Copernicus
EMS in support of crisis preparedness and response operations

Copernicus Emergency Management Service
C op e r n i c u s  E M S - c o m p o n e n t s

Mapping

RAPID MAPPING
- On demand
- Standardised
  Hours-days

REFERENCE MAPS
DELINEATION MAPS
GRADING MAPS
VALIDATION

EARLY WARNING
- Floods: EFAS
- Forest Fires: EFFIS
CONTINOUS ALERTS

RISK AND RECOVERY MAPPING
- On demand
- Tailored to user needs
- Weeks-months

REFERENCE MAPS
PRE-DISASTER SITUATION MAPS
REFERENCE MAPS
POST-DISASTER SITUATION MAPS
VALIDATION

Emergency Management
What are the Emergency Management Services?

COPERNICUS
Emergency Management Service

Copernicus Emergency Management Service (Copernicus EMS) 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. Three modules constitute the Copernicus EMS:

Copernicus EMS - Mapping
The Copernicus EMS - Mapping addresses, with extensive coverage, a wide range of emergency situations from natural or man-made disasters. Satellite data is used as the main datasource. The service provides information for particular:
- Floods
- Tsunamis
- Earthquakes
- Landslides
- Fires
- Severe Storms
- Volcanic eruptions
- Technological disasters
- Humanitarian crises

European Flood Awareness System
The European Flood Awareness System (EFAS) continuously provides hazard assessments up to 10 days in advance.

European Forest Fire Information System
The European Forest Fire Information System (EFFIS) provides detailed information on wildfire risk, current situation and related synergies. News on wildland fires in Europe is updated daily by the EFFIS team.

emergency.copernicus.eu
What is Copernicus EMS Mapping Services?

Rapid Mapping

On-demand and fast provision of geospatial information immediately following an emergency event

Risk and Recovery Mapping

Analyses delivered within weeks or months, in support of recovery, disaster risk reduction, preparedness and prevention

- 5 years of un-discontinued H24/365 operations
- 253 RM activations and 43 RRM
- More than 40 worldwide Users organizations triggering
- Providing support in more than 50 different Countries worldwide
- More than 3000 maps delivered
**Which type of maps and when?**

**Rapid Mapping - RM**
- **Reference maps**: baseline for generating post-emergency products
- **Delineation maps (with monitoring option)** outline the extent of the area affected by the event.
- **Grading maps**: assessment of the impact caused by the disaster.
- **Activation Extent Map**: atlas of the maps produced

**Risk and Recovery Mapping - RRM**
- **Reference maps**: comprehensive knowledge of the territory and exposed assets and population
- **Pre-disaster situation maps**: up-to-date thematic information for contingencies on areas vulnerable to hazards
- **Post-disaster situation maps**: for use beyond the immediate response phase, to assess recovery needs, long-term impact of the disaster event, progress in reconstruction efforts

**Service Level 1 (SL1)**
- Reference maps: 9 h
- Delineation and Grading maps: 12 h Service

**Service Level 5 (SL5)**
All map types typically in 5 working days

**Multilingual support**
Translation of relevant cartographic elements of the maps in official EU languages
### Typical key features

<table>
<thead>
<tr>
<th>Hydrology</th>
<th>Transport</th>
<th>Population-related (incl. Industry &amp; Utilities)</th>
<th>Land cover &amp; Physiography</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rivers</td>
<td>Railways</td>
<td>Toponyms</td>
<td>Woodland</td>
</tr>
<tr>
<td>Canals</td>
<td>Roads</td>
<td>Administrative boundaries</td>
<td>Natural vegetation</td>
</tr>
<tr>
<td>Lakes</td>
<td>Cart tracks</td>
<td></td>
<td>Cropland</td>
</tr>
<tr>
<td>Reservoirs</td>
<td>Bridges</td>
<td>Built-up areas</td>
<td>Grassland</td>
</tr>
<tr>
<td>Open Water</td>
<td>River crossing points</td>
<td>Settlements</td>
<td>Scrub</td>
</tr>
<tr>
<td>Shorelines</td>
<td>Cart tracks</td>
<td>Processing / industrial plants</td>
<td>Bare soil</td>
</tr>
<tr>
<td>Dams</td>
<td>Airfields</td>
<td>Pipelines</td>
<td>Snow/Ice</td>
</tr>
<tr>
<td>Wells</td>
<td>Runways</td>
<td>Power lines</td>
<td>Floodplains</td>
</tr>
<tr>
<td>Ponds</td>
<td>Ports</td>
<td>Power stations</td>
<td>Void areas</td>
</tr>
</tbody>
</table>

### Legend

- **Hydrology**
  - River Line
  - Lake Area
  - Reservoir
  - Dam
  - Well
  - Pond

- **Transport**
  - Railway
  - Road
  - Cart track
  - Runway
  - Airfield

- **Population-related**
  - Administrative boundaries
  - Settlements
  - Processing / industrial plants
  - Pipelines
  - Power lines
  - Power stations
  - Toponyms

- **Land cover & Physiography**
  - Woodland
  - Natural vegetation
  - Cropland
  - Grassland
  - Scrub
  - Bare soil
  - Snow/Ice
  - Floodplains
  - Void areas
  - Contours, spot heights
  - Cliffs
RRM Pre-Disaster Situation Map

- Hazard exposure
- Vulnerability and resilience of buildings or people
- Risk status for population and assets
- Evacuation plan
- Probabilistic risk assessment based on likely hazards
RM Activation Extent Map
153 RM activations

Type of disaster

- Flood, 38.2%
- Earthquake, 6.5%
- Fire, 11.6%
- Wind storm, 10.6%
- Other - landslides, 9.0%
- Other - volcano, 1.5%
- Other - humanitarian, 20.1%
- Industrial accident, 2.5%
43 RRM activations

Who triggered the EMSN activations (2012-2017)

- EC services
- NFP

EMSN activations

- Year 2012: 1
- Year 2013: 5
- Year 2014: 10
- Year 2015: 3
- Year 2016: 9
- Year 2017: 13
There are three distinct user categories:

- **Authorized Users** may trigger the service directly to the European Response Coordination Centre (ERCC)
  - National Focal Points (NFPs) in EU Member States and in countries participating in the European Civil Protection Mechanism as well as EC Services (DGs) and the Situation Room of the EEAS.

- **Associated Users** must go through the Authorized Users to trigger the service
  - local, regional and other public entities
  - International Governmental Organisations (e.g. UN agencies, World Bank), and National & International Non-Governmental Organisations
  - entities and institutions within the EEAS sphere such as EU Delegations, the INTCEN, the EU Satellite Centre

- **General Public Users** are not authorised to trigger the service, but can be informed of an activation request through the web portal
To whom shall I send my request?

ERCC@DG ECHO

Authorised User

End User@local authority

AU in Estonia is the Information Monitoring Department of the Ministry of Interior
**Emergency Management**

Will my request be accepted?

Send the SRF via mail to: 
@ ECHO-ERCC@ec.europa.eu

Followed by a phone call to: 
+32-2-29-21112

Check of the relevance: emergency situations and humanitarian crises related to natural disasters or man-made emergencies

Technical Feasibility check: to verify that satellite-based geoinfo shall meet your requirements

Sensitivity check: to decide whether specific confidentiality measures shall be applied

Capacity check: in case of multiple simultaneous activations to verify that the service can actually cover the requests

If the request is rejected, the ERCC notifies the Authorised user

ERCC sends the SRF to the Copernicus EMS Service Provider
Emergency Management

Copernicus EMS - components

Mapping

Rapid Mapping
- On demand
- Standardised
  - Hours-days

Reference Maps
- Delineation Maps
- Grading Maps

Validation

Risk and Recovery Mapping
- On demand
- Tailored to user needs
- Weeks-months

Reference Maps
- Pre-disaster situation maps
- Post-disaster situation maps

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Early Warning
- Floods: EFAS
- Forest Fires: EFFIS

Continuous Alerts
Scope of EFFIS

Harmonize the fire information exchange
EFFIS services and products are freely accessible via the EFFIS portal at http://forest.jrc.ec.europa.eu/effis/

EFFIS users include:
- EC DGs and Services,
- European Parliament,
- associated national/regional forest fire and civil protection services,
- FAO, Silva Mediterranea,
- UNECE

2016 EFFIS Network – 40 countries
1. Fire danger forecast

2. Active fire and burnt area mapping
1. Fire danger forecast

**Short and long-term fire danger forecast**

Daily maps of 1 to 10 days of forecasted fire danger level using numerical weather predictions.

**Monthly and seasonal fire weather forecast**

Temperature and rainfall anomalies expected over European and Mediterranean areas. Based on the ECMWF (European Centre for Medium-Range Weather Forecasts) monthly and Seasonal Forecasting.

<table>
<thead>
<tr>
<th>Fire Danger Classes</th>
<th>FWI ranges (upper bound excluded)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very low</td>
<td>&lt; 5.2</td>
</tr>
<tr>
<td>Low</td>
<td>5.2 - 11.2</td>
</tr>
<tr>
<td>Moderate</td>
<td>11.2 - 21.3</td>
</tr>
<tr>
<td>High</td>
<td>21.3 - 38.0</td>
</tr>
<tr>
<td>Very high</td>
<td>38.0 - 50.0</td>
</tr>
<tr>
<td>Extreme</td>
<td>&gt;= 50.0</td>
</tr>
</tbody>
</table>

- 6 classes (very low, low, medium, high, very high and extreme)
- Spatial resolution of about 16 km (ECMWF data), 10 km (MF data) and 36 km (DWD data)
- Harmonized picture of the spatial distribution of fire danger level throughout EU
2. Active fire and burnt area mapping

- Firenews, items selected from a large set of RSS feeds published by various forest fires related sites
- Active fire mapping (MODIS/VIIRS/Sentinel2&3)
- Medium spatial resolution (~ 300 m) Near-real time mapping of burnt areas (twice a day in pan-European region) (MODIS/VIIRS/Sentinel3)
- High spatial resolution (~10-30 m) weekly (or bi-weekly) mapping of burnt areas (e.g. Sentinel2, Landsat8, SPOT)
Fire severity: based on the Relative Difference Normalized Burn Ratio (Miller et al. 2009)

Under development:
- Post-fire vegetation regeneration to assess the vegetation recovery in a time series of images
- Post-fire soil erosion risk to assess the potential soil loss
How can I access EFFIS?

• The EFFIS landing page provides fire danger forecast and active fire and burnt area mapping in a freely accessible Web-GIS at: http://forest.jrc.ec.europa.eu/effis/
• WMS are available at http://forest.jrc.ec.europa.eu/effis/applications/data-and-services/, serving Hot Spot, Burnt Area Points, Burnt Area Perimeters (24 hours, 7 days, 30 days, entire season)
• Get additional support by filling in the data request form for any request of data which is not available through the EFFIS web services (e.g. historic data, extracts of the fire database, or raw burned area perimeters) can be asked.
Emergency Management

Copernicus EMS - components

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Early Warning
- Floods: EFAS
- Forest Fires: EFFIS

Continuous Alerts

EFAS
EFAS: support to decision making

• Early flood warning aims to draw attention to an upcoming event so a country can make proper preparations:
  – Equipment
  – Put team and responsible officers on standby
  – Consult local information regularly (MetService, observations, ...)

• At the EU level EFAS provides a congregated picture on a larger scale
Emergency Management

**EFAS portal services**

Information on current and past floods situation: active information on alert areas, flood forecasting, flood probability and real time hydrographs.

**Hydrological layers (0/6)**
Maps of the individual forecasts based on different meteorological inputs such as the ensemble for ECMWF and the COSMO consortium and the deterministic forecast from the German Weather office and the ECMWF.

**Flash flood layers (0/2)**
Flash flood warnings are generated using the methodology of the Enhanced Runoff Index based on Climatology.

**Init. Conditions layers (0/1)**
Maps such as the simulated soil moisture or snow water equivalent and associated anomalies, which are important background information when analysing flood forecast.

**Meteorological layers (0/6)**
Accumulated rainfall and EFAS forecast consisting in: deterministic medium-range forecasts:
- global model from DWD (German Weather office) and ECMWF
- ensemble forecast for flood warning times beyond 48 hours, from ECMWF and Consortium for Small-scale Modeling (COSMO).
Access to EFAS

How can I access EFAS?

EFAS real time forecasts are not publicly available in order to safeguard the one voice principle. To access those you have to be an EFAS partner. Archived EFAS forecasts (older than 1 month) however are freely available under www.efas.eu.

How can I become EFAS partner?

You should be a national, regional or local authority having a role in flood risk management or legally obliged to provide flood forecasting services (e.g. national hydro-meteorological services). In that case contact the EFAS team via info@efas.eu.

I am a partner of EFAS and I want to access real time forecast...

Once you have signed a condition of access (CoA), you automatically get free of charge, password protected, web access to real time services and products through the EFAS Information System (EFAS-IS): www.efas.eu.

Currently 62 national/regional authorities are EFAS partners.
1. Probabilistic flood forecasts

Main characteristics:

- for whole of Europe
- 10 day lead time
- 5*5km resolution
- twice a day updated
2. Meteorological forecasts

- **Deterministic forecasts**
  - DWD (ICON & ICON-EU) – global model, 7 forecast days (~ 6.5 km, day 1-3 – ~ 13 km, day 4-7)
  - ECMWF – global model, 10 forecast days, ~ 9 km

- **Ensemble forecasts**
  - ECMWF VAREPS – global model, 51 members, 10 forecast days, ~18 km
  - COSMO-LEPS – Europe, 16 members, 5 forecast days, ~ 7 km
3. Flash flood forecasting, ERIC indicator

Main characteristics:

• Based on forecast accumulated upstream precipitation for durations up to 24 hours (no hydrological simulation)

• Accounts for soil moisture status, geomorphology and land-use through a soil moisture - runoff coefficient relation

• COSMO-LEPS forecasts

• River network at 1 km resolution

• for catchments between 25-2000km²

• Probabilistic return period shown for lead time range 12-120 hours

3. Flash flood nowcasting, ERICHA (European Radar Nowcasting)

Main characteristics:
- Integrating OPERA radar data into EFAS
- Near real time monitoring of radar based precipitation plus nowcasting
- Flash flood hazard indicator based on the radar data precipitation

4. Rapid flood hazard assessment

Main characteristics:

- Done twice a day, based on EFAS probabilistic flood forecast
- Provides a flood hazard assessment on the fly for areas likely to be impacted by flooding within the forecasting period
  - Affected population
  - Affected roads
  - Potential monetary damages, etc
- Uses pan European exposure datasets

<table>
<thead>
<tr>
<th>Impact</th>
<th>HIGH</th>
<th>MEDIUM</th>
<th>LOW</th>
</tr>
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<tbody>
<tr>
<td>&gt;10k</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1k-10k</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>&lt;1k</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>&lt;48hours</th>
<th>2-6 days</th>
<th>&gt;6 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;10k</td>
<td>0</td>
<td>0</td>
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<td>&lt;1k</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
5. Seasonal outlook

Provides a seasonal outlook:

- At sub-river basin scale
- For next 8 weeks
- Used as very early indicator for low, normal or high flows
Main characteristics:

• Done for flood prone areas
• Based on simulations with 2D hydrodynamic model LISFLOOD-FP
• Spatial resolution of 100 m

6. Event-based flood inundation mapping

Pre-tasking of satellite images

EFAS flood summary layer – 30.03.2015

EMS Rapid Mapping activation – 31.03.2015

Reporting point high: forecasted probability of exceeding EFAS high threshold is more than 10%
EMC - Emergency Management Contacts

Visit emergency.copernicus.eu

Get support support@copernicus.eu

Get access to EMS mapping echo-ercc@ec.europa.eu

Get access to EMS EW www.efas.eu

http://forest.jrc.ec.europa.eu/effis/