CENTAUR Overview

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CENTAUR Project Coordinator

Funded by the European Union

https://youtu.be/2aeEfoVh8Vk?si=GPat4JzSXorNDIbc

Timeline and Phases

M1 Dec 2022 — **M16** Feb 2024 — **M23** Nov 2024 — **M36** Feb 2026

ANALYSIS OF REQUIREMENTS & USE CASE DEFINITION

THEMATIC PRODUCT ENGINEERING

SERVICE DEPLOYMENT

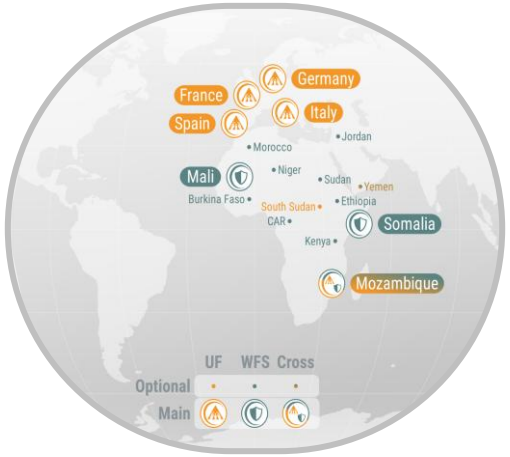
COLD PHASE

HOT PHASE

1° End-Users workshop

2° End-Users workshop

8 UCs (5 UF & 3 WFS)

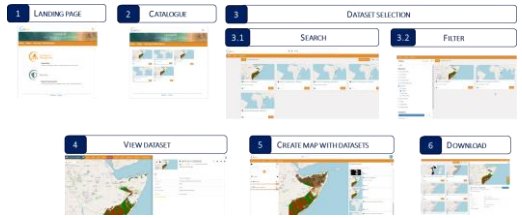


Improved production chains -> 33 Innovative indicators and 5 indexes

UF-ID		WFS-ID	Name
UF-ID-1	Static map	WFS-ID-1	Current Precipitation Deficit
UF-ID-2		WFS-ID-2	Future precipitation deficits + probability of drought events

WFS-ID	Name
WFS-ID-7	IDPs camps status indicator
WFS-ID-8	Populations at risk of food insecurity
WFS-ID-9	Populations at risk of water insecurity
WFS-ID-10	Number of people living in conflict-affected areas
WFS-ID-11	Food insecurity
WFS-ID-12	Economic insecurity
WFS-ID-13	Displaced persons
WFS-ID-14	Violent conflict
WFS-ID-15	Radicalisation and polarisation
WFS-ID-17	Humanitarian aid
WFS-ID-18	Resource capture
WFS-ID-19	Climate sensitivity of agri-food systems
WFS-ID-21	Public services and infrastructures
WFS-ID-23	State-citizen relations
WFS-ID-24	Dispute resolution mechanisms
WFS-ID-25	Social cohesion and trust

Production Environment



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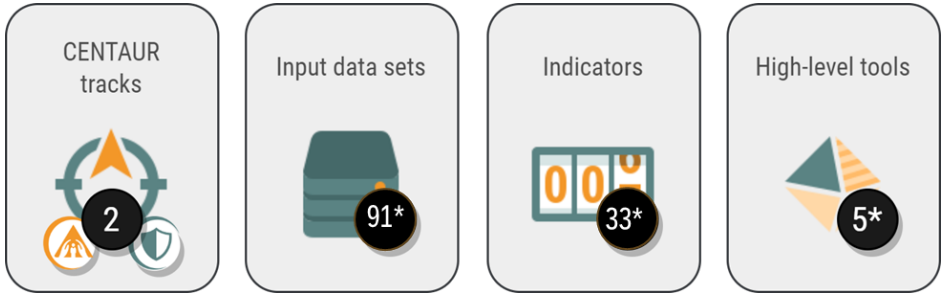
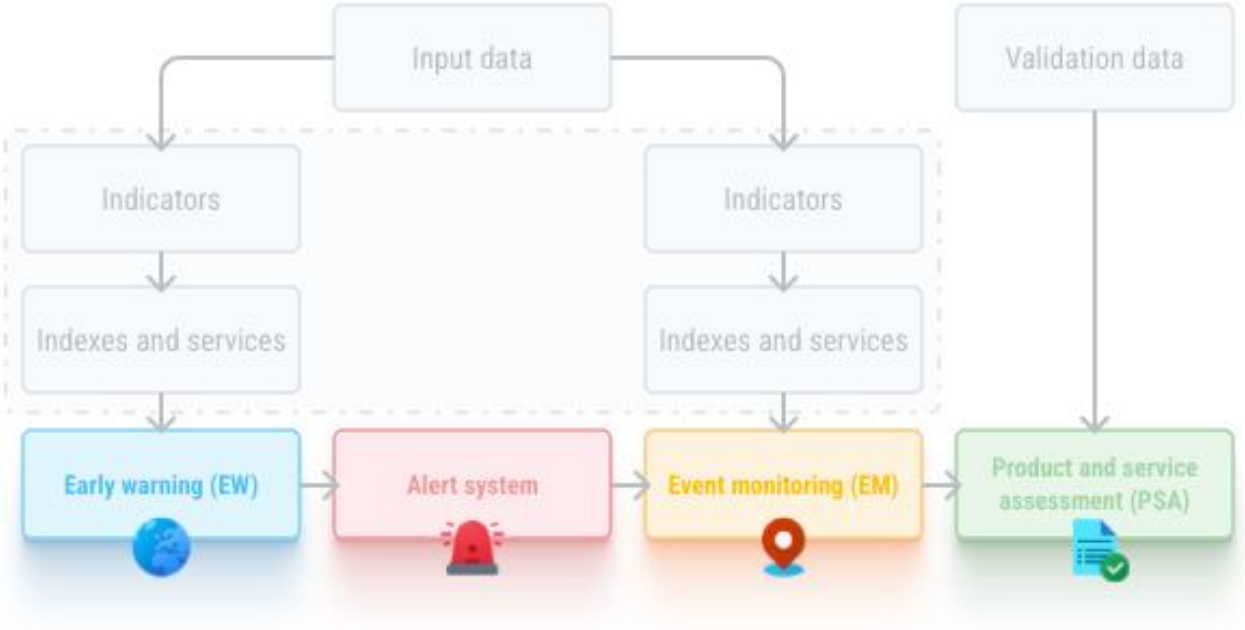
Methodological Approach





- **Dual-mode monitoring system: i)** the system runs a continuous **global monitoring to detect potentially hazardous events, alerts are triggered at pre-defined thresholds; ii)** an **event-driven monitoring** is launched at the scale of the area of interest (AOI).

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Urban Flood Indicators

11 Innovative indicators

7 indicators produced in the context of urban flood and

4 socio-economic related indicators

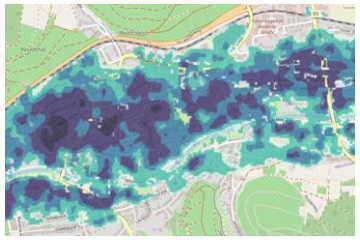
UF-ID	Name
UF-ID-1	Static map of precipitation associated to return period
UF-ID-2	Forecast of return period
UF-ID-3	High-Resolution urban flood maps for various return periods
UF-ID-4	Inferred INSAR urban flood extent
UF-ID-5	Enhanced Urban Flood Damage Assessment
UF-ID-6	Social/Traditional media indicators for Urban Flooding Map
UF-ID-7	Hazard web sources indicator
UF-ID-9	Assets and financial resources
UF-ID-10	Public services and government support
UF-ID-13	Ability to evacuate
UF-ID-14	Economic impact of floods

Urban flood conceptual model

UF-ID-1

UF-ID-2

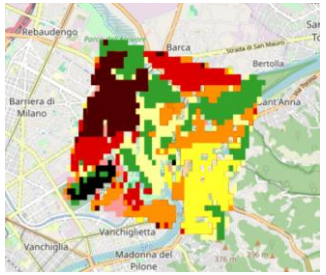
UF-ID-3



UF-ID-4

UF-ID-5

UF-ID-6



UF-ID-9/10/13

UF-ID-14

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Urban Flood – 6 Cold Use Cases

EMSR492, Jan. 2021

FRANCE

Floods in the Landes region, Sud Ouest (2021).

EMSR468, Mar. 2020

ITALY (Ceva)

Floods in Piemont, Fondazione Specchio dei Tempi (2020).

EMSR279, Apr. 2018

SPAIN

Flooding of the Ebro river in 2018; Vallés *et al.* (2023).

EMSR517, Jul. 2021

GERMANY

Floods in Bad Neuenahr-Ahrweiler, Euronews (2021).

EMSR192, Nov. 2016

ITALY (Turin)

Floods in Northern Italy in 2016, Euronews (2016).

EMSR348, Mar. 2019

MOZAMBIQUE

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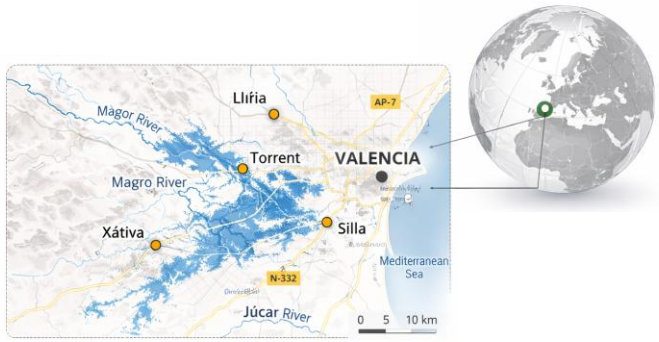
Urban Flood – Cold-Hot & Hot Cases

SPAIN

EMSR792, Mar. 2025

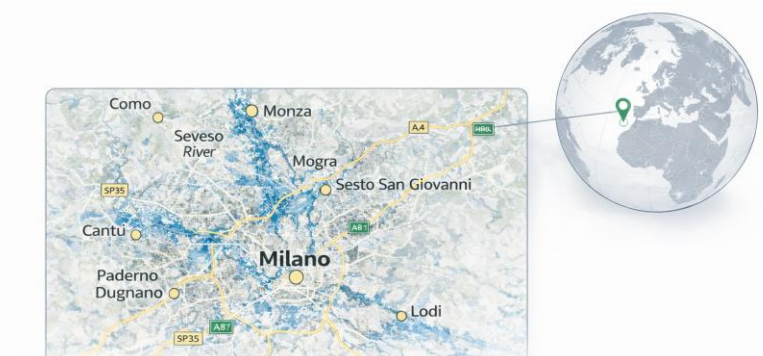


MOZAMBIQUE

EMSR793, Mar. 2025

ITALY (Milan)

EMSR843, Sept. 2025



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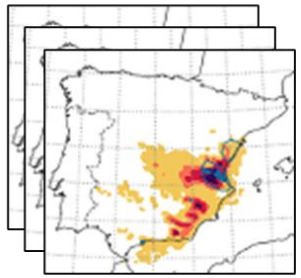
Flood Early Warning Index

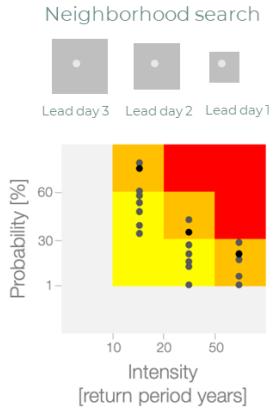
Flood Early Warning Index (FEWI)

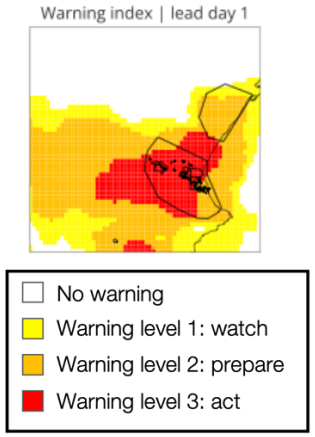
UF-ID-2
Impact-based forecasts of extreme precipitation



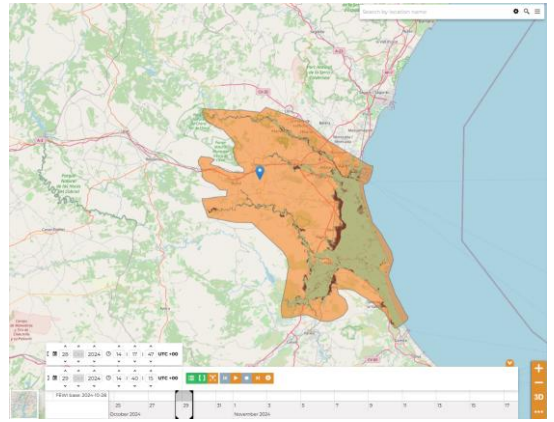
Probability of exceedance, daily precipitation

low very high





UF–ID-3
High-resolution inundation scenarios



Alert (daily, if thresholds exceeded)

Notification (after upload)

Gap between meteorological forecasts and high-resolution inundation modelling is filled.

CENTAUR 2nd Workshop – 25 February 2026

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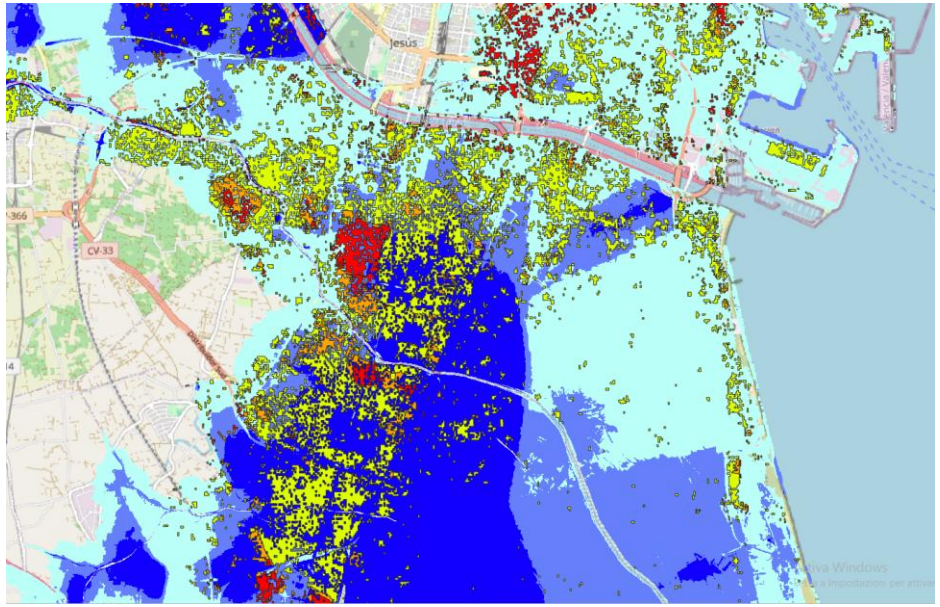
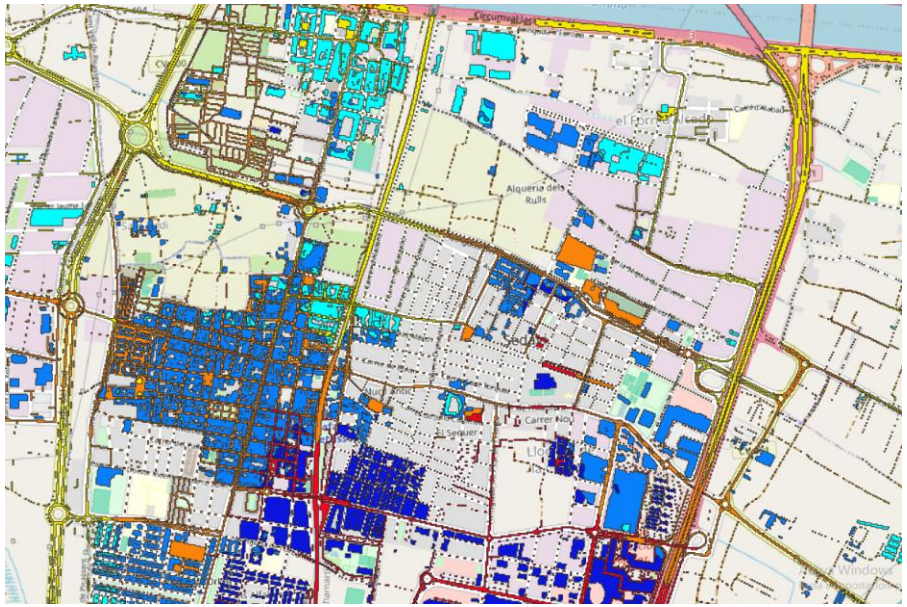
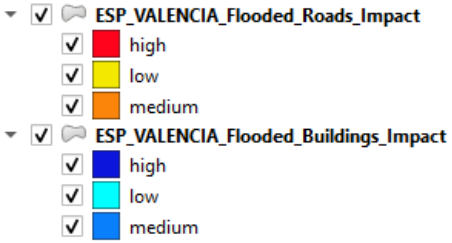
Flood Impact Index

Three distinct components focusing on a specific aspect of flood impact:

- **General-FII ->** Flood impact using corrected flood depth measurements.
- **Human-FII ->**Socio-economic vulnerability exposure
- **Asset-FII ->** Critical infrastructure & asset risk







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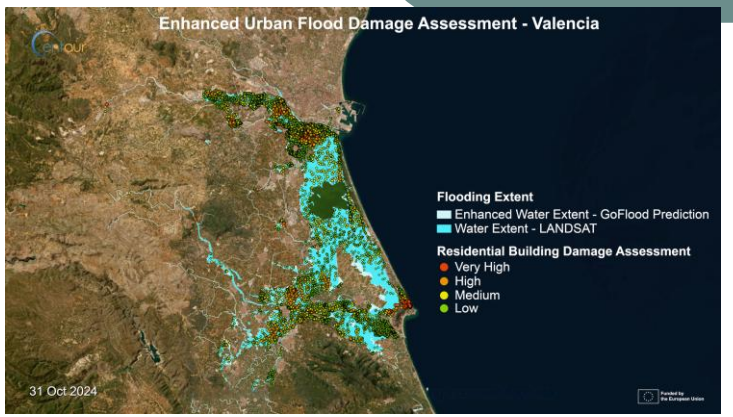
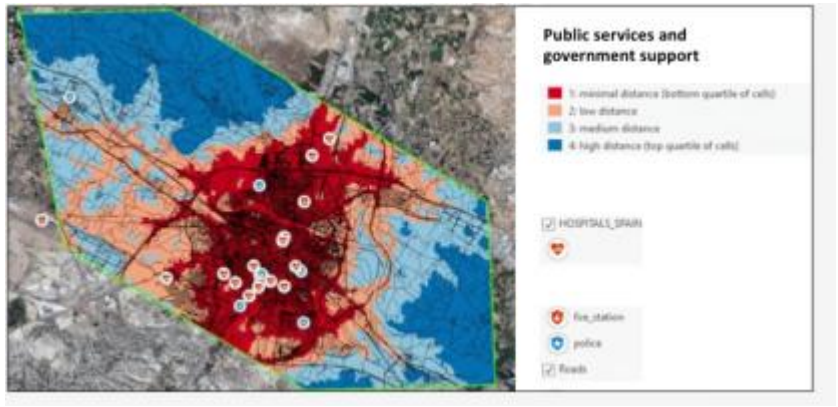
Added-value of CENTAUR to CEMS

- **Enhanced Flood Extent based on Geomorphological approach**
  - Enhanced Flood Extent estimation approach that goes beyond traditional satellite-based flood mask extraction
- **Flood depth-based asset grading**
  - Semi-automatic grading of buildings, roads & infrastructure
    - Faster product delivery
    - Supports economic loss estimation
- **Socio-economic indicators**
  - Potential for preparedness products, prior to crisis information production, such as the ability to evacuate.
  - Potential for grading products, with impact reports.





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WFS Indicators

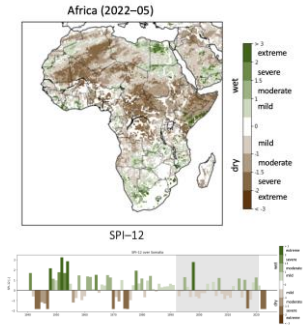
6 INDICATORS PRODUCED IN THE CONTEXT OF WATER & FOOD INSECURITY

WFS-ID	NAME
WFS-ID-1	Current Precipitation Deficit
WFS-ID-2	Future precipitation deficits + probability of drought events
WFS-ID-3	Probabilities of drought aggravation and recovery
WFS-ID-4	Monitored Agricultural Drought Indicator
WFS-ID-5	Predicted Agricultural Drought Indicator
WFS-ID-6	Agricultural Drought Danger Level

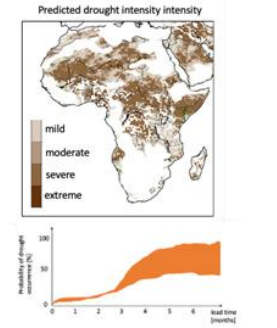
All produced **continuously**
at **country scale**

- For different time horizons: NRT/10 days/1 month/3 months
- For different land cover: cropland / grassland
- For different Administrative regions: ADM1/ADM2/ADM3

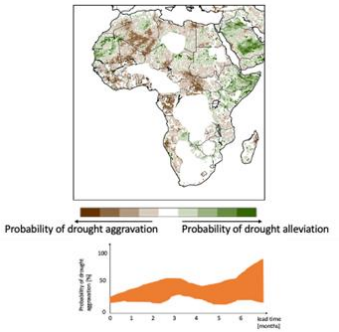
WATER & FOOD INSECURITY CONCEPTUAL



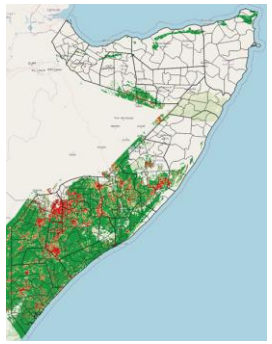
WFS-ID-1



WFS-ID-2



WFS-ID-3



WFS-ID-4 & -5

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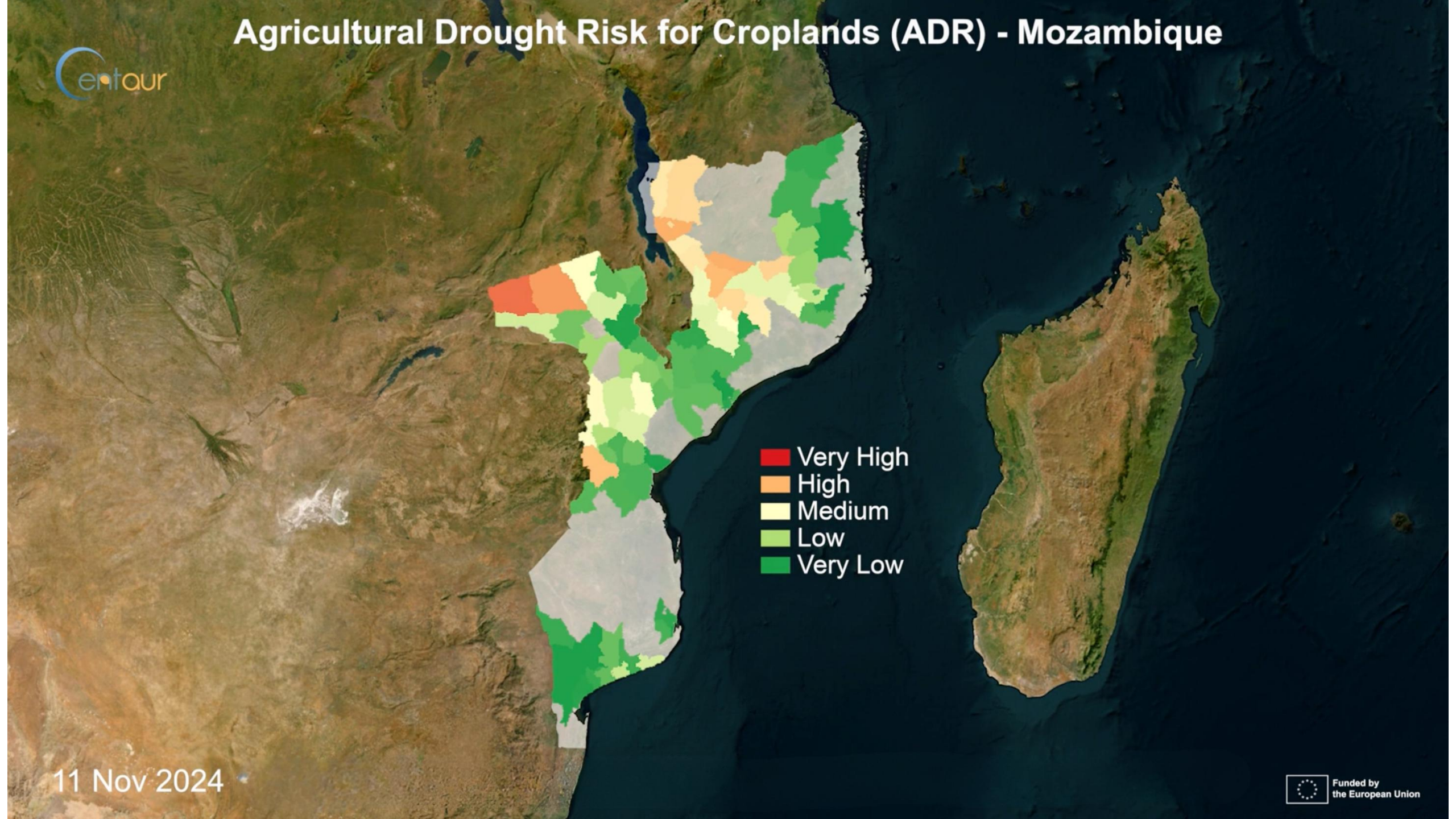
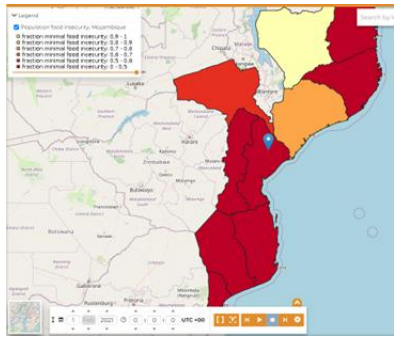

Agricultural Drought Risk for Croplands (ADR) - Mozambique
Very High
High
Medium
Low
Very Low
11 Nov 2024
Funded by
the European Union

WFS Indicators

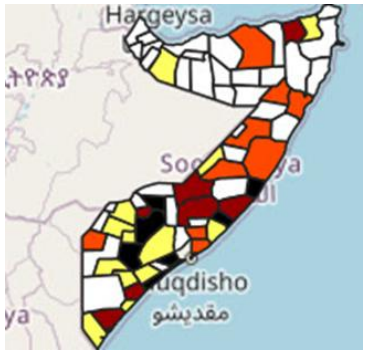
16 SOCIO-ECONOMIC RELATED INDICATORS

WFS-ID	NAME
WFS-ID-7	IDPs camps status indicator
WFS-ID-8	Populations at risk of food insecurity
WFS-ID-9	Populations at risk of water insecurity
WFS-ID-10	Number of people living in conflict-affected areas
WFS-ID-11	Food insecurity
WFS-ID-12	Economic insecurity
WFS-ID-13	Displaced persons
WFS-ID-14	Violent conflict
WFS-ID-15	Radicalisation and polarisation
WFS-ID-17	Humanitarian aid
WFS-ID-18	Resource capture
WFS-ID-19	Climate sensitivity of agri-food systems
WFS-ID-21	Public services and infrastructures
WFS-ID-23	State-citizen relations
WFS-ID-24	Dispute resolution mechanisms
WFS-ID-25	Social cohesion and trust

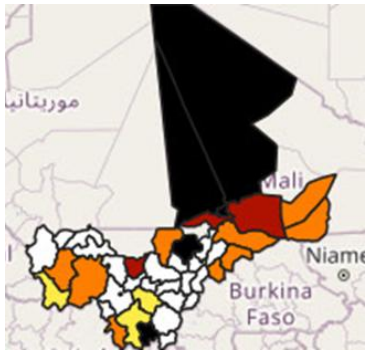
WATER & FOOD INSECURITY CONCEPTUAL



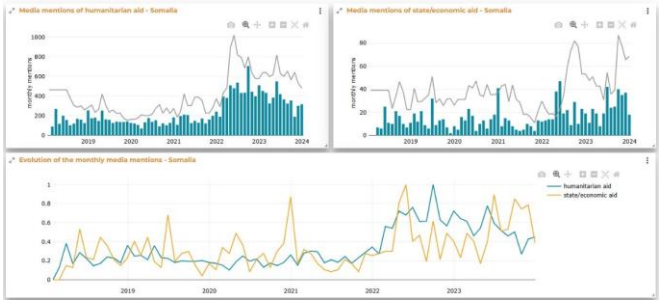
WFS-ID-8



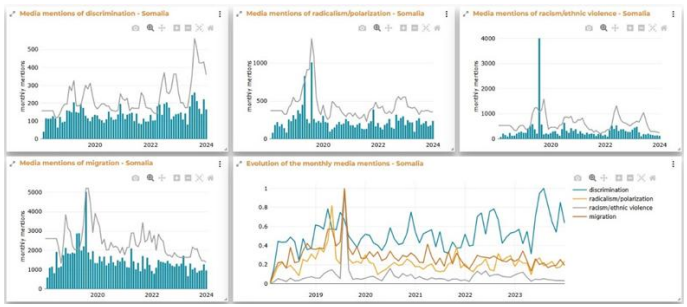
WFS-ID-14



WFS-ID-21



WFS-ID-17



WFS-ID-25

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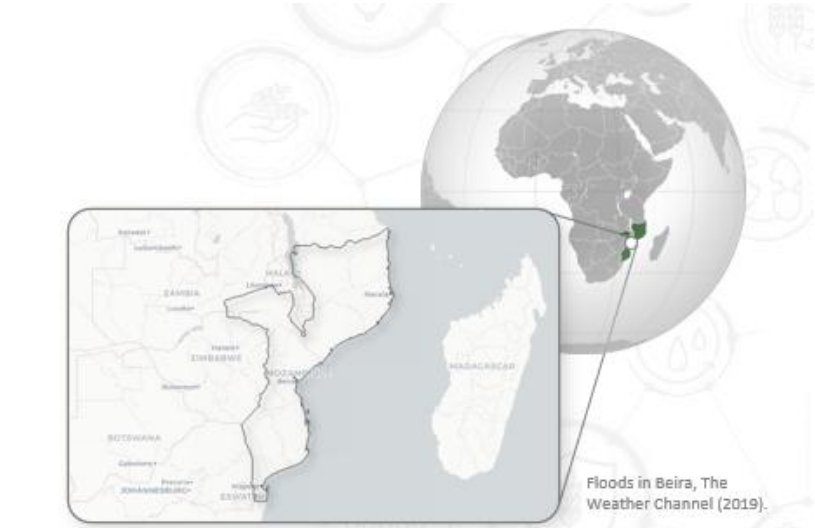
WFS Use Cases

MOZAMBIQUE



Floods in Beira, The Weather Channel (2019).

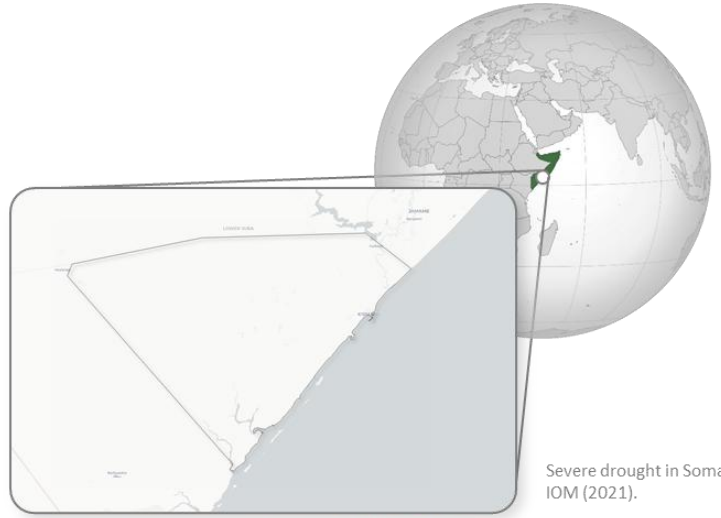
Country Wide

MALI

Water crisis in Mali, EcoHubMap (2023).

Country Wide

SOMALIA



Severe drought in Somalia, IOM (2021).

Country Wide

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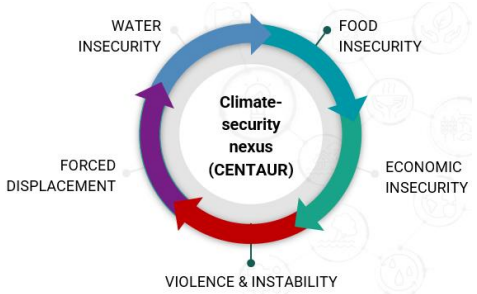
Dual-Mode Architecture WFS

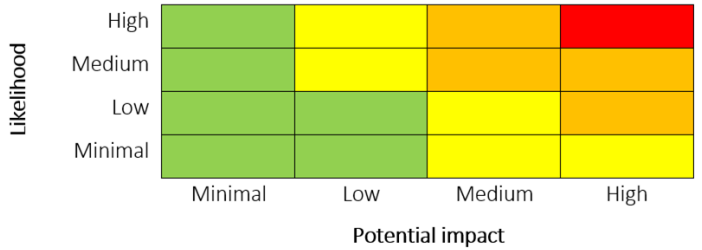
Monitoring risk **2 dimensions:**

- **Likelihood** of a drought event
- **Potential impact on:**
  1. Impact on **food security** (FEWSNET)
  2. **Economic** impact (FAO DIEM)
  3. Impact on **conflict** (ACLED)
  4. Impact on **displacement** (IOM-DTM)

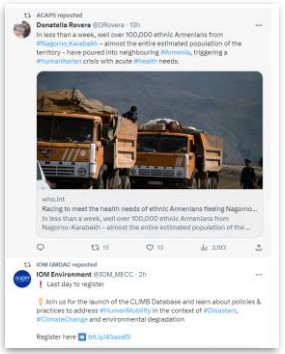
- **Activated by alert from Risk monitor**
- **Collection of situation-specific data**
  - High resolution
  - High frequency



WATER & FOOD INSECURITY CONCEPTUAL MODEL



Monitoring IDP camps



Monitoring news feeds etc.

Alerts sent to users:

- Once specific thresholds are reached on 1+ of the 4 risk scores.

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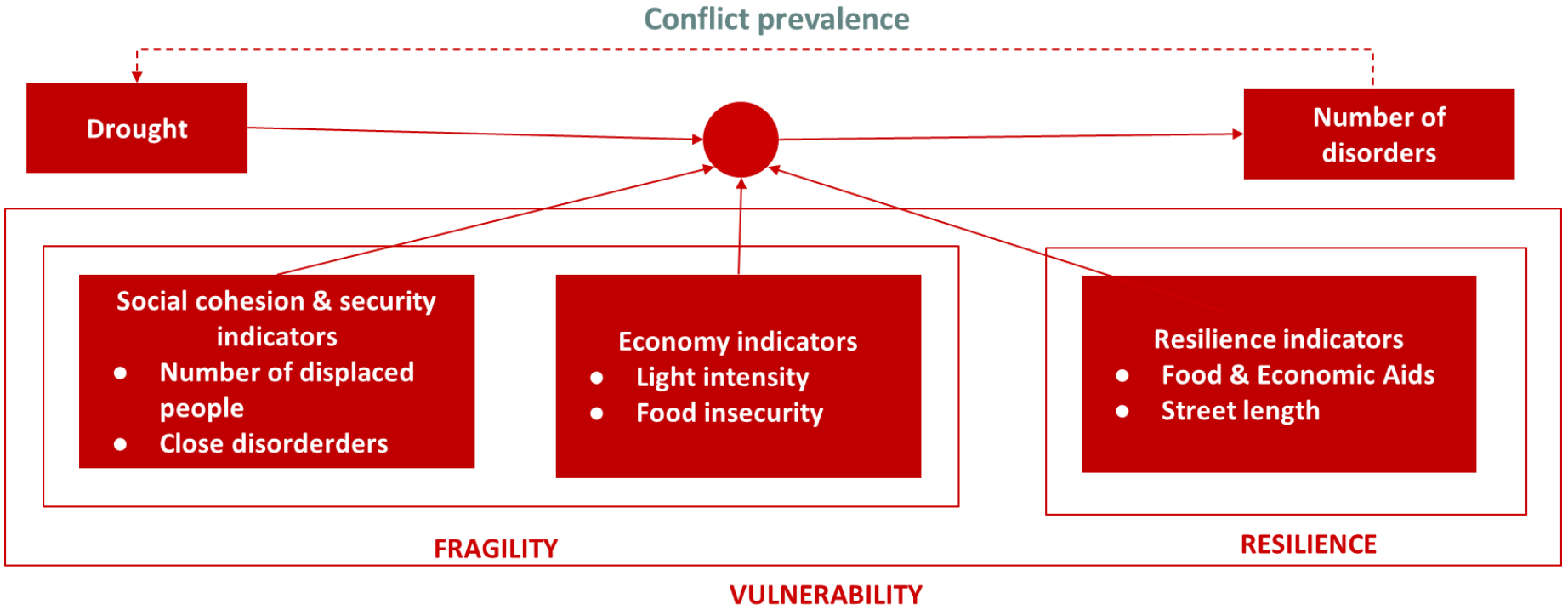
Indexes - DCPI

Drought Conflict Prediction Index, Security



- This type of models can be used to predict “where” and “when” to expect an impact.
- Model the concept of resilience.
- The model also has a retroaction, as the number of conflicts is influenced by the current conflict.

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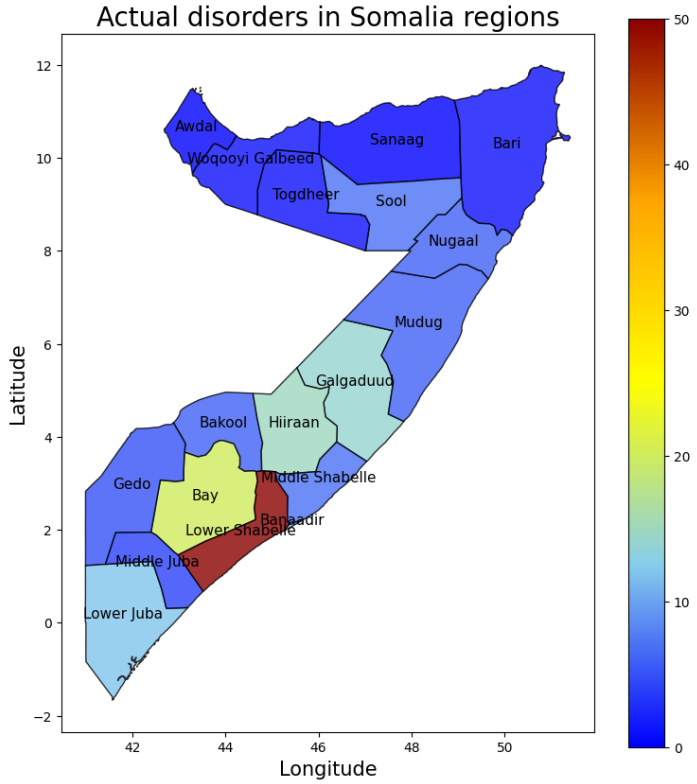
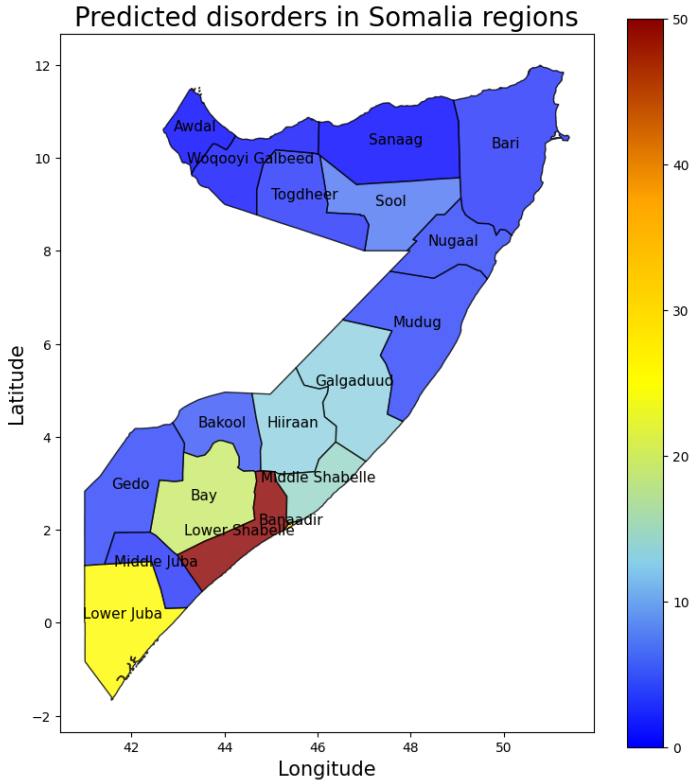
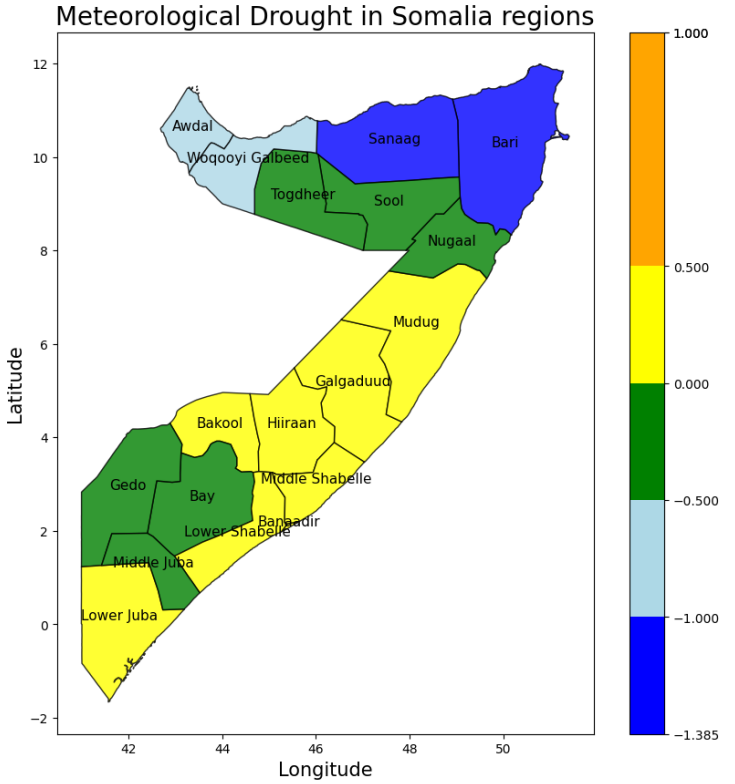
Indexes - DCPI

Drought Conflict Prediction Index, Security

- Actual vs. predicted impact (conflicts) for last month of time frame (June 2023).
- Errors are “conservative”, predicting more disorders rather than less.







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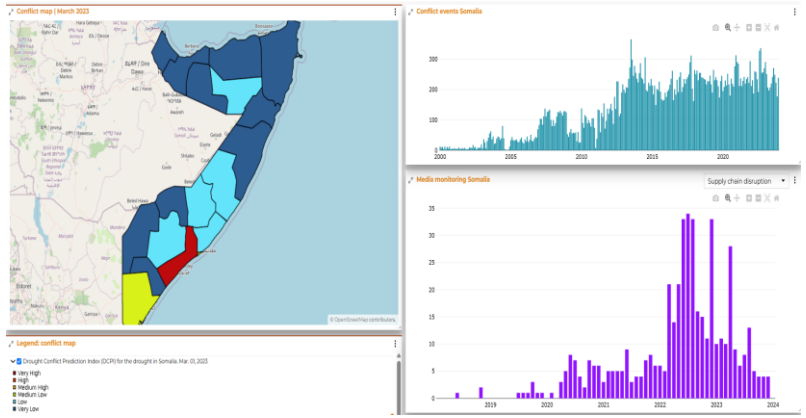
Added-value of CENTAUR to SESA

- **Thematic Enrichment:**
  - Structured Water & Food Security indicators -> Extends SESA with climate & environmental foresight layers
- **Exploration of Advanced Risk Monitoring Tools:**
  - Continuous monitoring architecture
    - Early detection of socio-political stress factors
    - Integration of non-EO data streams
- **Improved Understanding of the Climate-Security Nexus:**
  - A structured model linking climate, environmental, socio-economic and crisis indicators and indexes.
  - Support comprehensive assessments.



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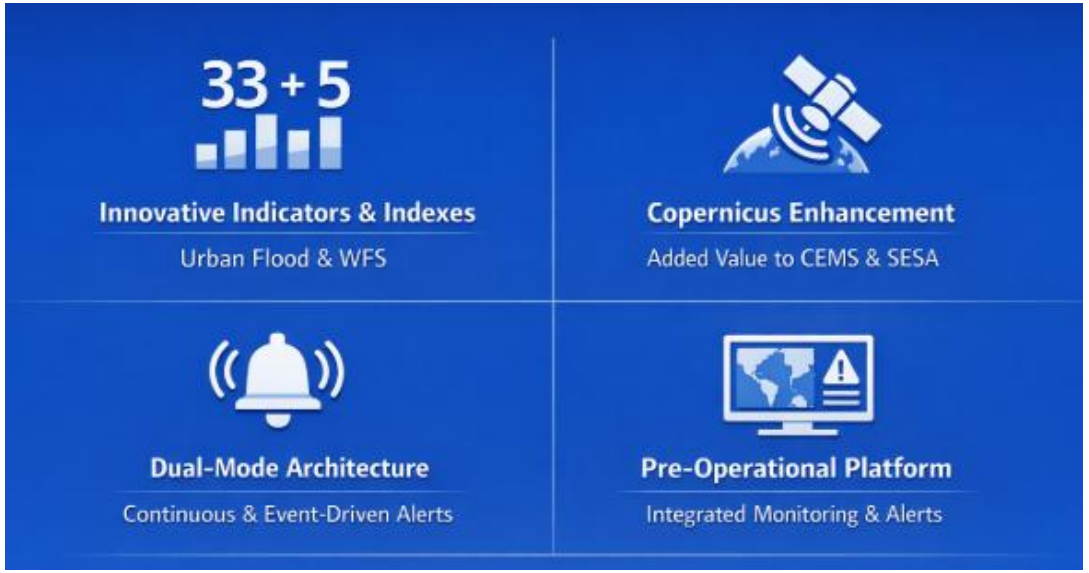
Key Achievements

- Development of **33 innovative indicators and 5 composite indexes** across Urban Flood and WFS domains
- Implementation of an **integrated early warning architecture operating** in continuous and event-driven modes
- Demonstrated **added value for Copernicus CEMS and SESA**
- Integration of all components into **a pre-operational production environment** with alert logic and product catalogue



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Transition to Demo

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Thank you!

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