



Emergency
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EDO & GDO

- Main Characteristics and Latest Developments -

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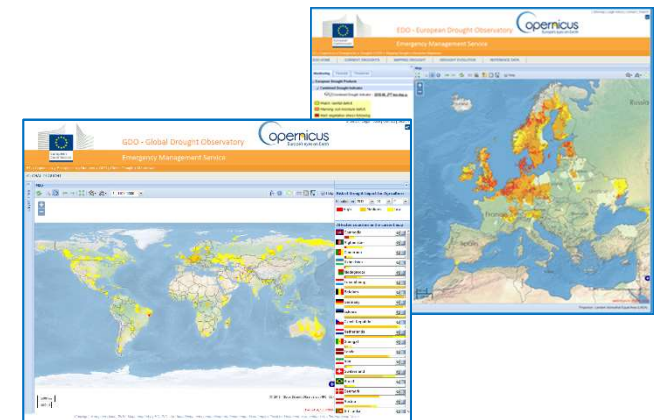
European & Global Drought Observatory

- Monitoring (and forecasting) of key drought & heat indicators based on satellite images, hydro-meteorological models & in-situ data
- Analysing (hazard, H), exposure (E) and vulnerability (V) for different sectors
- Assessing the dynamic risk (R) for drought impacts in different sectors ($R=H \cdot E \cdot V$)
- Serving the EU's ERCC, international & national stakeholders
- Contributing to the Integrated Drought Management Programme (WMO & GWP)



Main outputs

- **Drought monitoring and forecasting**
 - Continuous monitoring of the drought hazard at different scales
 - Medium range to seasonal forecasting
- **Analysing the risk of impacts**
 - Analysing the number of people and area affected
 - Warning for likely impacts in different sectors



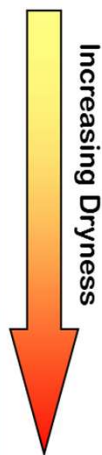
<http://edo.jrc.ec.europa.eu> <http://edo.jrc.ec.europa.eu/gdo>



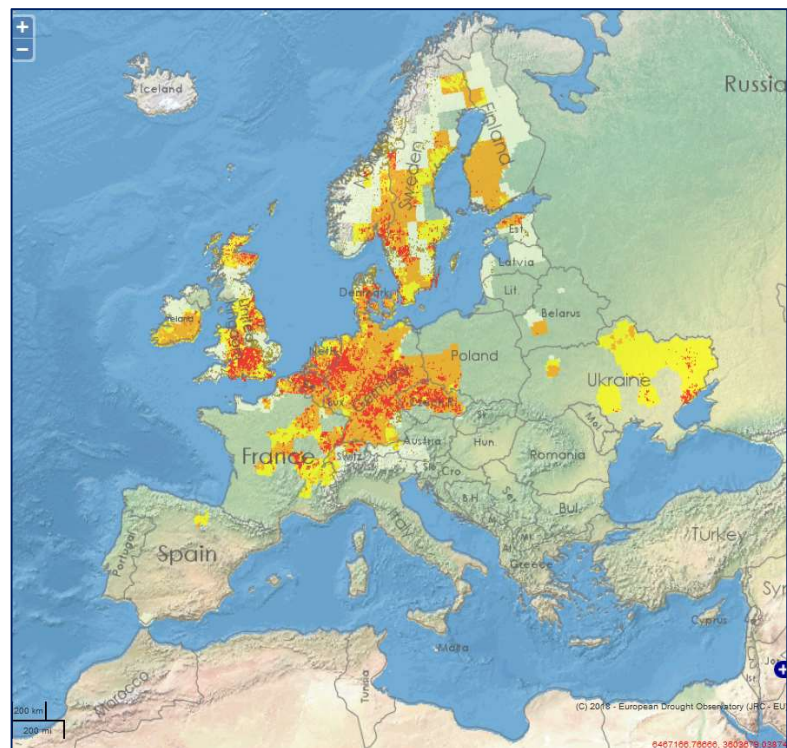
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Combined Drought Indicator (CDI)

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



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



CDI, 21-31 August 2018

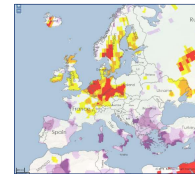


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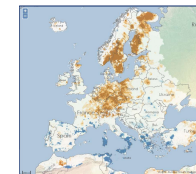
CDI - Conceptual Framework

Combined Drought Indicator (CDI) for Agricultural/Ecosystem Drought

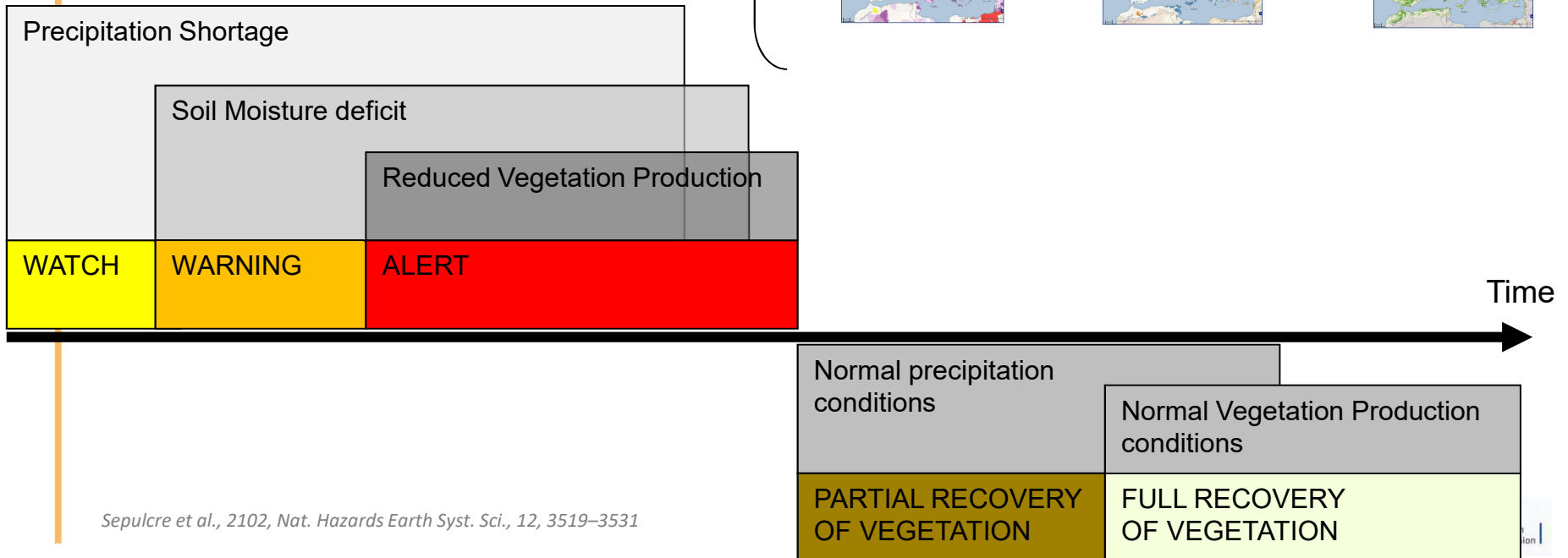
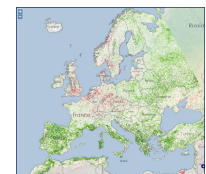
Precipitation
Anomalies (SPI)



Soil Moisture
Anomalies



fAPAR
Anomalies

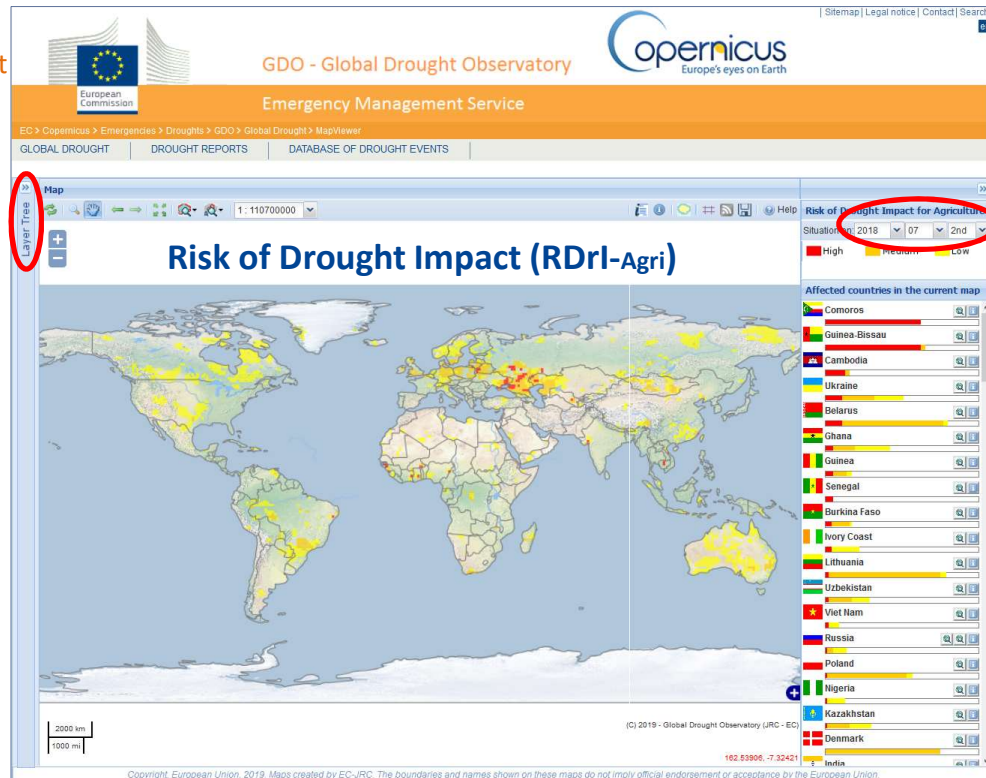


Sepulcre et al., 2102, Nat. Hazards Earth Syst. Sci., 12, 3519–3531



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Global Drought Observatory (GDO)



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

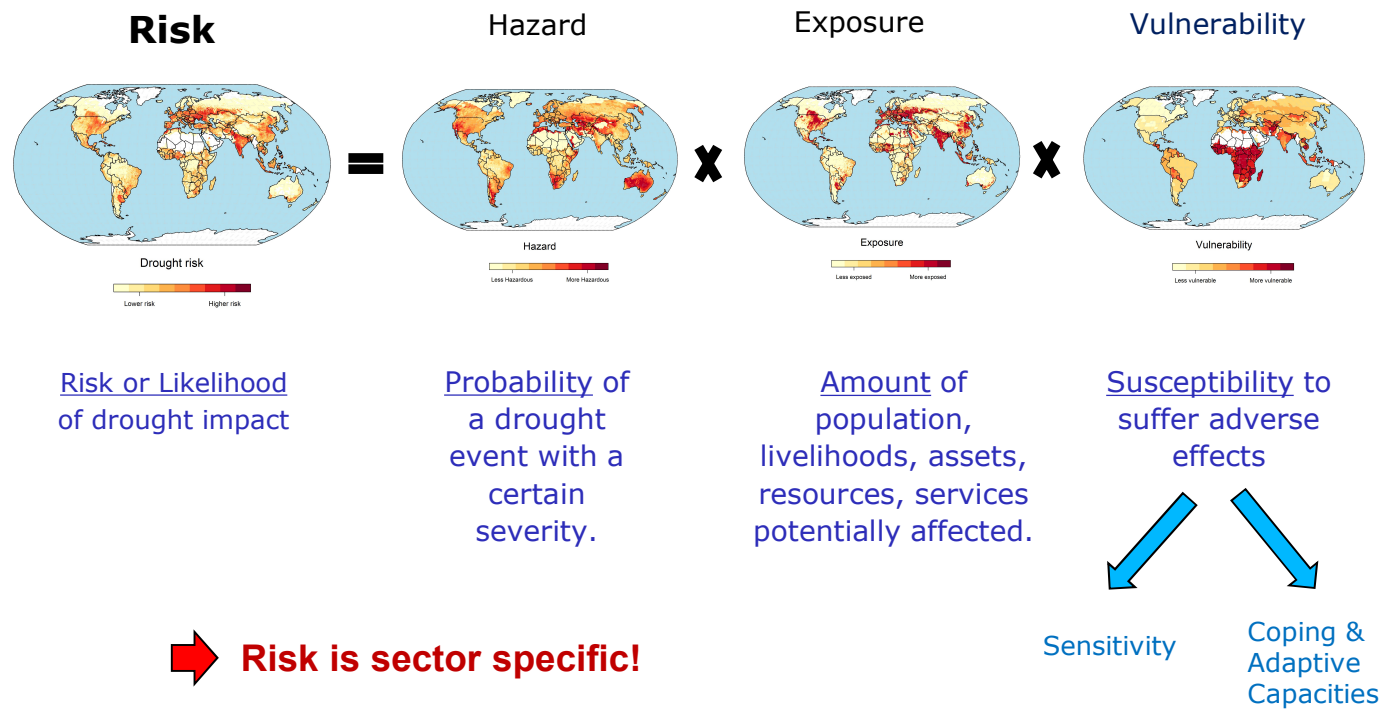
Hierarchical list of
affected countries

The **risk of impact** is evaluated based on the **drought hazard**, **exposure** and the **vulnerability**.



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Drought Risk Concept



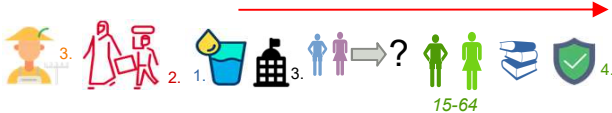


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What is behind the Vulnerability?

Social Factor:

Level of well-being of individuals and communities



Economic Factor:

Economic status of individuals, communities and nations



Infrastructural Factor:

Infrastructures needed to support the production of goods and sustainability of livelihoods



- Rural population (% of total population); World Bank
- Refugee population (% of total population); World Bank
- Improved water source (% of rural population); World Bank
- Life expectancy at birth (years); World Bank
- Population ages 15-64 (% of total population); World Bank
- Literacy rate (% of people ages 15 and above); World Bank
- Government Effectiveness; WGI
- Disaster Prevention & Preparedness (US\$/Year/capita); OECD

Proxy Indicators at Country Level

- Agriculture (% of GDP); World Bank
- Poverty headcount ratio at \$1.25 a day (PPP) (% of total population); World Bank
- GDP per capita (current US\$); World Bank
- Energy Consumption per Capita (Million Btu per Person); U.S. EIA

Proxy Indicators at Subnational Level

- Agricultural irrigated land (% of total agricultural land); FAO
- % of retained renewable water; Aqueduct

Carrao et al., 2016, Glob. Env. Change 39, 108–124

From Flaticon, created by

1: Kiranshastry, 2: mangsaabgur, 3: Freepik, 4: Smashicons, 5: Gregor Cresnar

— Positive (direct) correlation
— Negative (inverse) correlation

Copernicus
Europe's eyes on Earth

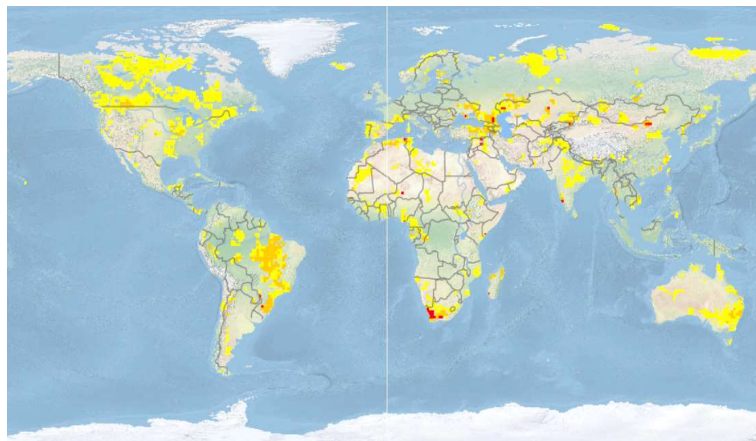
European
Commission



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Dynamic Drought Risk Monitoring

October 2017



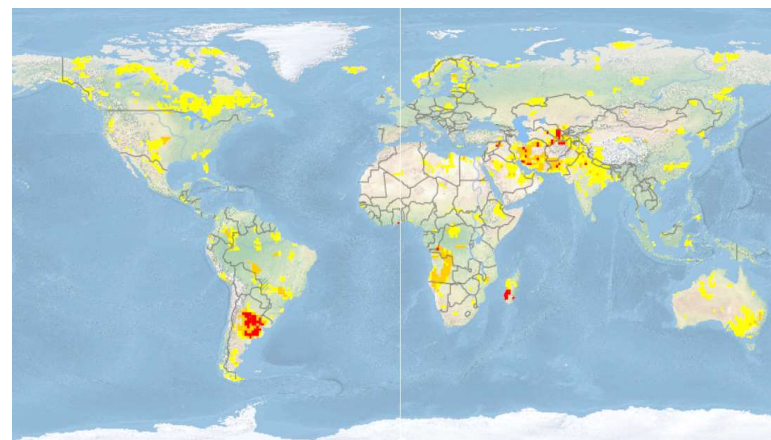
Risk Level:

High

Medium

Low

April 2018

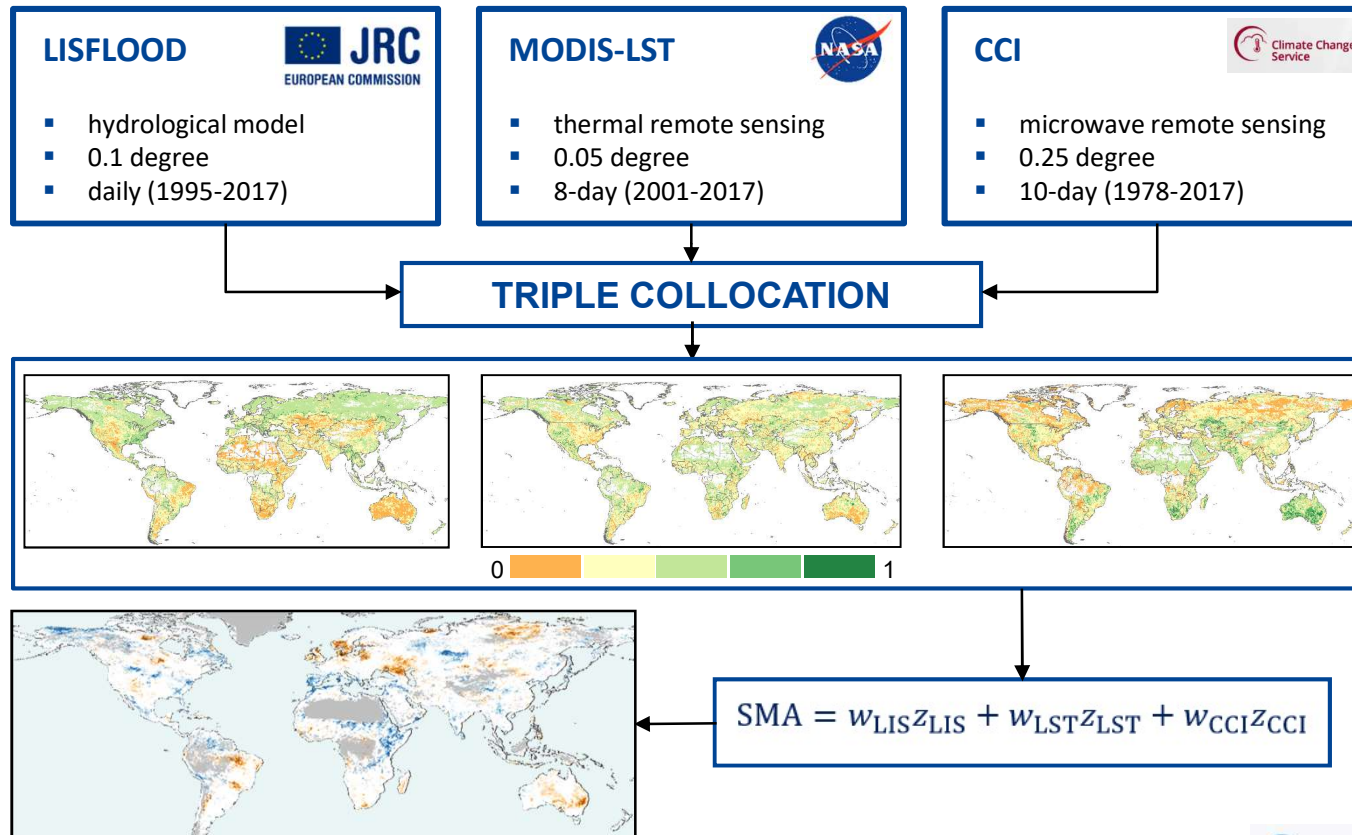


Updated every 10 days.



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Global Soil Moisture Layer



[Cammalleri et al., 2017; HESS: 21, 6329-6343]

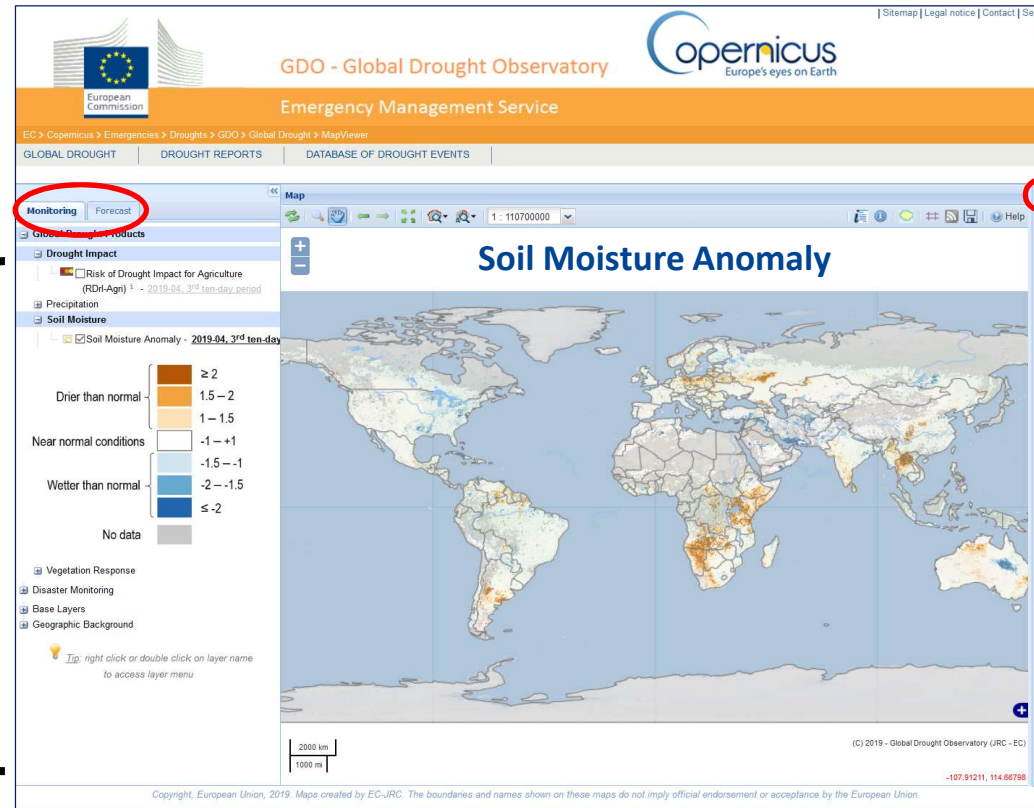


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Global Drought Observatory (GDO)

Monitoring &
forecasting menu open

Access to indicators
and other
information layers

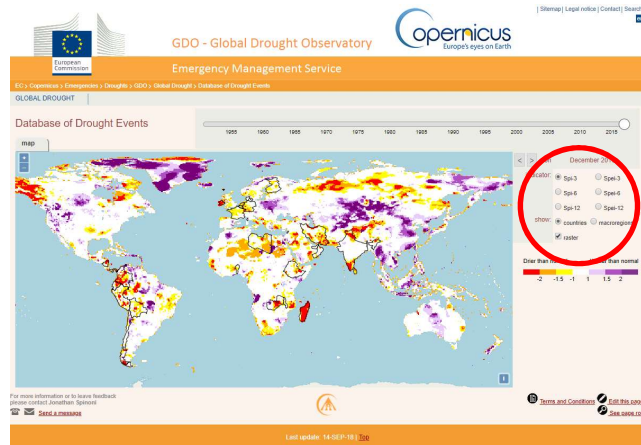
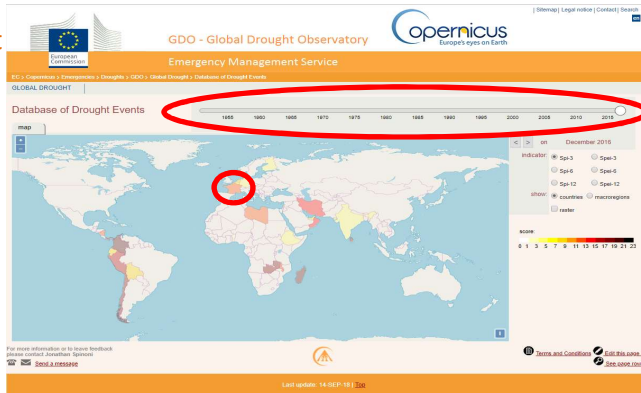


Impact
menu
hidden



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Global Database of Past Drought Events



Graphical Interface to explore the global database of meteorological drought events using a dash-board tool

- Based on SPI and SPEI
- 1951 to 2016

Table of historical events in France

Drought events in France, detected by Spi-3									
start	peak	end	max ext	duration	severity	intensity	average area involved	score	widest area involved
Aug 2016	Sep 2016	Dec 2016	Sep 2016	5 months	7.19	1.44	56 %	13	92 %
Dec 2015	Dec 2015	Jan 2016	Dec 2015	2 months	3.13	1.57	60 %	11	81 %
Mar 2011	May 2011	Jul 2011	May 2011	5 months	7.61	1.52	58 %	14	85 %
Sep 2009	Oct 2009	Nov 2009	Oct 2009	3 months	2.57	0.86	35 %	4	61 %
Nov 2007	Nov 2007	Feb 2008	Nov 2007	4 months	3.39	0.85	31 %	6	67 %

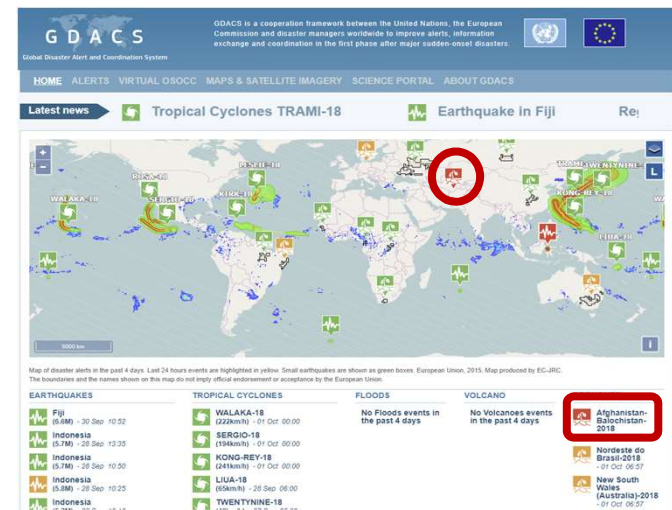
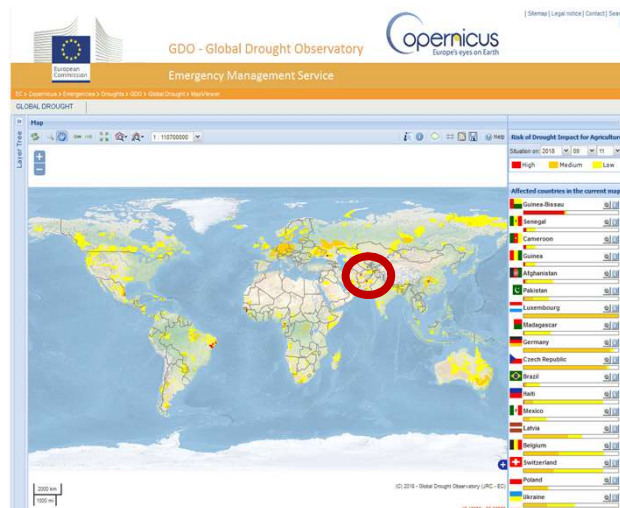
[Spinoni et al., 2019; J. Hydrol.: Reg. Studies, doi: 10.1016/j.ejrh.2019.100593]



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Injecting Drought Events in GDACS+

Injecting significant drought events into GDACS



GDACS: Global Disaster Alert and Coordination System,
www.gdacs.org

STEPS:

- 1) Automatic detection of agricultural drought events (other types to follow)
- 2) Evaluation and classification of detected drought events
- 3) Publication of confirmed and classified events and display in GDACS



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What else?

Other features:

- Side by side maps of different indicators or of time series of indicators
- On the fly reports of drought characteristics and areas affected
-

Latest developments:

- Extension of EDO soil moisture and low flow window (eastern Europe and northern Africa)
- Improvement and harmonization of colour schemes for all indicators
- Harmonization and updating of indicator factsheets
- New global soil moisture layer included in GDO → improvement of RDrl Agri
- New database of drought events included in GDO
- Regular injection of drought event information into GDACS (since December 2018)
- Forecasting of extreme SPIs (since January 2019)
- Improvement of the reporting tools



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What else?

Ongoing developments:

- Linking to additional national and/or RB systems
- Inclusion and further development of an impact database (EDII)
- Exposure, vulnerability & risk assessments for power generation, public water supply (GDO)
- Studying the changing risk under climate change
- Testing groundwater indicators (e.g. GRACE)
- Testing Sentinel data



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Web Site Statistics

Website Activity Monthly Statistics

2018	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Total Page Views	8695	10571	9935	8931	9750	9904	26985	20509	13598	13354	12612	11498	156342
Total Visits	7025	8810	8103	7128	7607	7761	21199	15685	11015	10563	10001	8609	123506

On average: 13,000 Page Views/month
 10,000 Independent Visits/month

Website Activity Monthly Statistics

2019	Jan	Feb	Mar	Apr
Total Page Views	11344	10453	15519	16665
Total Visits	8896	8130	11996	12510



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Key Questions:

Key Questions:

- Where to go from here?
- If and how to link to continental systems?
- How to improve the risk assessment and adding additional sectors?
- How to improve the forecasting capabilities?
- How to develop and implement an impact reporter?
- How to improve the information flow from monitoring to decision makers



Breakout Groups