Emergency Management

# A look into the future of the Copernicus Emergency Management Service

Copernicus
Europe's eyes on Earth

European Commission

## OPERATIONS

- CEMS operational activity since 2012 – **10 year anniversary in 2022**!

- Managed by the Joint Research Center of the European Commission

## PURPOSE AND IMPACT

- Supports all actors involved in the management of natural or manmade disasters and in particular the EU's Emergency Response & Coordination Centre (ERCC)

- Addresses all phases of the disaster management cycle from preparedness, response to recovery and prevention

  - Preparedness: forecasts
  - Response: rapid maps and monitoring of events
  - Recovery & prevention: risk assessment for specific hazards and post-disaster recovery maps

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April 2012 – On-demand Mapping

October 2012 – EW&M: EFAS

2015 – EW&M: EFFIS

2017 – EW&M: EDO/GDO

2018 – EW&M: GloFAS
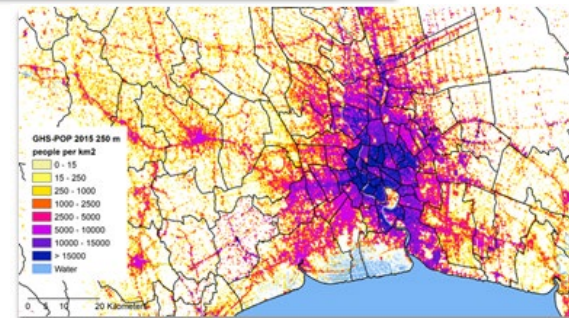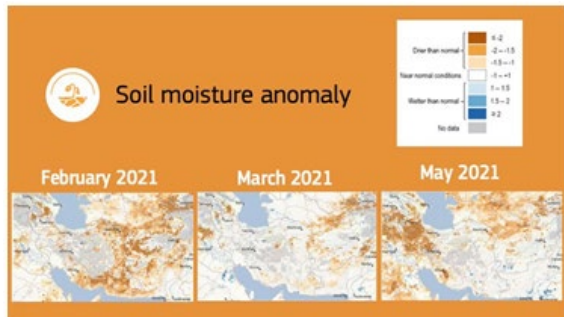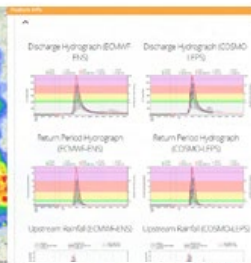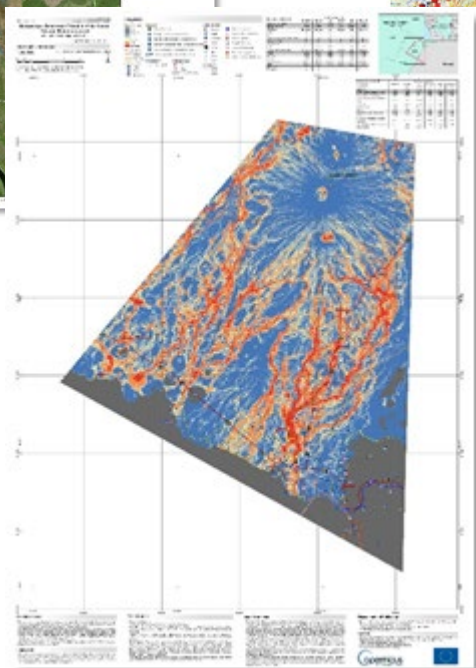
2022 – Exposure Mapping: GHSL

Emergency Response

Preparedness

Recovery

Emergency Management

# THE COPERNICUS EMERGENCY MANAGEMENT SERVICE

**On-demand mapping**
- Rapid Mapping
- Risk & Recovery Mapping

**Early warning and monitoring**
- Floods
- Fires
- Droughts

**Exposure Mapping**
- Population
- Built-up areas

New!

**CEMS evolution is based on several actions:**

I.   Collection of **user feedback** (standard/continuous and tailored)

II.  CEMS components **internal innovation and research** (JRC and Validation) then expressed in new call for tenders

III. Close interation **between CEMS components** (e.g. pretasking RM-VAL-EFAS, risk modeling RRM-VAL-EFFIS)

IV.  Close interaction with **Copernicus Services** to maximise synergies (e.g. C3S, Land, Security, CMEMS, CAMS, In-Situ)

V.   **International collaboration:** GEO, CEOS, UN agencies and programmes (FAO, WMO, World Bank, WFP), Space agencies,  IWG-SEM and the International Charter Space and Major Disasters

VI.  Establishing close links to **relevant research programs** at European and national level (**H2020** - e.g. G3P, ECFAS, WaterforCE, **Horizon Europe)**

**Emergency Management**

**Exposure information is fundamental for disaster risk and crisis management**:

- Users need impact information

- All CEMS components are using population and/or built-up area information already

- Global, harmonised and regularly updated information is required to complement national datasets

**New CEMS component:**

Exposure Mapping — Population — Built-up areas

Information on population and settlements is relevant for many other application domains, international frameworks and other Copernicus services:

UN World Conference on Disaster Risk Reduction 2015 Sendai Japan

SUSTAINABLE DEVELOPMENT GOALS

TOGETHER TOWARDS HABITAT III

11 SUSTAINABLE CITIES AND COMMUNITIES

PARIS2015 UN CLIMATE CHANGE CONFERENCE COP21·CMP11

The European Green Deal

Land Monitoring
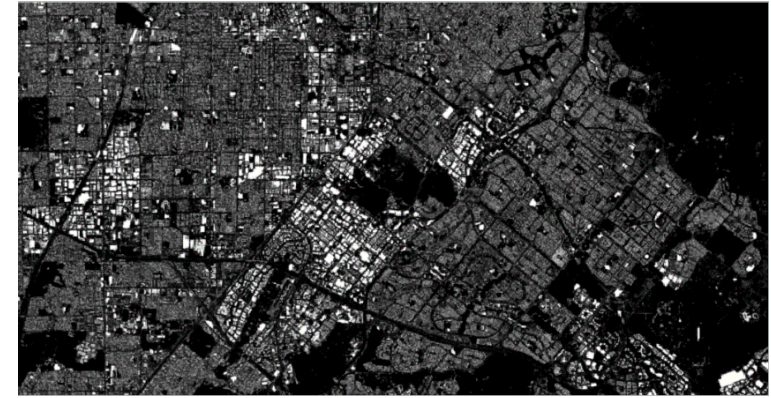
Climate Change

Security

Emergency Management

Exposure Mapping

Population

Built-up areas



- Based on the Global Human Settlement Layer concept & methodology developed by the JRC

- Time frame 1975-2015

- Update until 2020 in preparation

Exposure Mapping in CEMS:

- Input:
  – Sentinel-2 (and Sentinel-1)
  – Population census data

- Output:
  – Built-up area grids at 10 m resolution
  – Population density grids at 100 m resolution



**More details: Friday in session D2.01.2 Resilient cities**
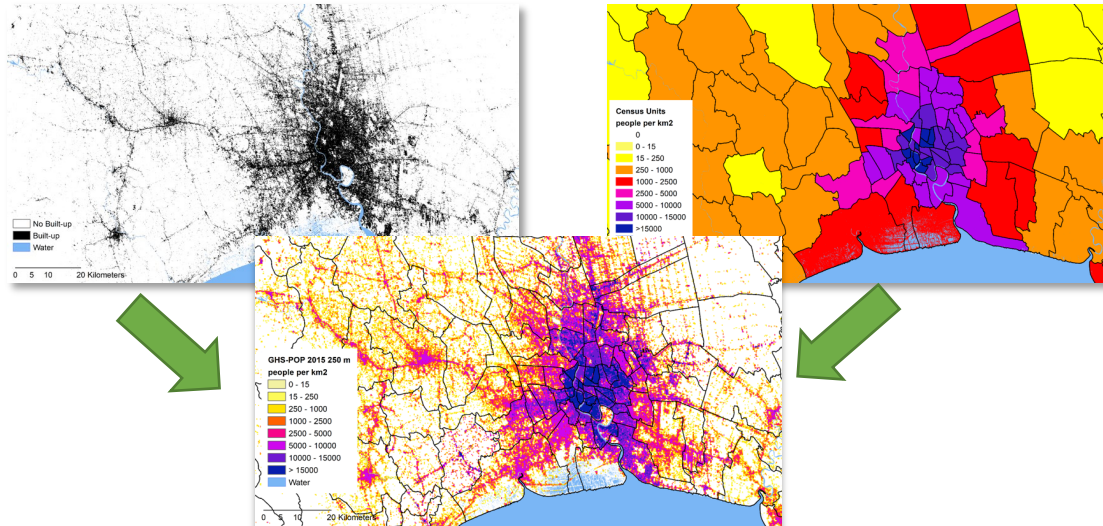
**Summary of future framework contract content**

LOT 1 : image supply through mapping drones

- TASK 1 : Network creation and network maintenance of authorized drone operators for 'specific category '  as explained and detailed in the commission regulation 2019/947 and 2019/945.

- TASK 2/3  : flight preparation, flight, image elaboration and dissemination

    - Max AOI per day 20 km2

    - Focus is on 5 cm orthorectified imagery and point cloud generation

    - Quick data transfer using cloud technology


LOT 2 : image supply though airplanes

- Using large format or push broom digital aerial sensors

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**Emergency Management**

- Joint initiative between GEO, NASA and JRC
- Not yet fully operational in CEMS but integration ongoing
- provide a comprehensive view and evaluation of fire regimes and fire effects at global level
- provide tools to support operational wildfire management from national to global scales.
- Complements national fire information systems through the provision of **harmonised data, methods and standards**
- **Users**: EC DGs and Services, EP, national/regional forest fire and civil protection services, FAO, UNECE, UNISDR

## Main outputs

### ➤ Fire danger forecast

  ➤ Fire danger forecast up to 10 days in advance on the bases of the Canadian Fire Weather Index (FWI)

➤ **Active fire detection (MODIS, VIIRS)**

➤ **Near real time burnt areas (MODIS, VIIRS)**

➤ **Country profiles (fire regimes)**

http://gwis.jrc.ec.europa.eu

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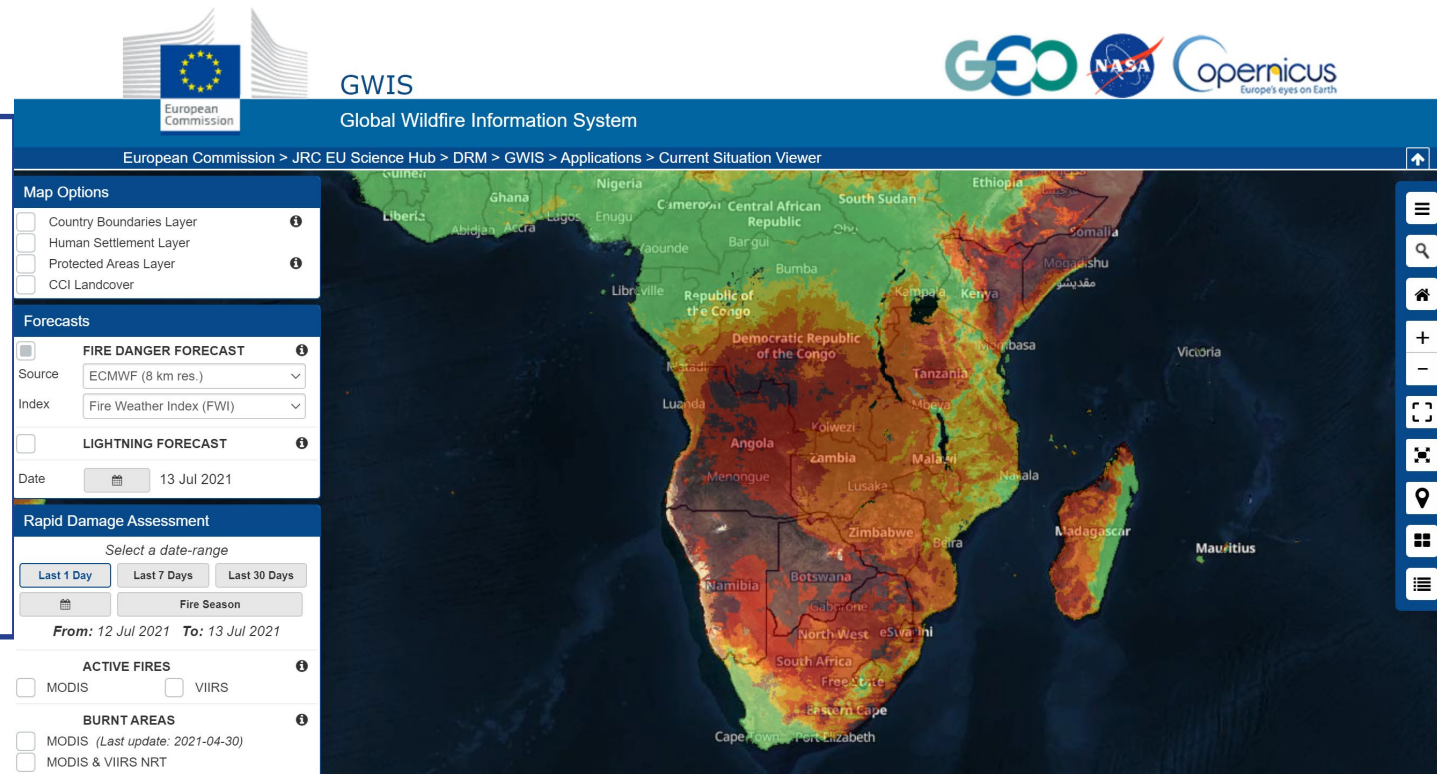
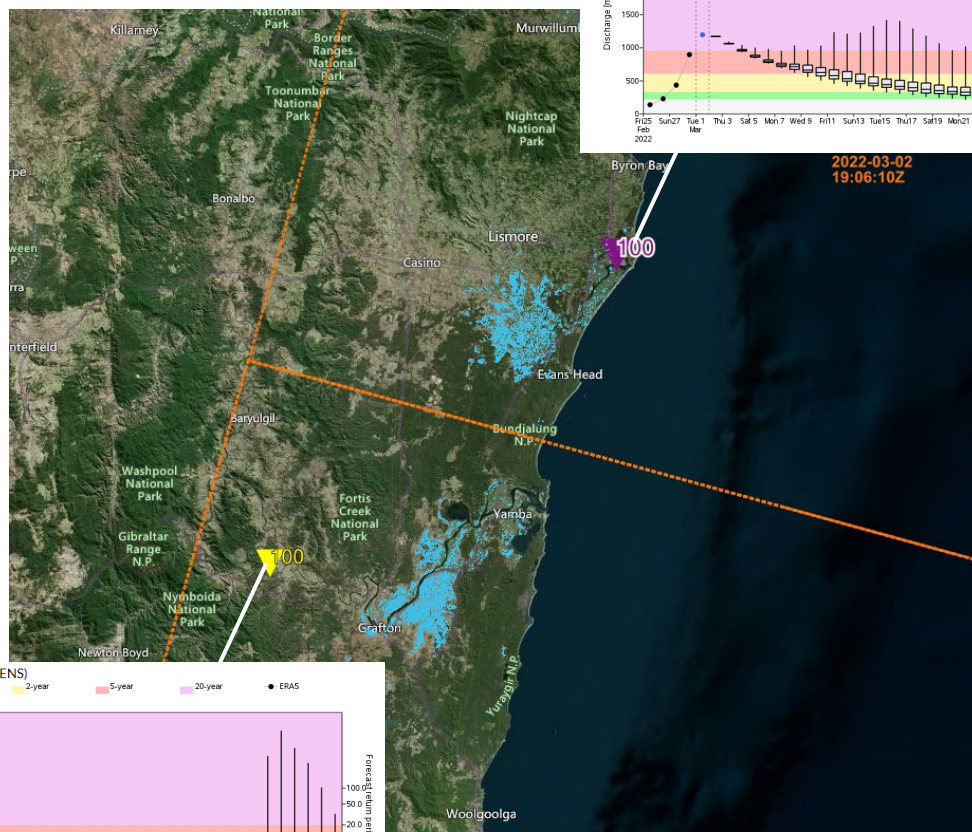**Global Flood Monitoring - User requirements:**

- **Timeliness**: better response planning

- **Frequent updates/continuous monitoring**: adapt measures depending on the evolution of the flood

- **Resolution**: needs to be adequate for impact assessment

- **Historic data**: improved prevention planning

- **Access**: as diverse as possible to account for all user needs

Discharge Hydrograph (ECMWF-ENS)

2022-03-02 19:06:10Z

<u>Sentinel-1 based:</u>

- SAR enables **all day and all weather** flood monitoring

- High **spatial resolution of 20 m**

- High **revisit frequency**: Europe **~ 1 – 3 days** World **~ 3 – 14 days** (to be further increased with Sentinel-1 C)
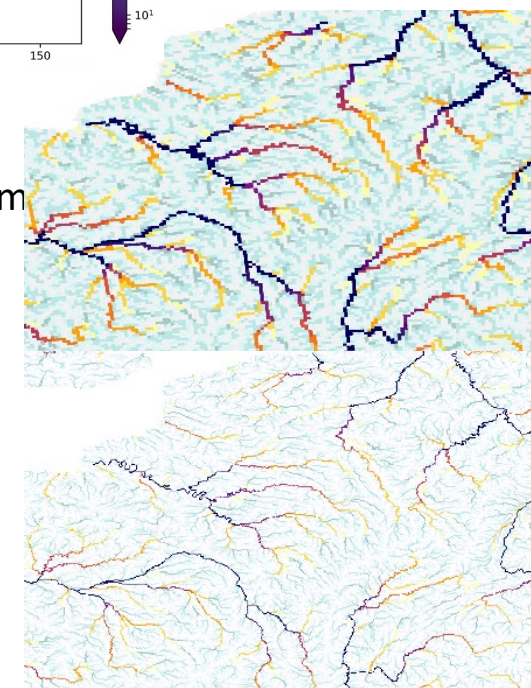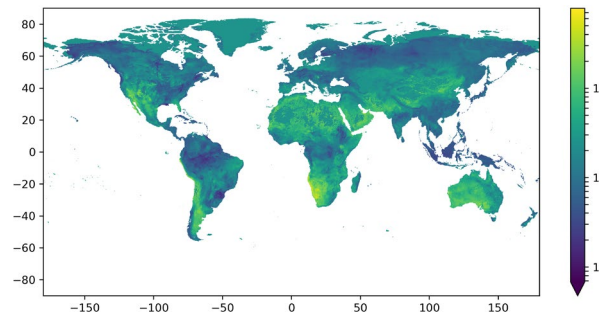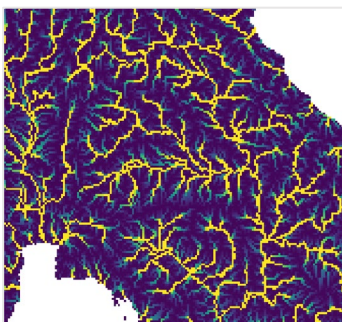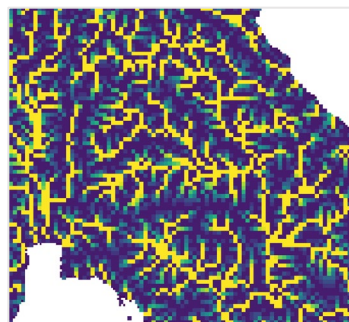
<u>Automatic:</u>

- **High timeliness** of the product – **less than 8 hours** between sensing and product delivery

- **Continuous monitoring** for large areas

Discharge Hydrograph (ECMWF-ENS)

*For more details see also presentation in session D2.07.1*

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- EFAS: 1 arcmin (~1.8 x 1.8 km pixel size) before 5 x 5km
- GloFAS: 3 arcmin (~5.4 x 5.4 km pixel size) before 10.8 x 10.8 km
- More accurate representation of river network.
- More accurate representation of the spatial variability of catchments' morphological, land cover, and soil properties.
- OS LISFLOOD upgrades incl. comp. performance
- New model calibration

Major impact on forecast skill!

*For more details see also presentation in session A7.03.1*

www.efas.eu

# Ongoing and planned development

- *Responsive web-mapping tool*
- *Integration of different data sources*
- *Enhancement of the seasonal prediction component*
- *Drought tracking*
- *AI-enhancement of the service*
- *Near-real-time attribution*



AI-enhanced Climate Services

**Find out more:**

https://emergency.copernicus.eu/

Thank you!