Emergency Management Service

Support to Disaster Management from Space

Emergency Management

P. Salamon & many more

European Commission Joint Research Centre

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Emergency Management

Service Overview

- Operational since April 2012
- Addresses natural and man-made disasters **globally**
- Provides EO, model & in-situ based disaster management information
- Supports all phases of the disaster management cycle:
  - Warnings & risk assessments
  - Information on the impact of natural and man-made disasters
- Complementary to national efforts
- Has been developed in close collaboration with national authorities & research inst.
- Provides European wide information to the European Union's Emergency Response and Coordination Centre (ERCC)

http://emergency.copernicus.eu

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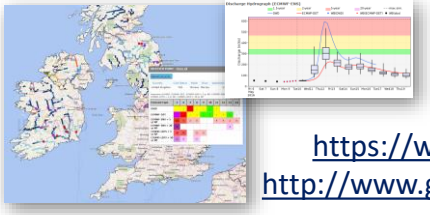
Service Overview

Flood Awareness Systems

Flood monitoring & forecasting



https://www.efas.eu/
http://www.globalfloods.eu/

Drought Observatories

NEW!

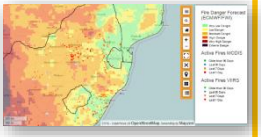
Drought monitoring & forecasting

http://edo.jrc.ec.europa.eu/
http://edo.jrc.ec.europa.eu/gdo/

Forest Fire Information Systems

Near real-time & historical information on forest fires

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



On-demand Mapping

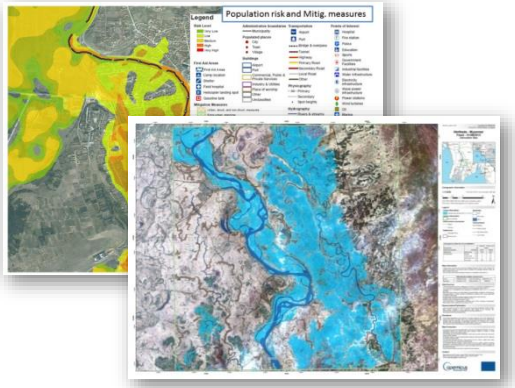
Rapid Mapping

any disaster

24/7 on-demand and fast provision of geospatial information

Risk and Recovery Mapping

On-demand GI supporting prevention, preparedness, disaster risk reduction, reconstruction, recovery



Rapid mapping

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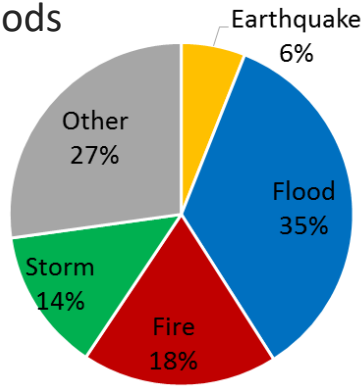
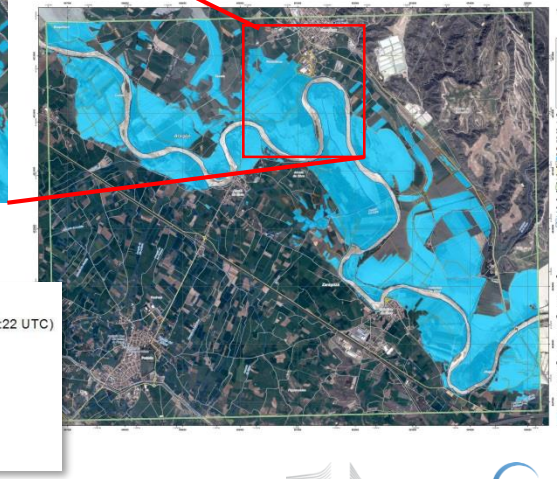
- On-demand 24/7 rapid mapping => supporting emergency response operations
- 35% of all Rapid Mapping activations are for floods (statistics since 2012)
- Rapid mapping of water extent and related damages to assets, affected population
- Analysis is mainly SAR based (weather independent but has limitations in urban & forest areas)
- Optical imagery is used to complement and in particular to assess damages to assets

287 Activations since 2012
=> 35% for floods

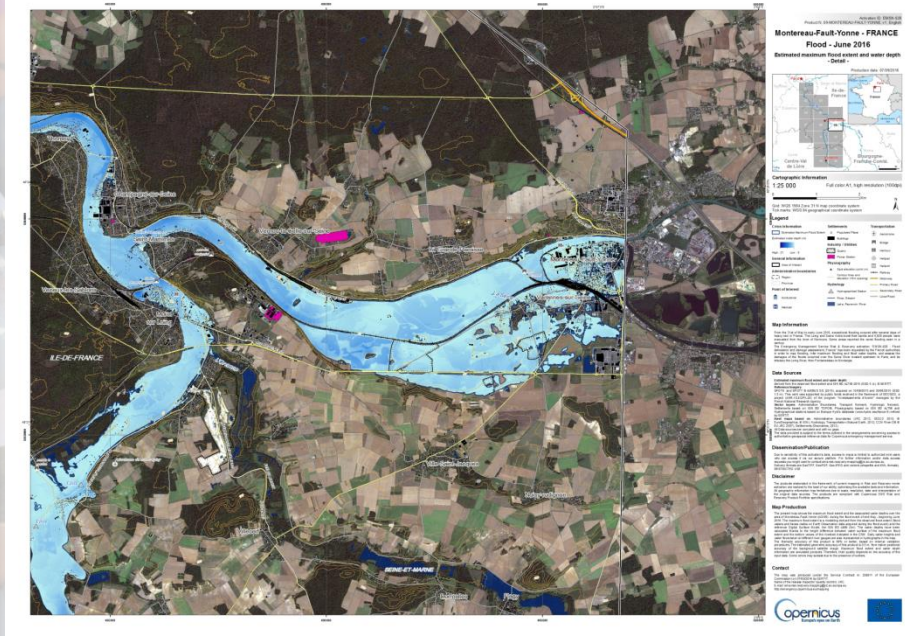


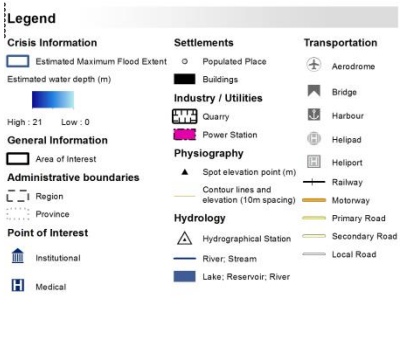


Grading map produced for Floods in Spain, April 2018 (EMSR279)

EMSN-028: Flood delineation and damage assessment, France

Maximum flood extent and water depth





Method: The maximum flood extent is derived from the observed flood extent (visible on images acquired during the flood event) and the reference Digital Surface Model (DSM), the IGN BD Alti® (5m).

The water depth is derived from the height difference between water surface of the maximum flood extent and the minimum values of the riverbed indicated by the DEM.

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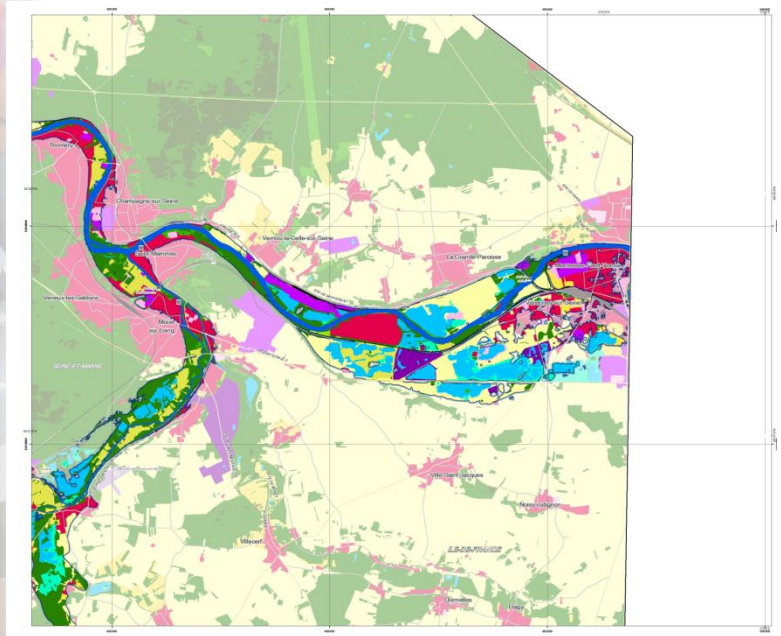
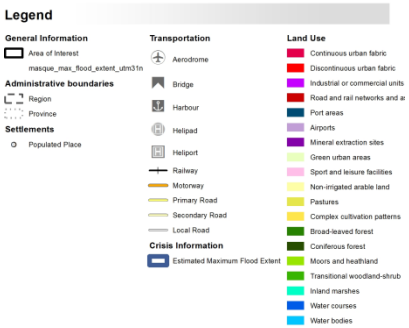
EMSN-028: Flood delineation and damage assessment, France

Impact assessment on population





Method: Cross-tabulation of the maximum flood extent and water depth layers with the refined population density data as a function of continuous/discontinuous urban fabric.

AOI09 - MONTEREAU-FAULT-YONNE		Water Depths			
		0-5m	6-10m	>10m	TOTAL
POPULATION (nb)	Continuous urban fabric	3439,9	72,3	0,0	3512,2
	Discontinuous urban fabric	0,0	0,0	0,0	0,0
	TOTAL	3439,9	72,3	0,0	

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Flood Awareness Systems

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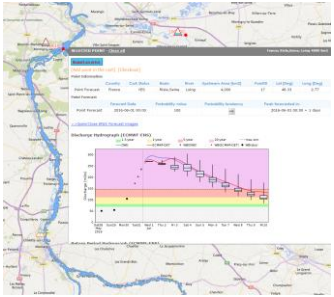
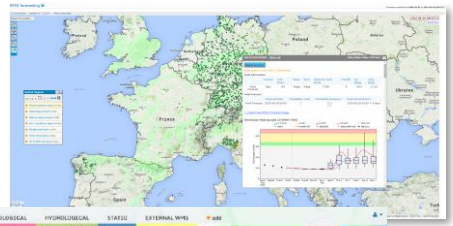
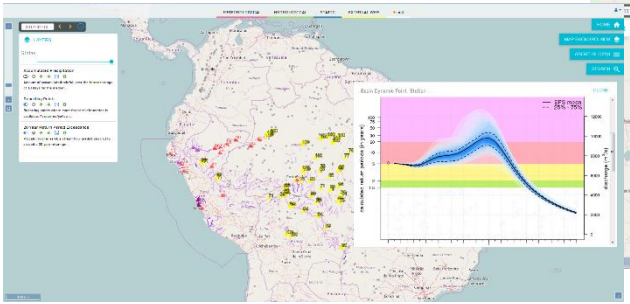
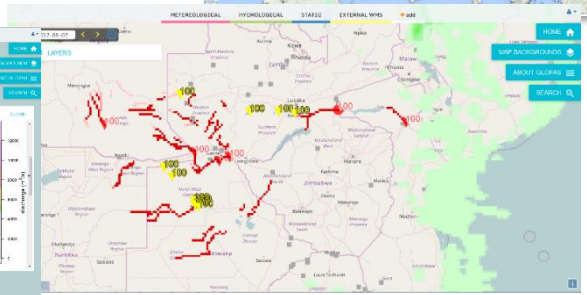
- **Aim:** to provides complementary flood forecast information to relevant stakeholders supporting flood risk management at national, regional and global level.
- Users: European civil protection, national hydro-met authorities, development agencies, international aid organizations, private sector
- **European Flood Awareness System (EFAS)**
- **Global Flood Awareness System (GloFAS)**









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GloFAS triggers pre-disaster humanitarian action in Uganda

RED CROSS/RED CRESCENT
CLIMATE CENTRE

International Federation of Red Cross and Red Crescent Societies
The Netherlands Red Cross

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'Humanitarian history' made as Uganda Red Cross launches forecast-based financing for real

15/11/2015 - by the Climate Centre

In a ground-breaking humanitarian action triggered by a scientific forecast of flood risk, the Uganda Red Cross (URC) Friday distributed just under 5,000 preparedness items to flood-prone communities in Kapelebyong sub-county, some 300 km north-east of the capital, Kampala.

The action was based on a forecast of rising water-levels in the Teso area – especially in Amemia parish.

The non-food items (NFI) were procured under 'forecast-based financing' with the support of the German government through the German Red Cross, who have established a special mini-site.

The URC mobilized the supplies as soon as a predetermined threshold of forecast risk was crossed on Thursday.

It was the first full humanitarian use of forecast-based financing, which had only been piloted.

Dysentery

"One of the disaster effects we were targeting is waterborne disease," said Irene Amuron, URC Disaster Risk Reduction Manager, who led the operation.

Local Acting Chief Administration Officer Paul Edotu had indicated that dysentery existed in the area, and the authorities were anxious to prevent it.

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Flood Awareness Systems

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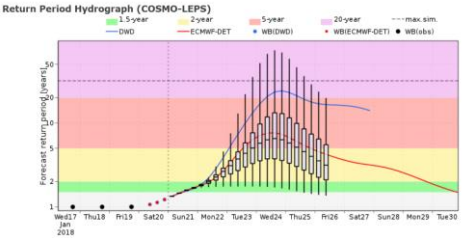
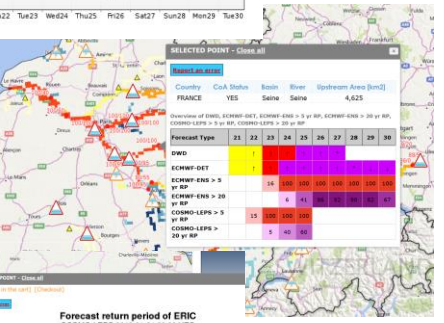
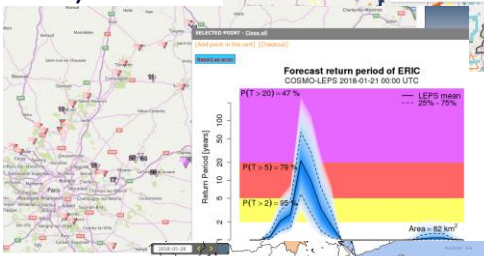
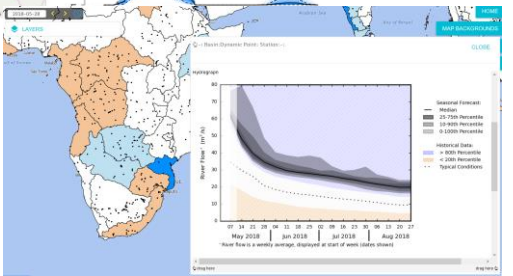
Real-time flood forecast products:

- Focus on probabilistic, medium range forecasts (ECMWF, DWD, COSMO-LEPS)
- Updated twice (Europe)/ once (Global) daily
- 6 hourly - daily time step
- Key variables: discharge, soil moisture, snow
- Return period threshold exceedances
- Hydrographs (return period & bias corrected)
- Persistence graphs
- Flood notifications
- Impact forecasts
- Flash flood products
- Soil moisture and snow anomaly
- Seasonal outlook
- Data availability: web interface, WMS, SOS, : download (Q4 2018), C3S, Climate Data Store (Q4 2018), DIAS





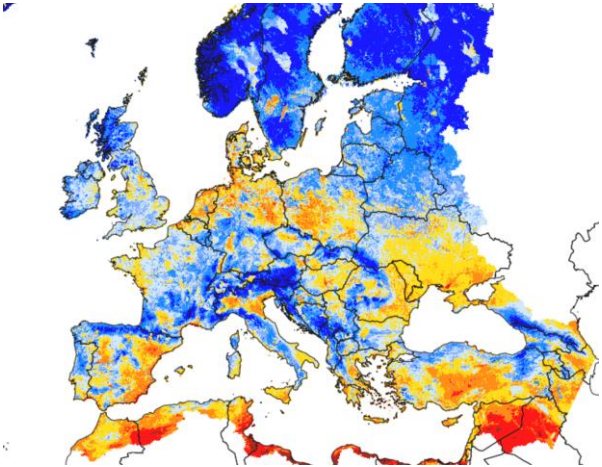


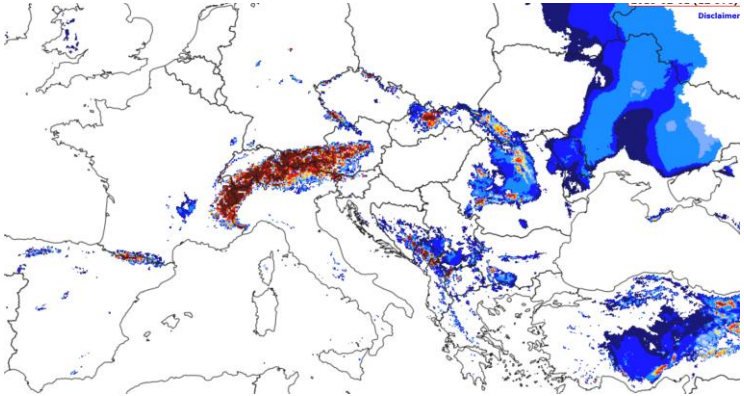


Flood Awareness Systems

Hydrological products:

- Hydrological climatology:
  - 1 Jan 1990 – recent
  - Daily time step
  - Key variables: soil moisture, river discharge, snow water equivalent
  - Key derived variables: anomalies, extreme value analysis (return period)
  - Data availability (Q4 2018): website download, C3S Climate Data Store, DIAS





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Drought Observation System (from 2018)

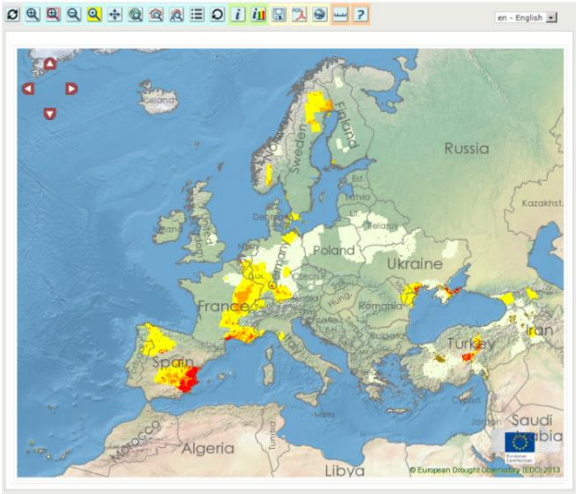
- **European & Global Drought Observatory** (EDO & GDO) – **new since 2018**
- Continuous monitoring of key drought & heat indicators
- Including assessments of drought hazard, vulnerability and risk
- combining satellite, model & in-situ data
- Serving the EU's ERCC, internat. & nat. stakeholders
- Contributing to a global drought information system and the Integrated Drought Management Programme (IDMP, global)

Impact	Level
Watch: rainfall deficit	1
	2
	3
Warning: soil moisture deficit	4
	5
	6
Alert: vegetation stress following rainfall/soil moisture deficit	7
	8
	9
	10

Increasing Dryness

Impact	Level
Partial Recovery of Vegetation: normal condition of rainfall still vegetation stress	11
	12
Full Recovery of Vegetation: normal condition of rainfall normal condition of vegetation productivity	13
	14

Increasing Recovery



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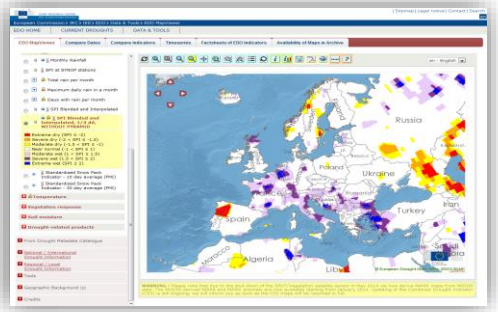
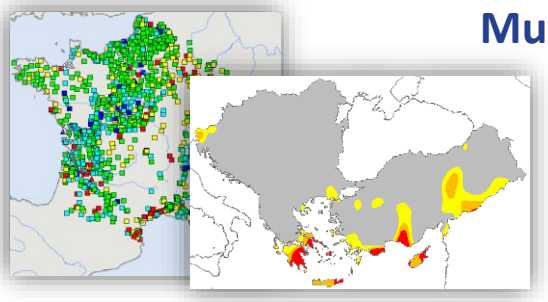
Drought Observatories



Web-based Platform

- commonly agreed products (e.g. drought indices)
- exchange of knowledge & information
- real-time monitoring and forecasting (early warning, preparedness)



Multi-scale approach, integrating

- EU / continental level
- Member State level
- Regional / River Basin level

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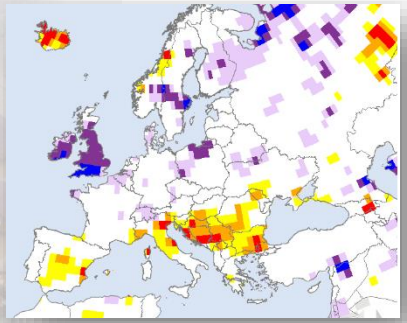
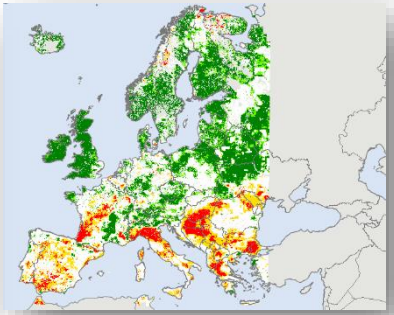
Drought Observatories

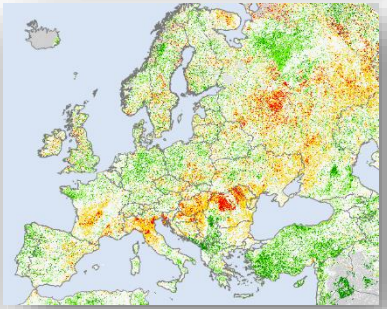
Precipitation Anomalies (SPI)



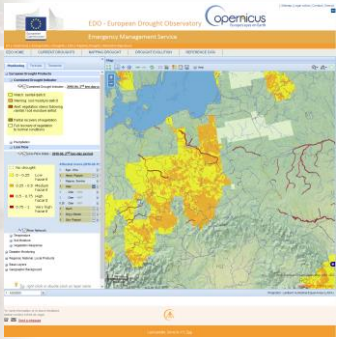
Soil Moisture Anomalies



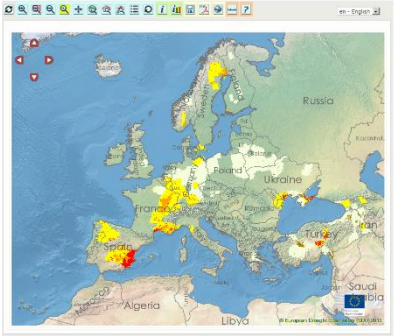
fAPAR Anomalies



Low flow indicator



Combined Drought Indicator (CDI) for agricultural/ecosystem impacts

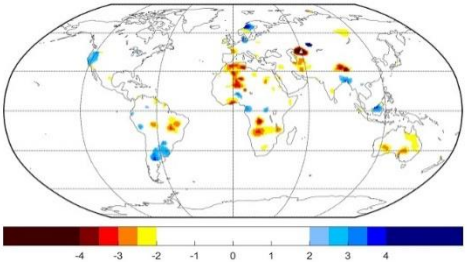


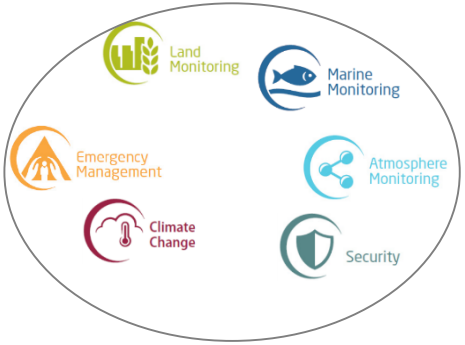
Emergency Management

Potential Evolution

- Integration of new drought indicators
- Expansion of the seasonal outlook also to the drought observatories
- Increase spatial & temporal resolution of forecast systems
- Use of gravity based indicators for flood and drought monitoring - tested already in the H2020 EGSIEM
- Automatic global scale flood monitoring
- Linking of current and future Copernicus products to EMS (snow, lake water level, etc.)
- Coastal storm surge forecasting

EGSIEM
European Gravity Service for Improved Emergency Management





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