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Drought in Europe June 2023

GDO Analytical Report

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Emergency Management Service

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2023

Preparedness
Response
Recovery

Rapid Mapping
Risk & Recovery Mapping
Floods
Fires
Droughts
Population
Built-up areas

Joint Research Centre

EUR 31607 EN

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Drought in Europe - June 2023

JRC Global Drought Observatory (GDO) of the Copernicus Emergency Management Service (CEMS) – GDO/EDO data up to 20/06/2023

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Executive summary

- A severe drought is affecting large parts of Europe. The severity and phases of its evolution differ across the continent: southern Europe already shows many impacts and is slowly moving into a drought recovery phase; northern Europe, on the other hand, is in an initial drought phase with a severe lack of precipitation.
- Recent precipitation in the Iberian Peninsula has not counterbalanced the effects of a persistent lack of precipitation and heatwaves. Impacts on crops and vegetation are still severe.
- A more recent meteorological drought affects the Baltic Sea regions, Scandinavia, the UK, Ireland, and Germany. It raises concerns for crop growth.
- Snow accumulation for the 2022-2023 winter season in Italy has been one of the worst of the last 30 years for the second year in a row, and the contribution of snowmelt to the runoff has been extremely reduced.
- Fire danger ranges from moderate to high over most of Europe, and is extreme over the Iberian Peninsula.
- Seasonal forecasts point to a warmer than average summer. Precipitation is expected to be higher than normal in the Mediterranean, but severely lower in central and northern Europe, particularly for the Baltic Sea regions. Close monitoring of drought evolution and proper water use plans are required, as the summer of 2023 currently has a high risk of being critical with respect to water resources.
- The European Commission proposes to mobilise an additional €330 million for farmers in 22 Member States of the European Union which are impacted by adverse climatic events.

Combined Drought Indicator (CDI)

Dry conditions are affecting wide areas of Europe and are associated with severe impacts and a potential critical evolution for the availability of water resources. The Combined Drought Indicator (CDI) for mid-June 2023 shows widespread alert conditions in the Iberian Peninsula[1], and "watch-to-warning" conditions in most of central-northern Europe. In the Baltic Sea regions, warning conditions are dominant due to severe precipitation and soil moisture anomalies (Fig. 1).[2]

The persistent lack of precipitation in spring and the warmer-than-average conditions in the Iberian Peninsula have led to a negative soil moisture anomaly and poor vegetation conditions that are still not fully counterbalanced by the recent precipitation in May and June 2023. Vegetation and crops in the middle of the growing season have been significantly affected. Some areas are showing recovery, but alert conditions are still dominant. More recently, in April-June 2023 heatwaves and a lack of precipitation affected northern and central Europe, particularly in the Baltic Sea area. The current situation may be exacerbated during summer if warmer-than-average temperature and negative precipitation anomalies persist.

[1] See also the two GDO Analytical Reports "Drought in the western Mediterranean - May 2023" (https://edo.jrc.ec.europa.eu/documents/news/GDO-EDODroughtNews202305_Western_Mediterranean.pdf) and "Drought in Europe - March 2023" (https://edo.jrc.ec.europa.eu/documents/news/GDO-EDODroughtNews202303_Europe.pdf).

[2] For more details on the CDI, and the other GDO and EDO indicators of drought-related information used in the report, see the Appendix at the end of the document.

Drought in Europe - June 2023

JRC Global Drought Observatory (GDO) of the Copernicus Emergency Management Service (CEMS) – GDO/EDO data up to 20/06/2023

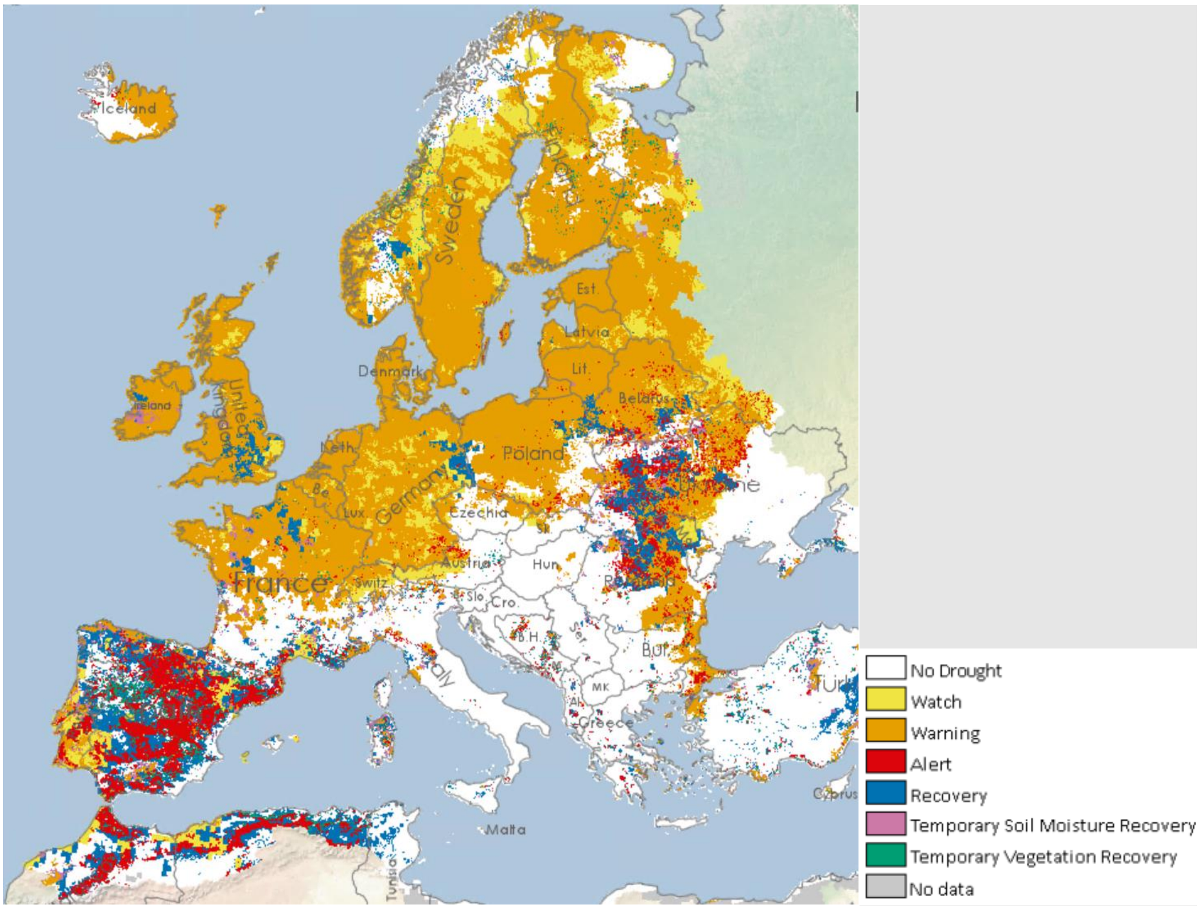

Figure 1: The Combined Drought Indicator (CDI), based on a combination of indicators of precipitation, soil moisture, and vegetation conditions, for mid-June 2023.[2]

The CDI at mid-June 2023 in Europe shows comparable conditions to those for the same period in 2022, when a severe-to-extreme drought developed over Europe, affecting water resources, agriculture and energy production.[3] The main differences between the two years are apparent in the southern countries, where in 2023 the western Mediterranean has been hit more severely, while the eastern Mediterranean and Italy have recovered quite well to close-to-normal conditions, after a critical early spring. Both 2023 and 2022 are worse than 2021 in terms of drought conditions, except for northern Scandinavia (Fig. 2).

[3] See also GDO Analytical Report "Drought in Europe - July 2022" (https://edo.jrc.ec.europa.eu/documents/news/GDO-EDODroughtNews202207_Europe.pdf).

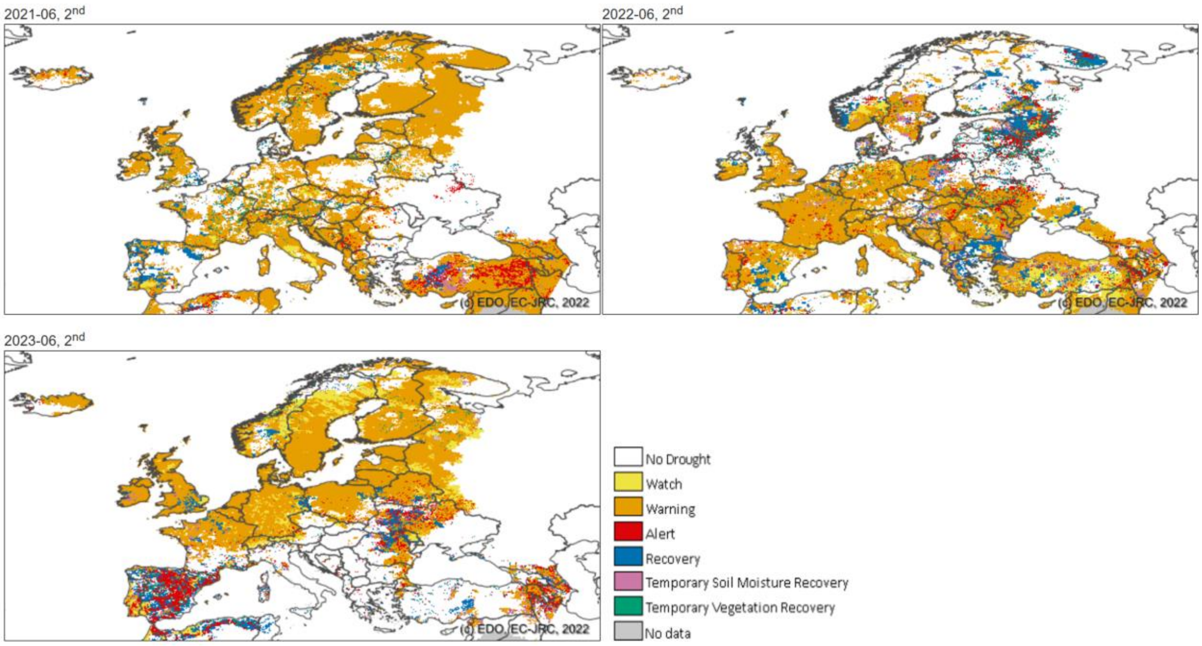

Figure 2: *The Combined Drought Indicator (CDI), based on a combination of indicators of precipitation, soil moisture, and vegetation conditions, for mid-June of 2021 (top-left), 2022 (top-right), and 2023 (bottom-left).*[2]

Standardized Precipitation Index (SPI)

Until spring 2023, persistent negative anomalies of precipitation have affected many parts of western Europe and the western Mediterranean for over a year.[1]

From mid-April to mid-June 2023, the precipitation pattern changed to normal or wetter-than normal conditions in southern Europe (based on SPI-3, computed for an accumulation period of 3 months) and dry anomalies in the northern countries, particularly around the Baltic Sea (Fig. 3).

The SPI-1 (i.e. for an accumulation period of 1 month) shows extreme contrasting precipitation patterns with severe dry conditions in north-eastern France, Benelux region, Germany and the Baltic Sea, and wetter conditions in the Iberian Peninsula, central-southern Italy and the Balkans (Fig. 4).[4]

[4] For more details on the SPI, and the other GDO and EDO indicators of drought-related information used in this report, see the Appendix at the end of the document.

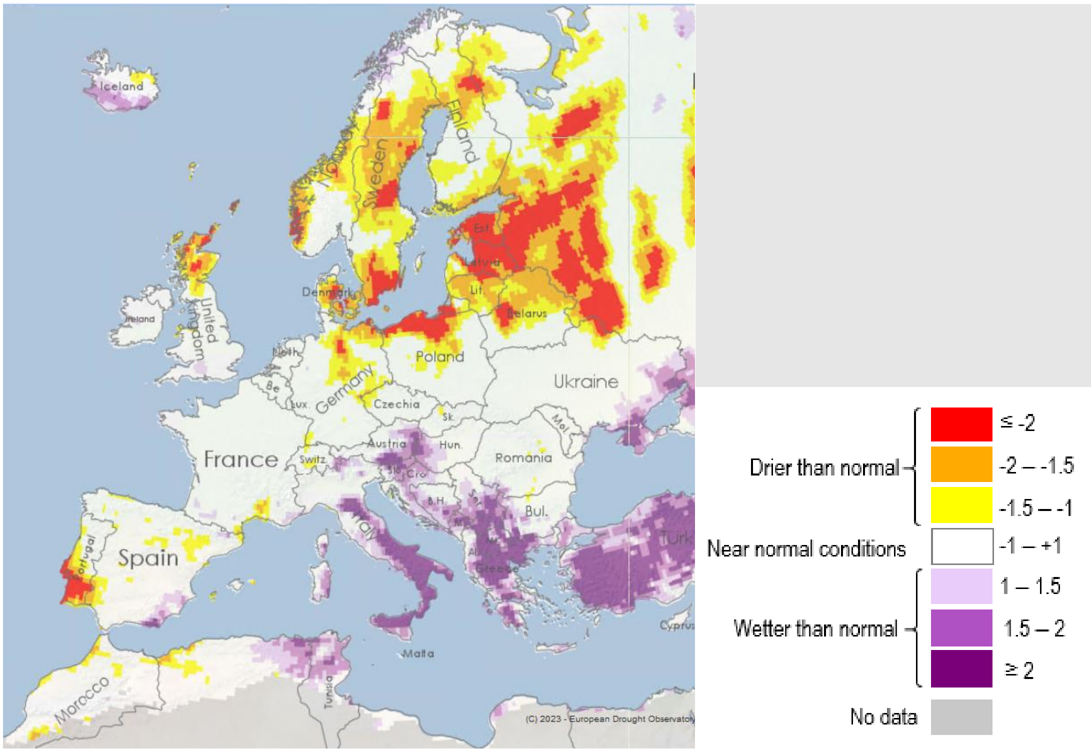

Figure 3: Standardized Precipitation Index (SPI-3), for the 3-month accumulation period ending at mid-June 2023.[4]

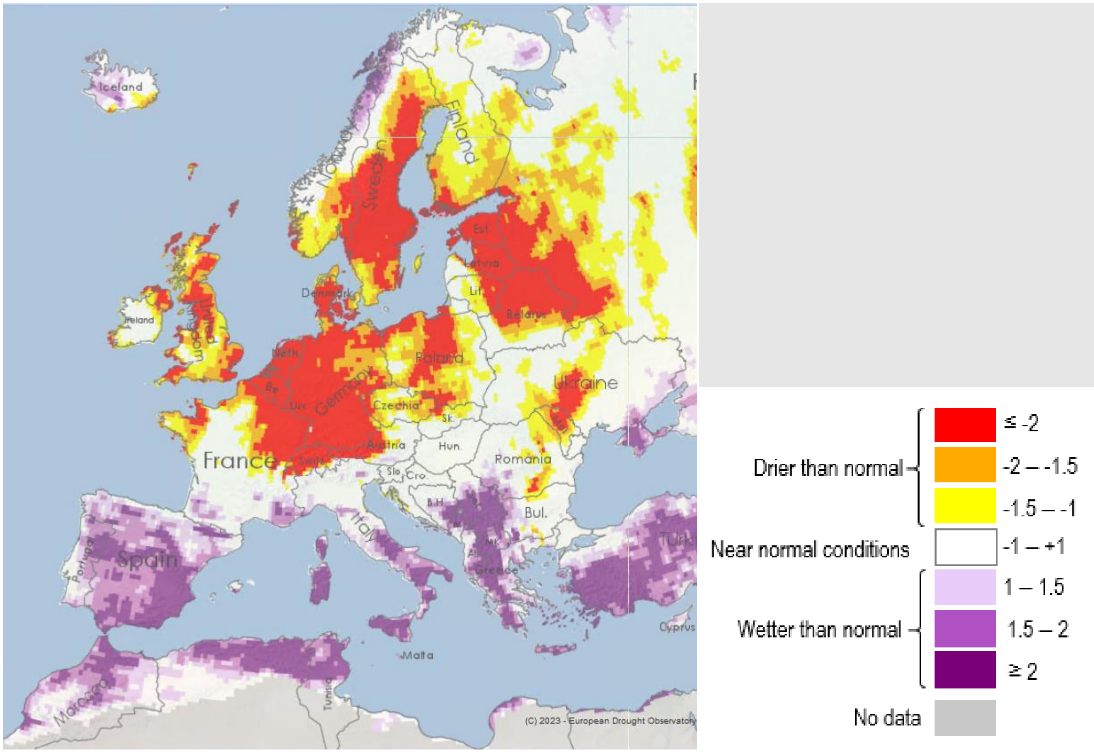

Figure 4: Standardized Precipitation Index (SPI-1) for the 1-month accumulation period ending at mid-June 2023.[4]

Temperature

Most of Europe experienced above-average temperatures during January to May 2023. In many places the average temperature anomaly was 0.8 °C higher than average (1991-2020 baseline) and reached values above 1.6 °C in the southern Iberian Peninsula, southern France, northern Italy, and eastern Europe (Fig. 5).

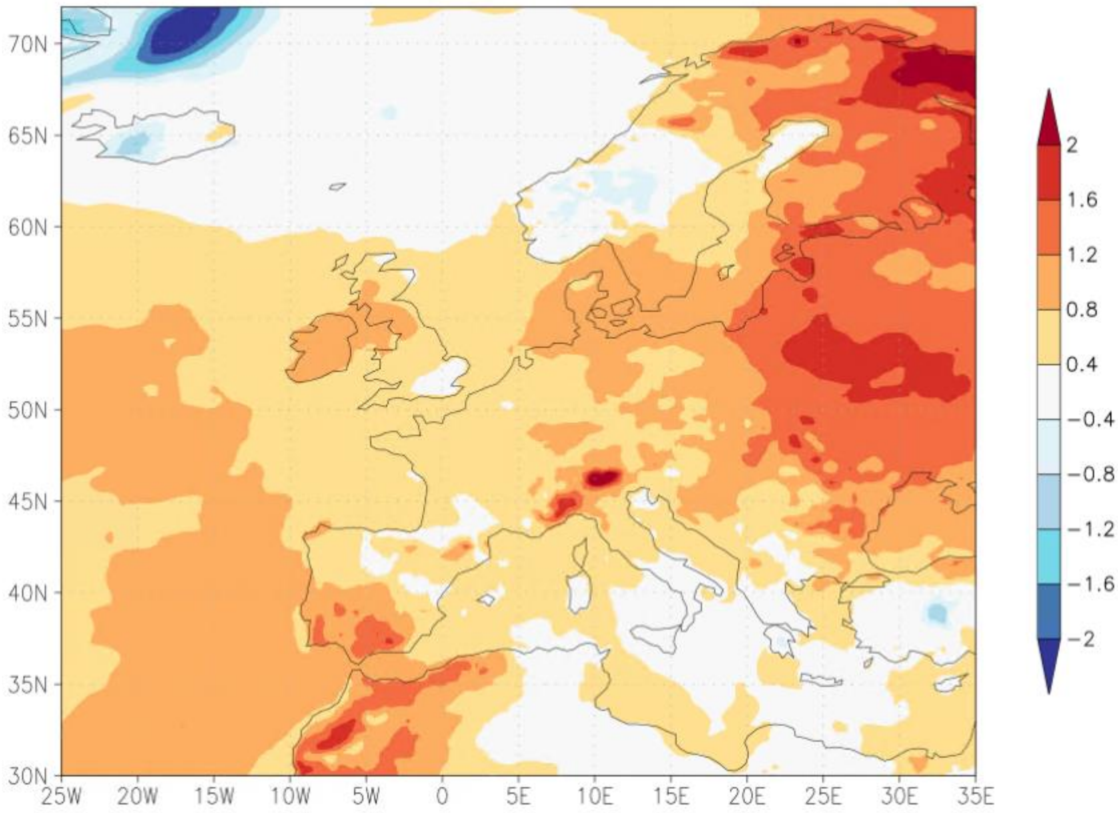

Figure 5: *Average temperature anomaly (ERA5) computed for the period January - May 2023 (baseline 1991-2020). Source: The KNMI Climate Explorer.*[5]

On 21st June 2023, a moderate heatwave hit Scandinavia, Germany, Poland, Czechia, Austria, northern Italy, and eastern France. According to the Heat and Cold Wave Index (HCWI)[6], the heatwave had a duration longer than 5 days in some regions of Scandinavia (Fig. 6).

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[5] The KNMI Climate Explorer https://climexp.knmi.nl

[6] For more details on the Heat and Cold Wave Index (HCWI), and the other GDO and EDO indicators of drought-related information used in this report, see the Appendix at the end of the document.

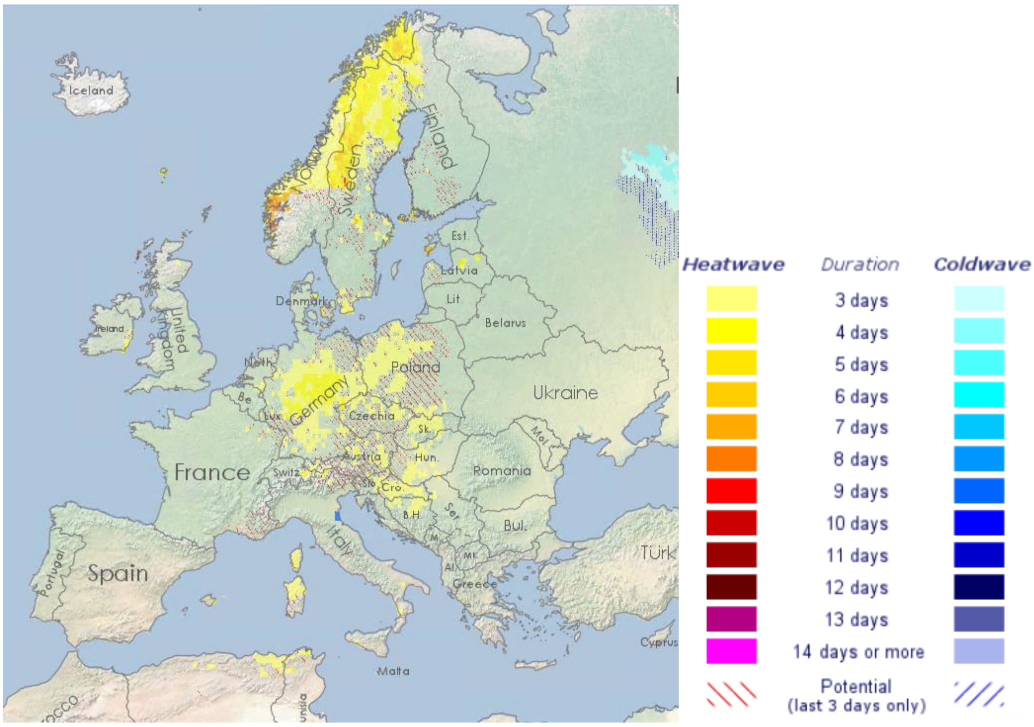

Figure 6: *Duration (in days) of the heatwave of 21st of June 2023, based on the Heat and Cold Wave Index (HCWI). The yellow to purple colour scheme represent increasing duration.*[6]

Snow Water Equivalent (SWE)

The 2022-23 snow season in Italy was characterized by a persistent precipitation deficit up to April 2023. Along with comparatively high temperatures, this deficit resulted into a significant lack of snow water resources across the country.

Historically, peak snow accumulation in Italy takes place between the end of February and the end of March. In 2023, the total Snow Water Equivalent (SWE) in Italy in March was about 30% to 40% of the median SWE for the 2011-2021 period (Fig. 7, top panel). Conditions in March were worse than in 2022, which was an already dry and warm year.

Due to frequent warm spells since December 2022, the 2022-2023 snow season was also characterized by frequent, early snow-melt episodes that substantially contributed to the overall national deficit. As a result, seasonal snowmelt started in February 2023, as opposed to historical data placing the onset in March to April.

In the geo-spatial context, the SWE deficit in April 2023 was strikingly homogeneous across the Italian Alps, with peaks well below -60% (Fig. 7, bottom panel). Compared with 2022, the SWE was also substantially lower than normal across the Apennines.

May 2023 brought abundant precipitation across the country, which had two impacts on the SWE. The most significant one was a temporary hiatus in snowmelt across the Alps (Fig. 7, top panel). Incoming snow precipitation also locally replenished the snowpack, although this process only affected areas above 2500 metres, which are very small compared with the country area. The snow-fed area is much wider and affects also lower altitudes in the usual snow season. Thus, the impact of this late snow precipitation on the national SWE deficit was marginal. As a result of this wet period, SWE conditions at the end of May 2023 were comparable with those at the beginning of the month.

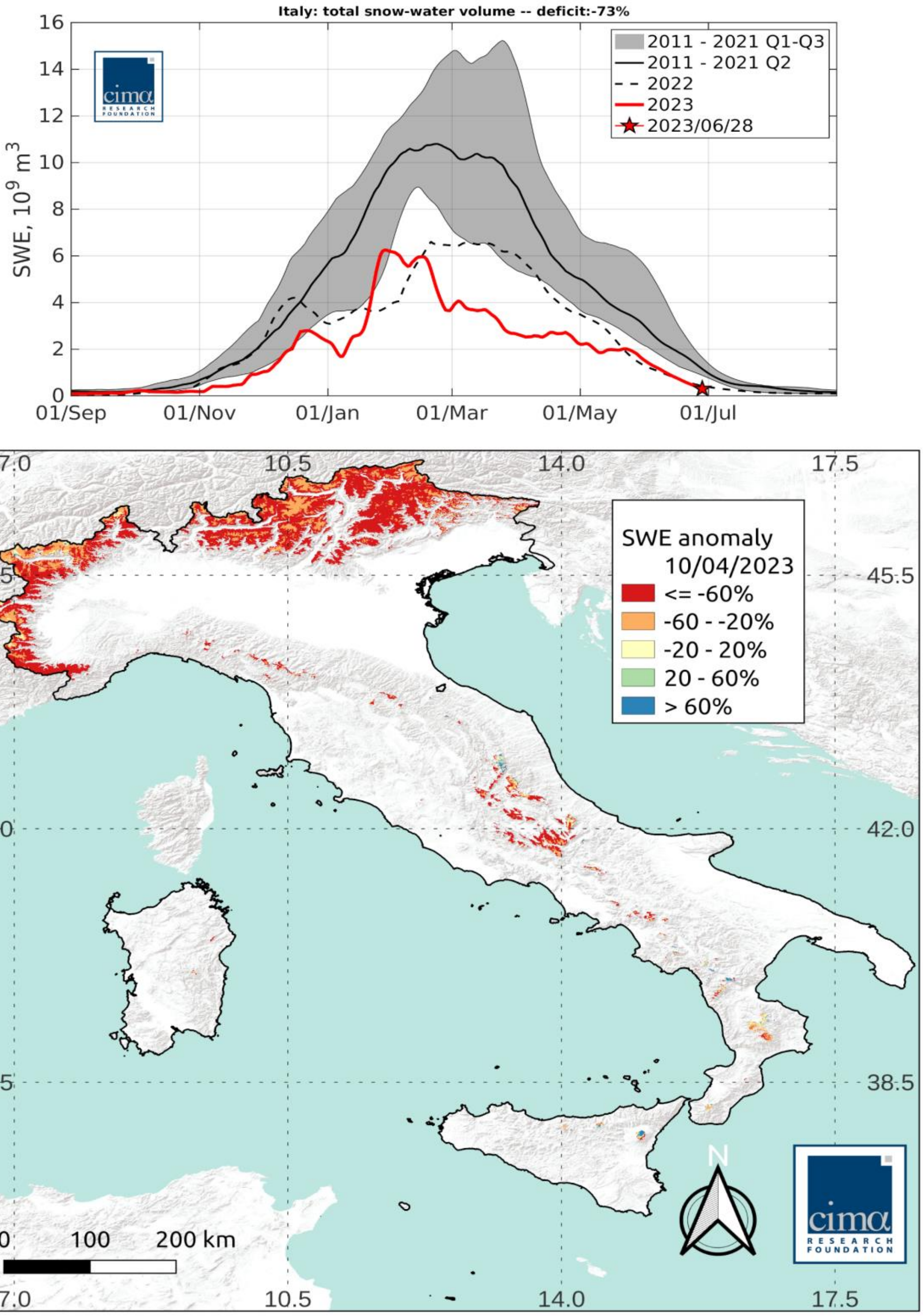

Figure 7: *Snow Water Equivalent (SWE) anomaly for Italy, for the 2022-23 snow season. Top panel: total Italian SWE for the 2022-2023 (red line) and 2021-2022 (black dashed line) snow seasons, compared with the 2011-2021 climatology. The black line represents the median (Q2), while the light grey area encloses the range between the first (Q1) and third (Q3) historical quartiles. Bottom panel: spatial distribution of the percentage anomaly on 10th April (onset of snow-melt season) SWE compared to 2011-2021. Source: CIMA Research Foundation.*

Over the Swiss Alps, the 2022-23 snow season started close to the historical first quartile during the period 1998-2022. After mid-December 2022, scarce snow accumulation and above-average temperatures led to the lowest SWE value for the beginning of March since 1998. At the beginning of March 2023, the SWE was about 35% of the climatology value. According to the historical data, peak accumulation occurs around the end of March with a tendency towards earlier dates in the case of low-snow winters. The current snow season, in contrast, after the described severe scarcity, has been abundantly snowy from mid-March to the beginning of May, resulting in a melting season close to the historical first quartile (Fig. 8).[7]

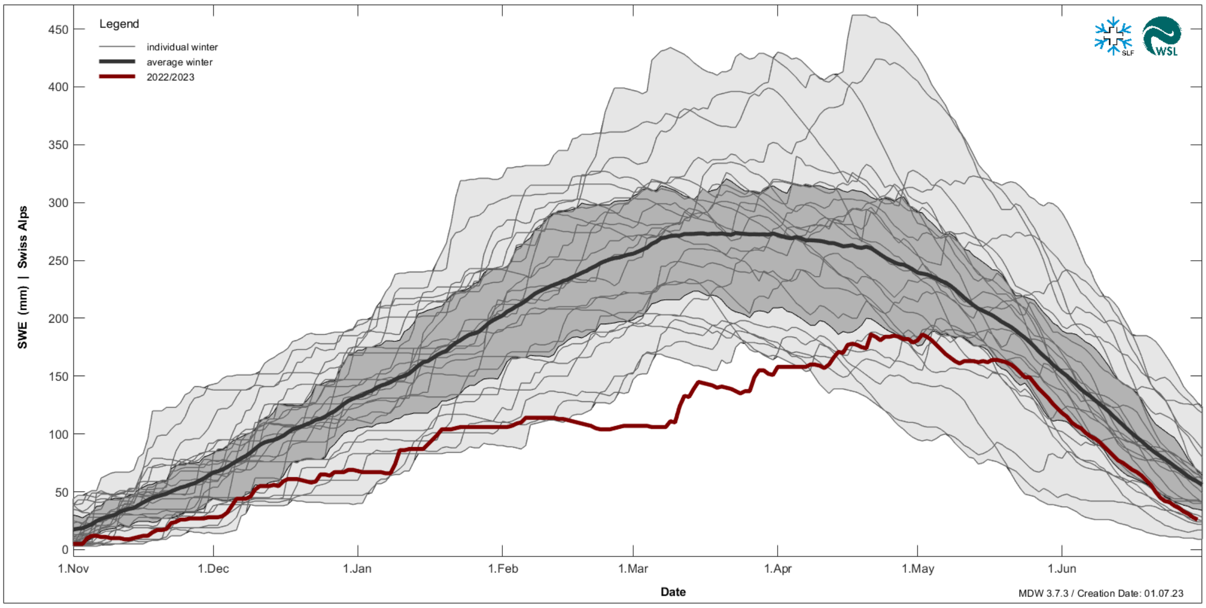

Figure 8: *Average SWE for the 2022-2023 snow season (red line) compared with the 1998-2022 climatology, for the Swiss Alps. The black line is the mean, the medium grey area is the 25-75 percentile, and the light grey area is the 0-100 percentile. Light grey lines indicate data from individual years. Source: Institute for Snow and Avalanche Research (SLF) of the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL).*

Soil moisture

In mid-June 2023, the Soil Moisture Anomaly was remarkably negative in central-northern Europe, particularly in the Baltic Sea regions and along the border between France and Germany (Fig. 8). This is due to a combination of low precipitation and high temperatures in the previous months. The drier-than-normal soil moisture pattern is consistent with the precipitation deficit of the previous months (i.e. SPI-3 and SPI-1, see Figs. 3 and 4). Some of the regions with the strongest precipitation anomalies were also affected by high temperatures, which contributed to accelerating the water loss from the soil. Large areas show a Soil Moisture Anomaly below -2, corresponding to the driest class of this indicator (Fig. 9).[8]

[7] The analysis over the Swiss Alps is based on data and information provided by the Institute for Snow and Avalanche Research (SLF) of the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL).

[8] For more details on the Soil Moisture Anomaly, and the other GDO and EDO indicators of drought-related information used in the report, see the Appendix at the end of the document.

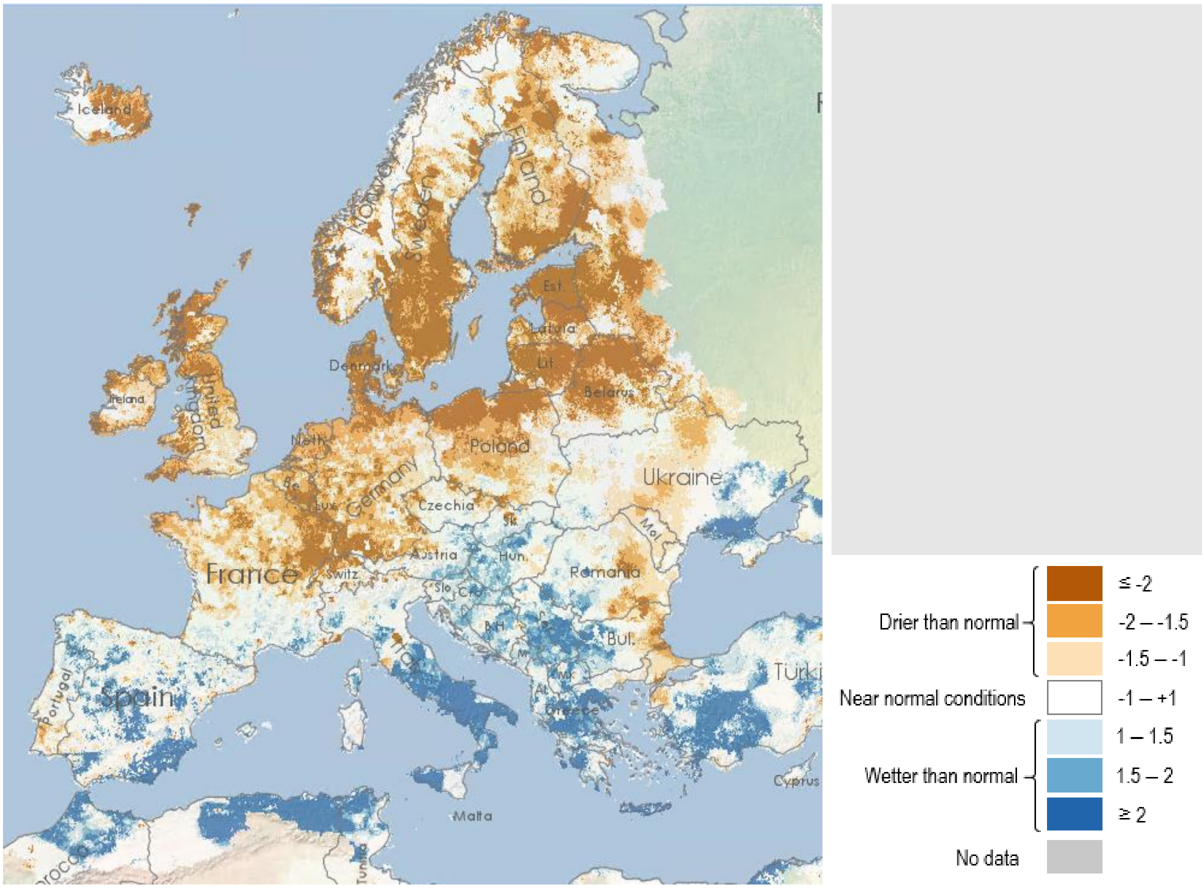

Figure 9: *Soil Moisture Anomaly for mid-June 2023.* [8]

Figure 10 shows the evolution of the Soil Moisture Anomaly during spring and early summer 2023. The severe dry conditions in February 2023 in the UK, Ireland, France, and northern Italy, rapidly improved in March and April thanks to precipitation, remaining slightly dry only in northern Italy. However, the drought severely expanded into the Iberian Peninsula. From April to May 2023 also the Baltic Sea regions became progressively drier. (Fig. 9) In June 2023 most of southern Europe shows wetter than normal soil moisture, while central and northern Europe is dry (Fig. 8). The evolution of these conditions during summer are potentially critical for the crop growing season.

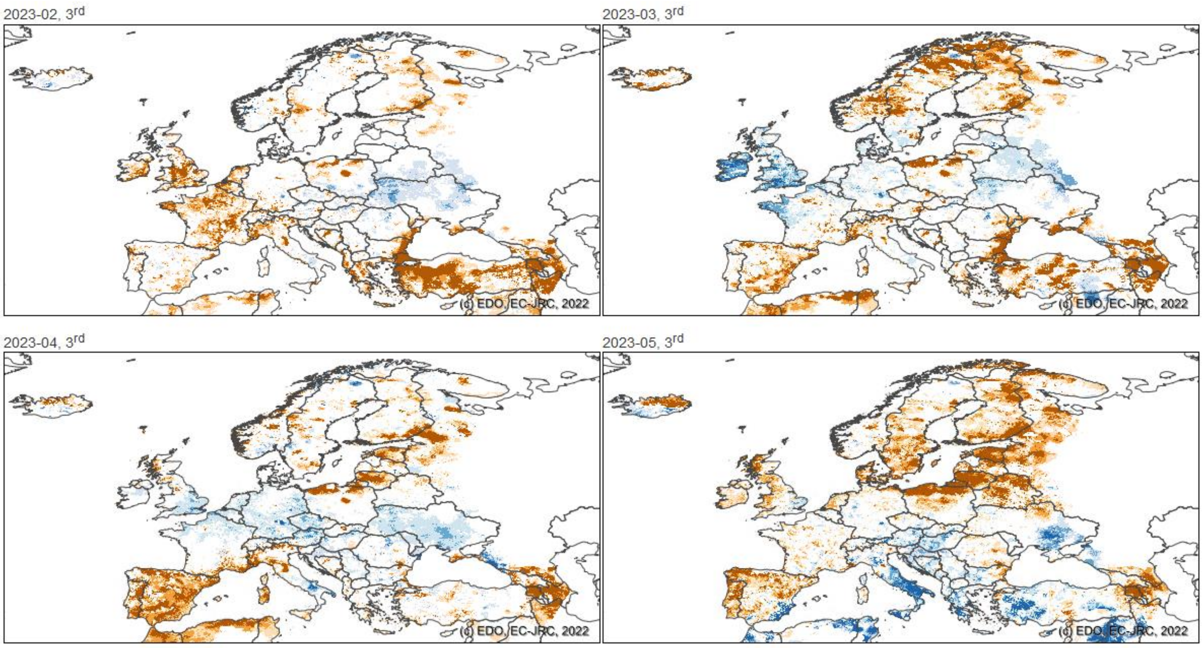

Figure 10: *Soil Moisture Anomaly from February to May 2023.*[8]

Vegetation biomass

In mid-June 2023, the satellite-derived fAPAR anomaly indicator shows severe vegetation stress over the Iberian Peninsula (except for northern Portugal and Galicia), most of the Mediterranean countries (except for some regions in Italy and Türkiye), northern Austria, Belorussia, Ukraine, and Romania (Fig. 11). These critical and widespread conditions are due to the combined effects of a severe lack of precipitation and higher-than-normal temperatures. [9]

[9] For more details on the satellite-derived fAPAR anomaly indicator, and the other GDO and EDO indicators of drought-related information used in the report, see the Appendix at the end of the document.

Drought in Europe - June 2023

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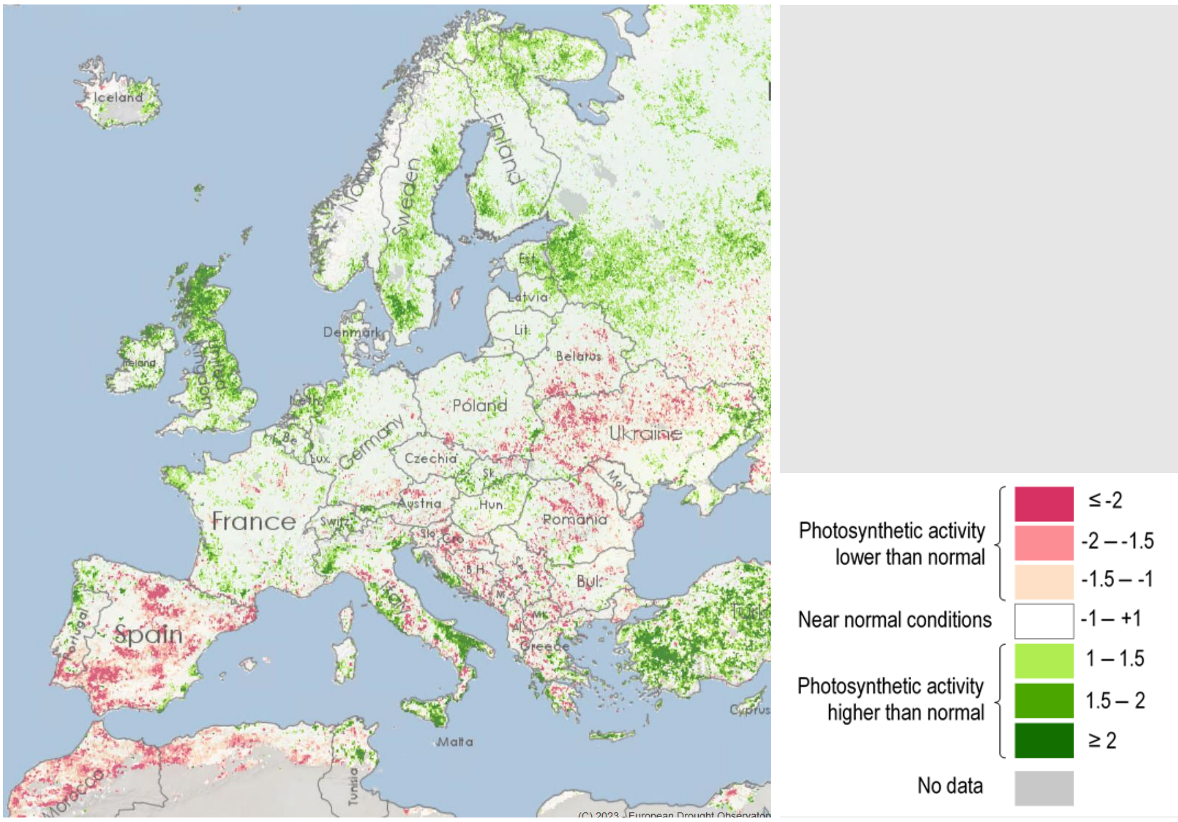

Figure 11: *Satellite-derived fAPAR anomaly indicator (measuring photosynthetic activity of vegetation), for mid-June 2023.*[9]

The evolution of the fAPAR anomaly from February to May 2023, shown in Figure 12, indicates a slow but progressive worsening of the vegetation stress, starting from Ireland in February 2023, then increasing and expanding in France and eastern Europe in March-April, and affecting the Mediterranean region with particular severity in the Iberian Peninsula in May.

Dedicated information concerning the agricultural yield forecast for Europe can be found in the JRC MARS Bulletins[10].

[10] https://joint-research-centre.ec.europa.eu/monitoring-agricultural-resources-mars/jrc-mars-bulletin_en

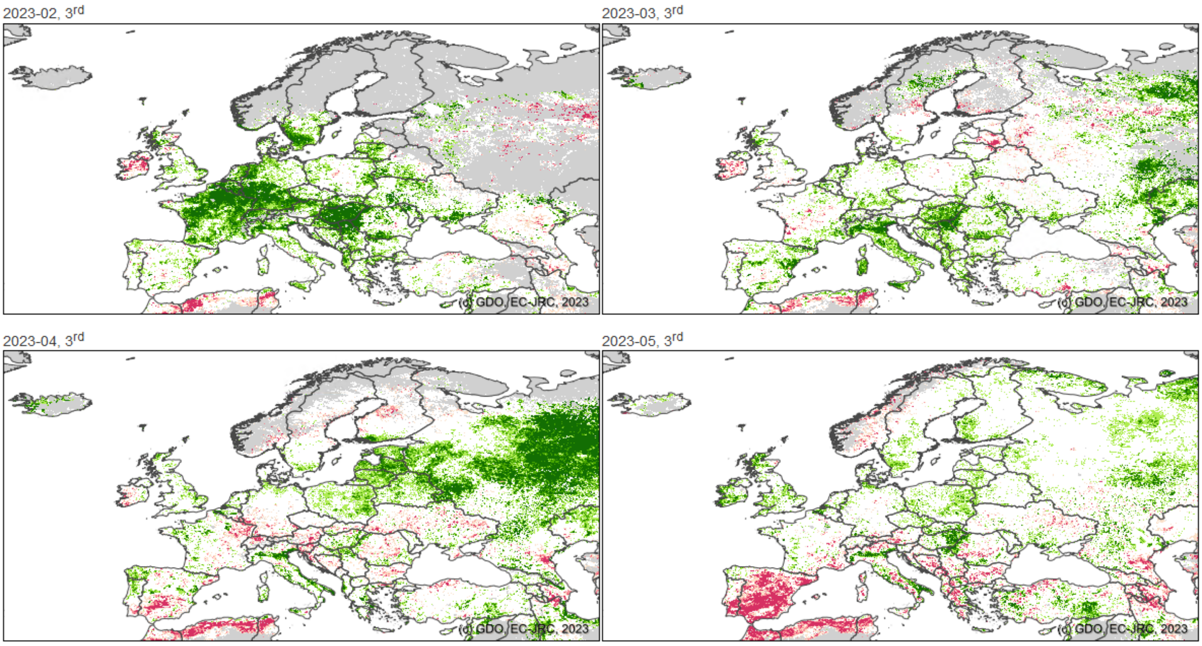

Figure 12: *Satellite-derived fAPAR anomaly indicator (measuring photosynthetic activity of vegetation), for the end of each month from February to May 2023.* [9]

River Flow

At the beginning of June 2023, the Low-Flow Index (LFI) shows critical hazard values mainly over Baltic Sea regions, Germany, north-eastern France and northern Ukraine. (Fig. 13). The flow reduction clearly correlates with the severe lack of precipitation of the last months, as shown by the SPI-3 and SPI-1 (Figs. 3 and 4).[11]

[11] For more details on the Low-Flow Index (LFI), and the other GDO and EDO indicators of drought-related information used in the report, see the Appendix at the end of the document.

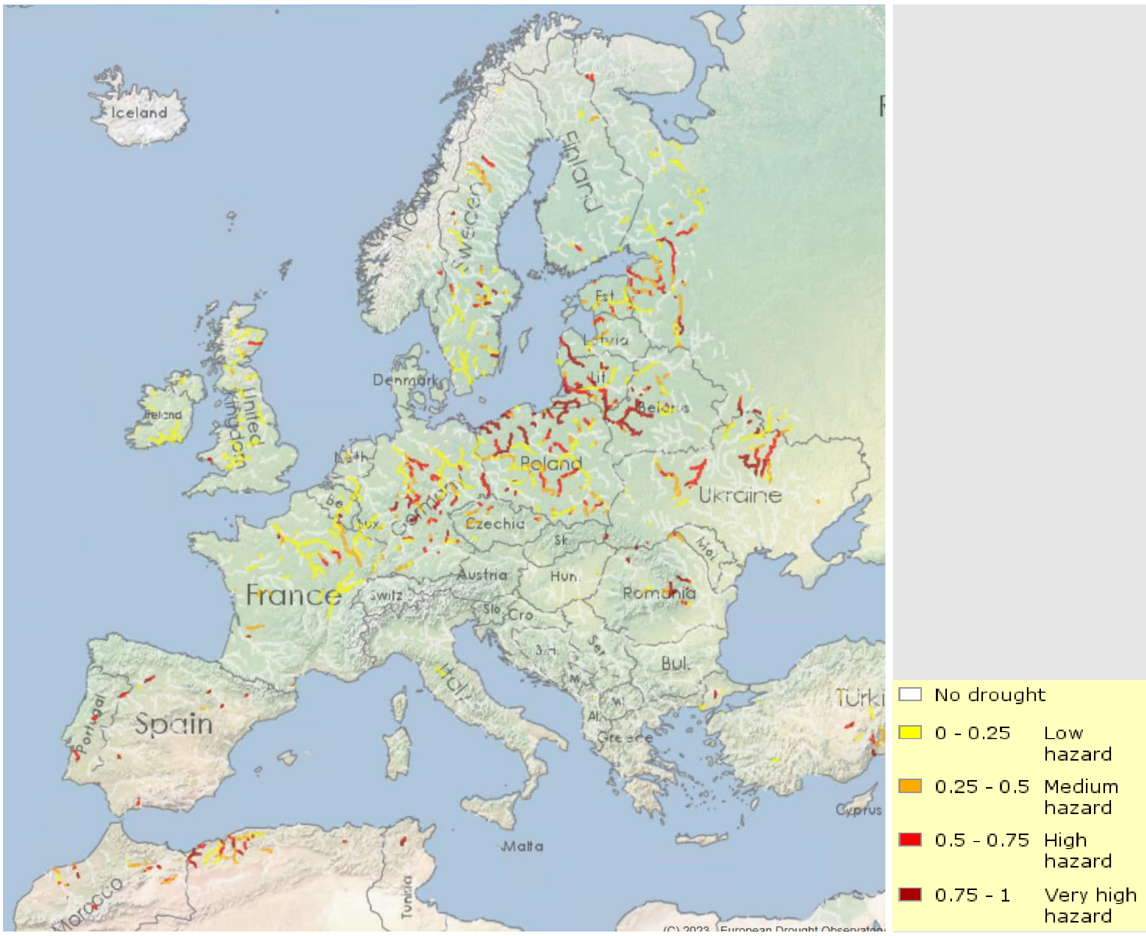

Figure 13: *Low-Flow Index (LFI) for the beginning of June 2023. LFI ranges from 0 (no drought) to 1 (very high drought hazard).*[11]

Large-scale atmospheric conditions

The days from 16th May to 15th June 2023 were characterized by two major centres of anomalous anticyclonic circulation, one between the UK and Ireland area and Iceland, and another one in western Russia. Cyclonic conditions were present over the Mediterranean basin. This particular atmospheric configuration led to predominantly easterly winds in eastern, central and western Europe, transferring dry and warm continental air. Contrastingly, wind flow in southern Europe was predominantly south-easterly, transferring moist air from the Mediterranean Sea to a region with atmospheric instability due to the cyclonic conditions. The lack of precipitation in the north of the continent on the one hand, and the above average precipitation in the south on the other hand (Fig. 4), are most likely the response to this observed large scale circulation.

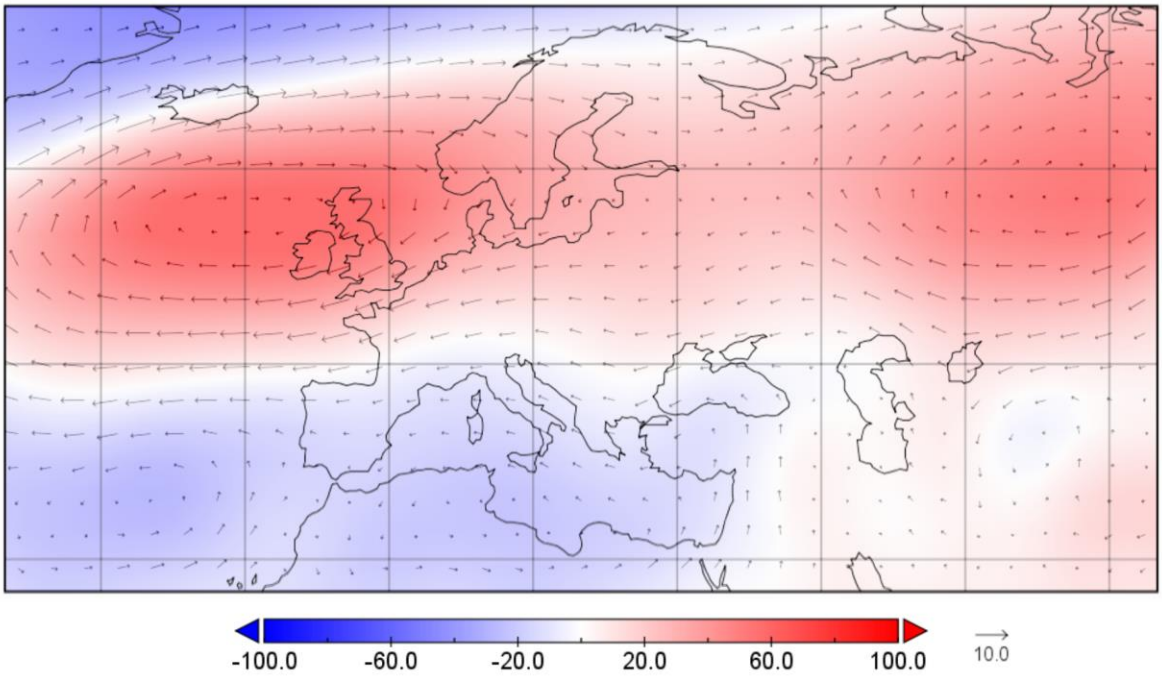

Figure 14*: Geopotential height (m, colour) and wind (m/s, vector) anomalies at 850 hPa for the period 16th May - 15th June. Data source: NCEP/NCAR reanalysis (https://psl.noaa.gov/data/composites/day/).*

Fire danger forecast

The wildfire hazard is a direct consequence of the elevated temperature anomalies and surface dryness, in combination with the availability of fuel (dry litter and wood). The European Forest Fire Information System (EFFIS) provides mapping services of the fire danger forecast all over Europe[12]. A high-to-extreme danger is shown over the Iberian Peninsula and most of the Mediterranean region. Moderate danger is shown in southern Germany, Czechia, and the south-eastern Baltic Sea countries up to the 7th July 2023 (Fig. 15).

[12] The European Forest Fire Information System of CEMS: https://effis.jrc.ec.europa.eu/

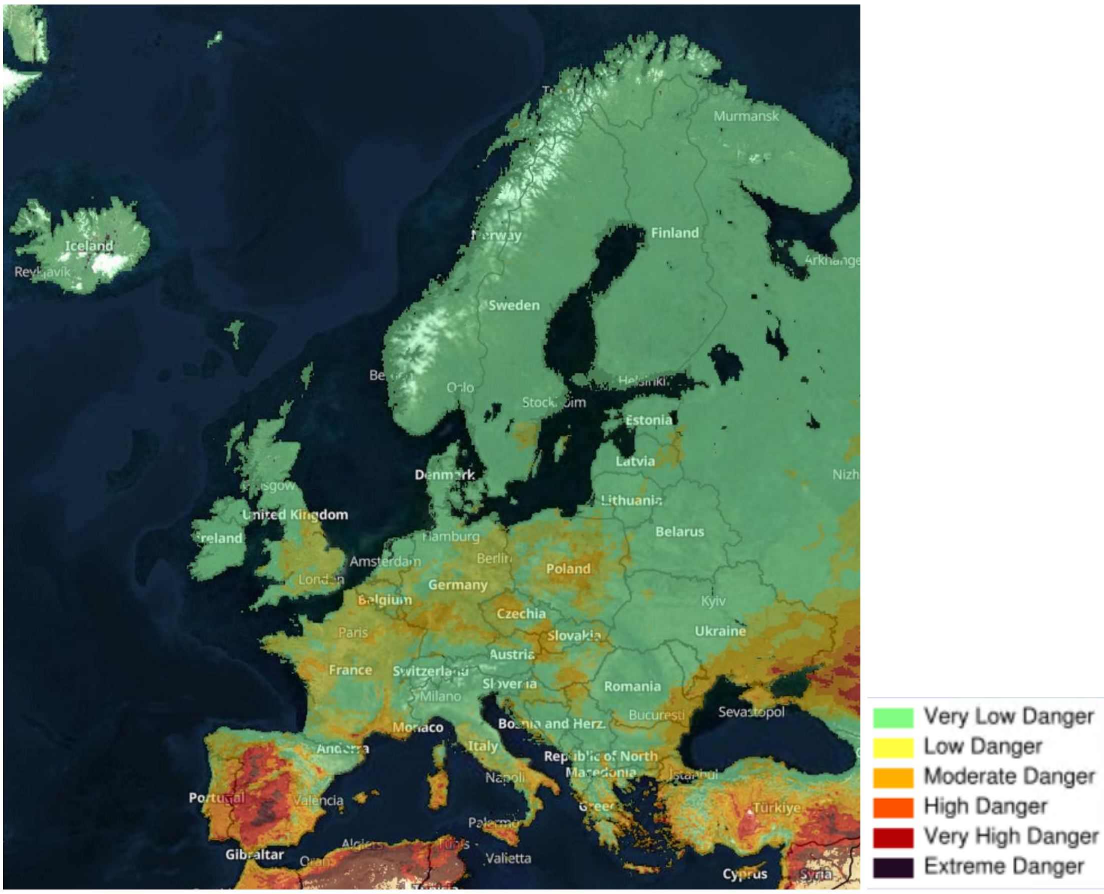

Figure 15*: Fire danger forecast expressed by the Fire Weather Index up to 7th July 2023. Data source: European Forest Fire Information System (EFFIS)[12].*

Seasonal forecast

From June to August 2023, drier than average conditions (compared with the 1981-2016 baseline) are predicted for southern Scandinavia, the southern UK, Denmark, Germany, and the Baltic Sea regions, as shown in Figure 16. Wetter conditions are predicted for the Mediterranean regions. According to the Copernicus C3S seasonal forecasts[13], warmer than usual conditions are likely to occur in Europe up to September 2023, with large positive anomalies. Precipitation forecasts are close to average conditions in central Europe, wetter in the Mediterranean, and slightly drier only in some Scandinavian regions. However, some variability between models is evident. Close monitoring is required to better understand the impacts expected for the coming season.

[13] https://climate.copernicus.eu/seasonal-forecasts

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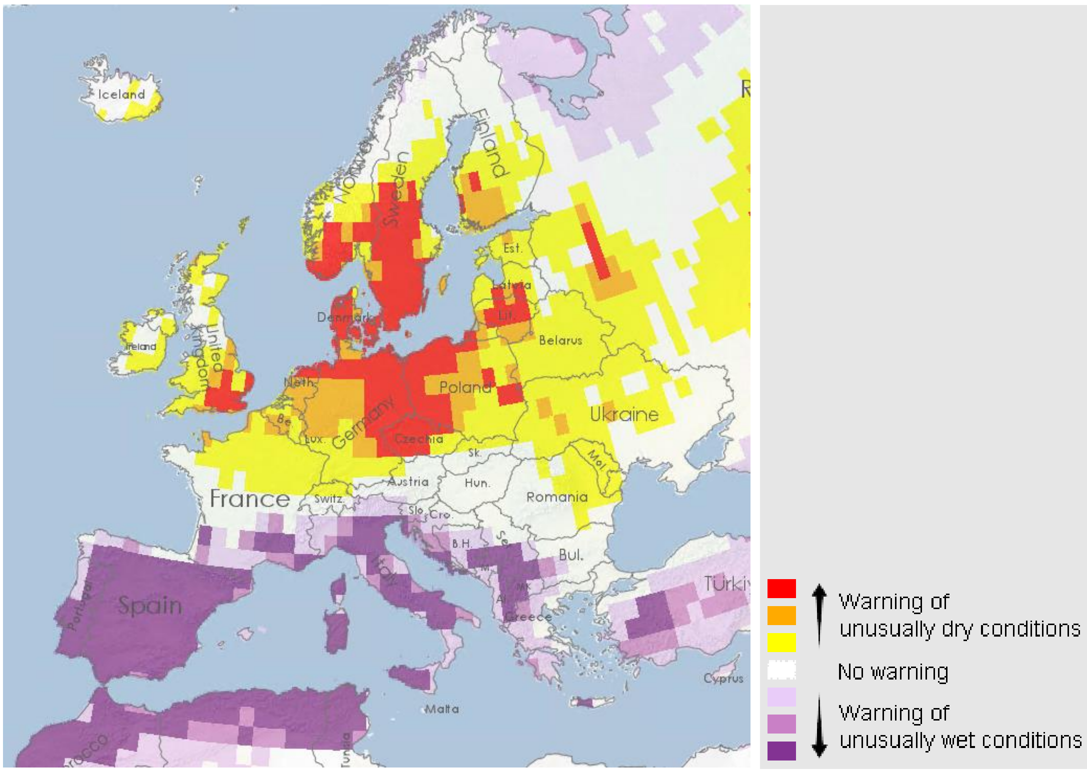

Figure 16: *Indicator for Forecasting Unusually Wet and Dry Conditions, for June to August 2023 (based on ECMWF SEAS5).*[14]

The probability of occurrence of low flows for rivers during July-August 2023 ranges from low to high in northern Spain, France, Sardinia, Sicily, Croatia, northern Germany, and the Baltic Sea regions (Fig. 17)[15, 16].

In these regions, the prolonged lack of precipitation and the forecast of a warmer-than-average summer is likely to cause a further reduction of river flows, with direct impacts on agriculture, ecosystems and energy production. Water resource management should be cautiously planned in order to limit impacts and identify adaptation strategies.

[14] For more details on the Indicator for Forecasting Unusually Wet and Dry Conditions, and the other GDO and EDO indicators of drought-related information used in the report, see the Appendix at the end of the document.

[15] The analysis is based on the LISFLOOD hydrological model outputs driven by 51 ensemble members of the ECMWF SEAS5 seasonal forecast. For more information on LISFLOOD: De Roo et al., 2000. "Physically based river basin modelling within a GIS: the LISFLOOD model". Hydrological Processes, 14, 1981–1992. Additional and updated information: Open Source Lisflood (ec-jrc.github.io)

[16] The regions displayed in Fig. 17 were created by merging several basins together, respecting hydro-climatic boundaries. This allows the capture of large-scale variability in weather, and the summarising of the forecast information. The map shows the river flow anomaly for each region over the forecast horizon (8 weeks): red [blue] colours indicate the probability of a low [high] flow anomaly. The intensity of the colour represents the highest forecasted probability of falling below [exceeding] the low [high] threshold within the forecast horizon.

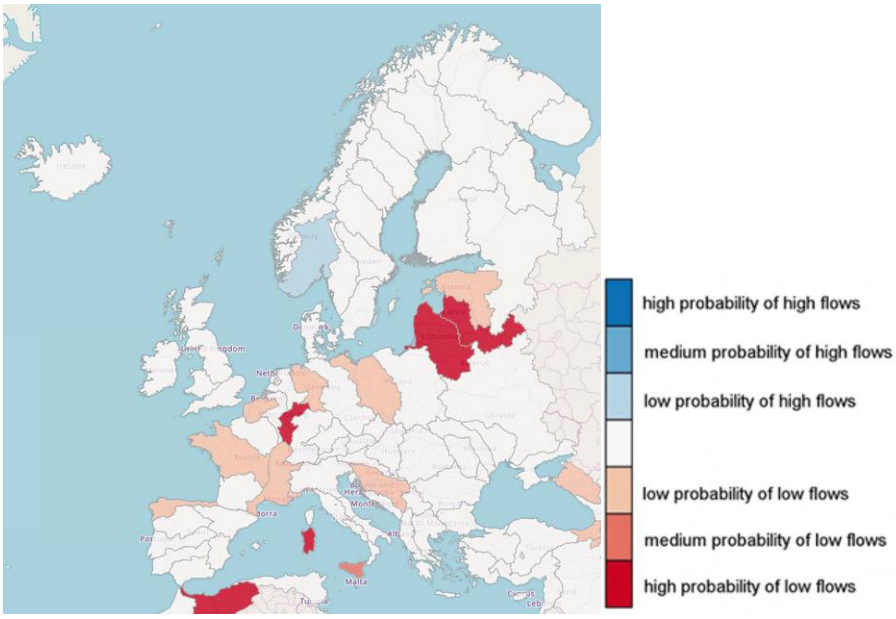

Figure 17: *The probability of occurrence of river flow anomalies for eight weeks (July-August 2023), issued on 4th July 2023. The thresholds for high and low probability refer to the 90th and 10th percentiles of the simulated discharge from a 29-year model climatology run (1991 - 2019).*[17]

Reported impacts

The European JRC Mars Bulletin of June 2023 reported that the recent precipitation in the Iberian Peninsula provided only limited benefit for spring crops already severely impacted, while summer crops continue under low irrigation quotas. In the Baltic Sea regions, Scandinavia, the UK, Ireland, Benelux and Germany, the lack of precipitation raises concern and water stress might impact yields. [18]

The European Commission has proposed to mobilise additional EU funding for EU farmers impacted by adverse climatic events, high input costs, and diverse market and trade related issues. The amount of the package will be €330 million for 22 Member States[19].

In Spain the recent precipitation was not enough to counterbalance the water deficit due to the prolonged drought. Moreover, there are great differences across the country where the reservoirs are at about 90% of their capacity in the north, and only 24% in the south.[20] In the affected regions water scarcity could have some impacts on normal water usage and could affect tourism. For example, the Veléz-Màlaga municipality in Andalusia, Spain, restricted supply of drinking water and prohibited its use for irrigation of gardens and parks and street and car washing. Citizens are asked to be responsible, supportive, and efficient in the use of water.[21]

[17] Source: The European Flood Awareness System (EFAS) of the Copernicus Emergency Management Service: https://www.efas.eu
[18] JRC MARS Bulletin - Crop monitoring in Europe - June 2023 - Vol. 31 No 6 https://publications.jrc.ec.europa.eu/repository/handle/JRC133186
[19] https://ec.europa.eu/commission/presscorner/detail/en/IP_23_3189
[20] https://www-eldebate-com.translate.goog/sociedad/sociedad-medio-ambiente/20230602/desigualdad-sequia-espana-cuencas-90-capacidad-norte-frente-24-sur_118486.html?_x_tr_sl=auto&_x_tr_tl=en&_x_tr_hl=it&_x_tr_pto=wapp
[21] https://www-iagua-es.translate.goog/noticias/europa-press/velez-malaga-restringe-abastecimiento-agua-potable-como-consecuencia-sequia?_x_tr_sl=auto&_x_tr_tl=en&_x_tr_hl=it&_x_tr_pto=wapp

The Environment Agency in the UK met at the end of June 2023 with a team of national experts to discuss and take steps to increase water resilience, and maintain a stable water supply, design plans to fix leaks and reduce water loss, proactively react to droughts, help to reduce water consumption, and prioritise water usage to ensure water for essential needs.[22]

Appendix: GDO and EDO indicators of drought-related information

The Combined Drought Indicator (CDI) of the European Drought Observatory (EDO) is used to identify areas that may be affected by agricultural drought. The CDI is derived by combining the Standardized Precipitation Index (SPI), the Soil Moisture Index Anomaly (SMA), and the FAPAR anomaly. Areas are classified according to three primary drought classes: (1) "Watch", indicating less than normal precipitation; (2) "Warning", indicating that also soil moisture is in deficit; (3) "Alert", indicating that also vegetation shows signs of stress. Three additional classes – i.e. "Recovery", "Temporary Soil Moisture Recovery" and "Temporary FAPAR Recovery" – identify the stages of drought recovery processes in terms of impacts on soil moisture and vegetation.

The Standardized Precipitation Index (SPI) provides information on the intensity and duration of the precipitation deficit (or surplus). SPI is used to monitor the occurrence of drought. The lower (i.e., more negative) the SPI, the more intense is the drought. SPI can be computed for different accumulation periods: the 3-month period is often used to evaluate agricultural drought and the 12-month (or even 24-month) period for hydrological drought, when rivers fall dry and groundwater tables lower.

The Heat and Cold Wave Index (HCWI) is used to detect and monitor periods of extreme-temperature anomalies (i.e., heat and cold waves) that can have strong impacts on human activities, health and ecosystem services such as sprouting of crops. It is based on the persistence for at least three consecutive days of events with both daily minimum and maximum temperatures (Tmin and Tmax) above the 90th percentile daily threshold (for heat waves) or below the 10th percentile daily threshold (for cold waves). For each location, the daily threshold values for Tmin and Tmax are derived from a 30-year climatological baseline period (1991-2020), using the GloFAS/ERA5 derived temperature data.

Lack of precipitation induces a reduction of soil water content. The Soil Moisture Anomaly provides an assessment of the deviations from normal conditions of root zone water content. It is a direct measure of drought associated with the difficulty of plants in extracting water from the soil.

The satellite-based fraction of Absorbed Photosynthetically Active Radiation (fAPAR) monitors the fraction of solar energy absorbed by leaves. It is a measure of vegetation health and growth. Negative fAPAR anomalies with respect to the long-term average are associated with negative impacts on vegetation.

The Low-Flow Index (LFI) is based on daily river water discharge simulated by the LISFLOOD hydrological model. It captures consecutive periods of unusually low streamflow. It compares the consequent water deficit during those periods with historical climatological conditions.

The Indicator for Forecasting Unusually Wet and Dry Conditions provides early risk information for Europe. The indicator is computed from forecasted SPI-1, SPI-3, and SPI-6 derived from the ECMWF seasonal forecast system SEAS5.

Check https://edo.jrc.ec.europa.eu/factsheets for more details on the GDO and EDO indicators.

[22] https://www.gov.uk/government/news/drought-planning-stepped-up-amid-potential-hottest-june-on-record

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JRC Global Drought Observatory (GDO) of the Copernicus Emergency Management Service (CEMS) – GDO/EDO data up to 20/06/2023

Glossary of terms and acronyms

CDI	Combined Drought Indicator
CEMS	Copernicus Emergency Management Service
EC	European Commission
ECMWF	European Centre for Medium-Range Weather Forecasts
EDO	European Drought Observatory
EFFIS	European Forest Fire Information System
ERA5	ECMWF Reanalysis v5
ERCC	European Emergency Response Coordination Centre
EU	European Union
fAPAR	Fraction of Absorbed Photosynthetically Active Radiation
GDO	Global Drought Observatory
GloFAS	Global Flood Awareness System
HCWI	Heat and Cold Wave Index
JRC	Joint Research Centre
KNMI	Koninklijk Nederlands Meteorologisch Instituut (Royal Netherlands Meteorological Institute)
LFI	Low-Flow Index
MARS	Monitoring Agricultural Resources
NCAR	National Center for Atmospheric Research (United States of America)
NCEP	National Centers for Environmental Prediction (United States of America)
SLF	Institute for Snow and Avalanche Research (Switzerland)
SMA	Soil Moisture Anomaly
SPI	Standardized Precipitation Index
SWE	Snow Water Equivalent
VIIRS	Visible Infrared Imaging Radiometer Suite
WSL	Swiss Federal Institute for Forest, Snow and Landscape Research

GDO and EDO indicators versioning

The GDO and EDO indicators appear in this report with the following versions:

GDO, EDO indicator	*Version*
▪ Combined Drought Indicator (CDI)	*v.3.0.1*
▪ Low-Flow Index (LFI)	*v.2.1.0*
▪ Soil Moisture Index (SMI) Anomaly (SMA)	*v.2.1.2*
▪ fAPAR (fraction of Absorbed Photosynthetically Active Radiation) Anomaly (VIIRS)	*v.1.0.0*
▪ Indicator for Forecasting Unusually Wet and Dry Conditions	*v .1.1.0*
▪ Standardized Precipitation Index (SPI) (ERA5)	*v.1.0.0*
▪ Heat and Cold Wave Index (HCWI)	*v.1.0.0*

Check https://edo.jrc.ec.europa.eu/download for more details on GDO and EDO indicator versions.

Distribution

For use by the ERCC and related partners, and publicly available for download at GDO website: https://edo.jrc.ec.europa.eu/reports

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