2010 © UT BATTELLE, LLC
Digital Elevation Model: EU-DEM (25 m)

RASTER PACKAGE

Consequences within the AOI								
	Unit of measurement		Destroyed	Highly damaged	Moderately damaged	Negligible to slight damage	Total affected	Total in AOI
Estimated population	No. of inhabitants						28	863
Settlements	Residential	No.	0	8	27	4	39	1198
	Agriculture	No.	0	0	3	0	3	133
	Cemetery	No.	0	0	0	0	0	16
	Industrial	No.	0	0	0	0	0	11
	Recreational	No.	0	0	0	0	0	41
	Religious	No.	0	2	1	0	3	8
Transportation	Bridge	No.	0	0	0	0	0	1
	Secondary roads	km	0.0	0.0	0.0	0.0	0.0	13.2
	Local roads	km	0.0	0.0	0.0	0.0	0.0	160.0
Utilities	Power substation	No.	0	0	0	0	0	1

VECTOR PACKAGE

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Copernicus EMS RM – Use of NMCA datasets - Case Study

The intervention of *the Italian Cadastre* in the Copernicus project for the earthquake emergency in Central Italy

Settlement → Inspire theme: Buildings **(BU - Annex 3)**

+ Level of detail

- ✓ Very good geometric accuracy and completeness

+ The Cadastral layer easily used by the end user

- ✓ Civil protection
- ✓ Firefighters

- Availibility Time

- ✓ Some maps in the same activation were delivered before the NMCA data availability

- Thematic and attributes information

- ✓ Data Harmonization issue with the RM data model
- ✓ National language, field, domain and values interpretation issues

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Copernicus EMS RM - Challenges and opportunities

CORDA Copernicus Reference Data Access

The **EEA** is working to make **NMCAs data** available via CORDA.
A **single entry point node** to the relevant national and regional geospatial **in situ data**:

- ✓ **Single login solution**
- ✓ **Spatial search of datasets**
- ✓ **Complete catalogue of datasets by data provider**
- ✓ **Continuously updated portal and communications**

- ✓ **Not harmonized data model**
- ✓ **Some area not covered by proper services (WFS, download)**
- ✓ **Data download timeliness not compliant with the CEMS-RM time constraint**

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Copernicus EMS RM - Challenges and opportunities

Does the **ELS solution** fit **the CEMS Rapid Mapping requirements** in terms of **access** and **common data model** to the NMCA in-situ datasets?

Test Phase evaluating the following functionalities:

ELS download services access timeliness and technical constraints

- Standard Web Services (24/7/365 availability).
- Interactive spatial search and query tools.

Data model

- Information and metadata about the adopted data model.
- The completeness of the thematic information within a common and harmonized NMCA data model.

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