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Drought in the Mediterranean Region
January 2024

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Emergency Management Service

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Drought in the Mediterranean Region - January 2024

JRC Global Drought Observatory (GDO) of the Copernicus Emergency Management Service (CEMS) – GDO/EDO data up to 20/01/2024

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Abstract

- After the severe and prolonged drought events that impacted northern Africa during the last 6 years, and Europe for over 2 years, drought conditions are again affecting large parts of the Mediterranean region.
- Long-lasting, above-average temperatures and a sequence of warm spells have exacerbated the effect of the prolonged lack of precipitation, directly impacting soil moisture and vegetation growth, with severe impacts already visible in northern Africa, coastal regions of Spain, and most of the Mediterranean islands.
- Wildfire danger varies from moderate to high over some coastal regions of Spain, but ranges from very high to extreme over northern Africa.
- Impacts on water resources have been reported over coastal regions of the Iberian Peninsula, the Mediterranean islands, and northern Africa. Water use restrictions have been announced or are already implemented in Spain, Portugal, and Morocco.
- At the end January 2024, the snow water equivalent (i.e. the amount of water the snowpack contains) in Italy is far below the historical average, and even lower than the one of the 2022-2023 winter. This will lead to severely reduced snowmelt contribution to river flows in the peri-alpine region during spring and early summer 2024.
- Seasonal forecasts point to a warmer than average spring 2024, compared with long-term records.

Combined Drought Indicator (CDI)

After an extremely hot 2023, dry conditions are again affecting most of the Mediterranean region, and are already associated with severe impacts. In terms of availability of water resources, the evolution is uncertain and variable across the different sub-regions.

The Combined Drought Indicator (CDI)[1] for mid-January 2024 (Fig. 1) shows generally severe and potentially critical conditions in the Mediterranean region. Southern and eastern Spain, southern France, most of Italy, Malta, eastern Poland, central Romania, southern Greece, Cyprus and central Türkiye are in warning conditions.

Some parts of the Mediterranean region, namely southern Italy, southern Spain and Malta, are under alert conditions, with vegetation already affected by the drought. This phenomenon is much more severe and prolonged in Morocco, Algeria and Tunisia, where the situation appears to be serious.

The persistent lack of precipitation in the last months and warmer-than-average temperatures have led to severe negative soil moisture anomalies and poor vegetation conditions in those areas.

The evolution of the CDI (Fig. 2) shows that watch-to-warning drought conditions were identified in northern Africa, southern France, Italy, the Alps, the Balkans, and eastern Europe in September 2023. By October 2023, they worsened towards scattered alert conditions over some regions of northern Africa, Italy, and the Alps, and widespread warning conditions in the Balkans, while France entered into a recovery phase. During November 2023, the recovery phase developed also in the Balkans, but the drought further developed and worsened in northern Africa, the southern and the eastern parts of the Iberian Peninsula, central and southern Italy, Greece and the Mediterranean islands, with widespread warning conditions and large alert conditions by December 2023.

[1] 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 the Mediterranean Region - January 2024

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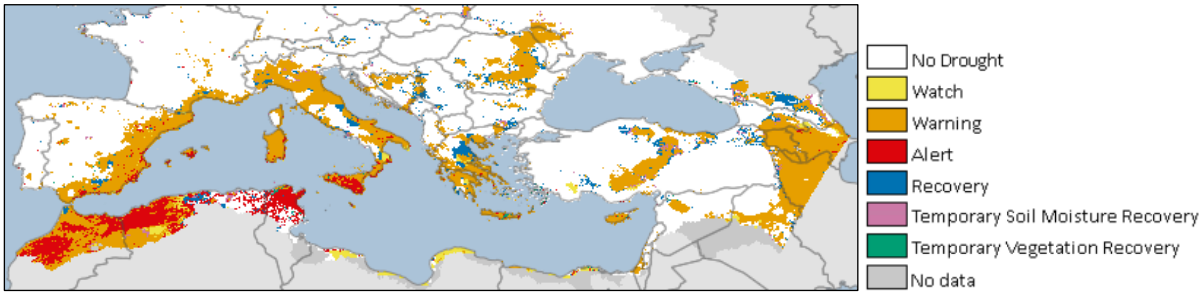


Figure 1: The Combined Drought Indicator (CDI), based on a combination of indicators of precipitation, soil moisture, and vegetation conditions, for mid-January 2024.[1]

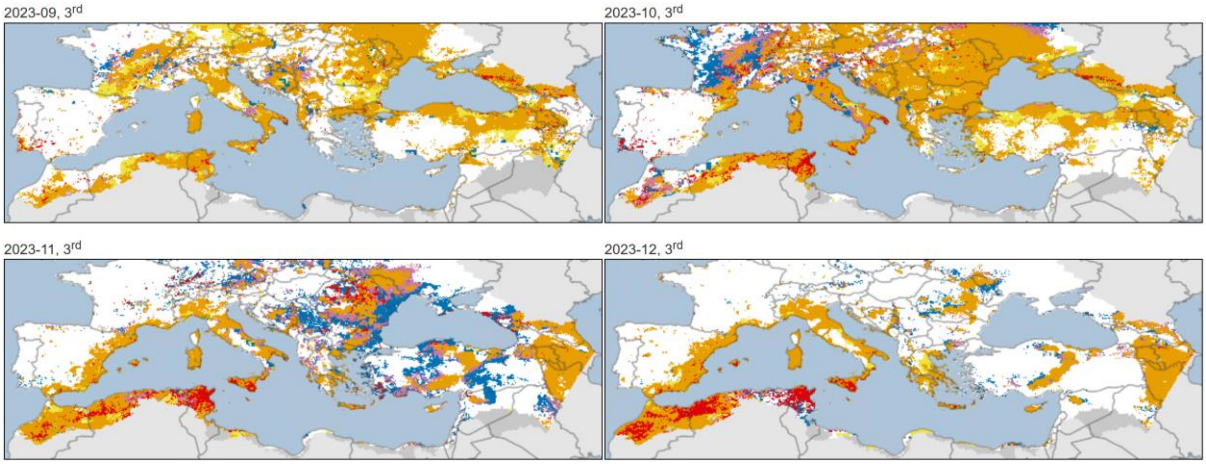


Figure 2: The Combined Drought Indicator (CDI), based on a combination of indicators of precipitation, soil moisture, and vegetation conditions, from September to December 2023. [1]

Standardized Precipitation Index (SPI)

In mid-January 2024, SPI-3 (i.e. SPI computed for an accumulation period of 3 months)[2] shows normal or wetter than normal conditions over the northern side of the Alps and the Balkans, while dry anomalies are seen for most coastal regions of the Mediterranean region and particularly for most of northern Africa (Fig. 3).

Until September 2023, persistent negative anomalies of precipitation had been affecting many parts of southern and eastern Europe for over a year, with the exception of most of the Iberian Peninsula and Greece (Fig. 4, top-left). In October 2023, precipitation conditions changed to normal or wetter than normal for most of central Europe (based on SPI-3), with dry anomalies concentrated in northern Africa, southern Italy, eastern Europe, and the Balkans (Fig. 4, top-right). In November 2023, the drought in the eastern regions quickly receded, and the drought was evolving more over the Mediterranean region, remaining mostly stable also in December 2023 (Fig. 4, bottom-left and right).

[2] 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.

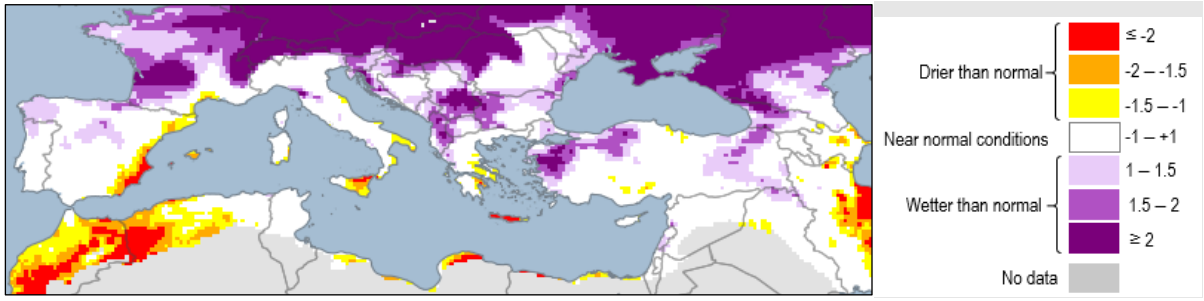


Figure 3: Standardized Precipitation Index (SPI-3), for the 3-month accumulation period ending in mid-January 2024.[2]

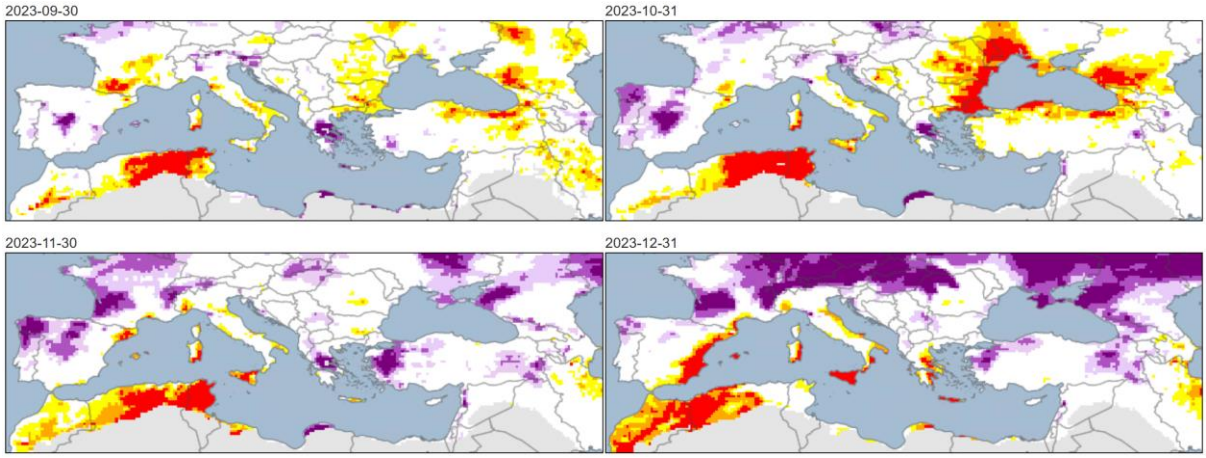


Figure 4: Standardized Precipitation Index (SPI-3) for the 3-month accumulation period from September to December 2023.[2]

Temperature

During 2023, most of the Mediterranean region experienced above-average temperatures. In September (Fig. 5a), positive temperature anomalies affected mostly the northern side of the Mediterranean region with anomalies above 3° C, while the rest of the region was still under positive anomalies, with values above 1° C. In October 2023 (Fig. 5b), the warm positive anomalies expanded southwards over almost the entire Mediterranean region, with very large areas experiencing anomalies above 2° C. The highest temperature anomalies were concentrated across the eastern Mediterranean during the last two months of 2023 (Fig. 5c and 5d). These anomalies occurred at the end of the hottest year on record, according to the Copernicus Climate Change Service.[3]

In addition to above-average temperatures, a sequence of warm spells hit most of the Mediterranean region in the period from September to December 2023. The Heat and Cold Wave Index (HCWI)[4] shows the most extended and long-lasting events in this period (Fig. 6). Italy, the Iberian Peninsula, northern Africa and Türkiye were alternatively hit.

[3] https://climate.copernicus.eu/global-climate-highlights-2023
[4] 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.

Drought in the Mediterranean Region - January 2024

JRC Global Drought Observatory (GDO) of the Copernicus Emergency Management Service (CEMS) – GDO/EDO data up to 20/01/2024

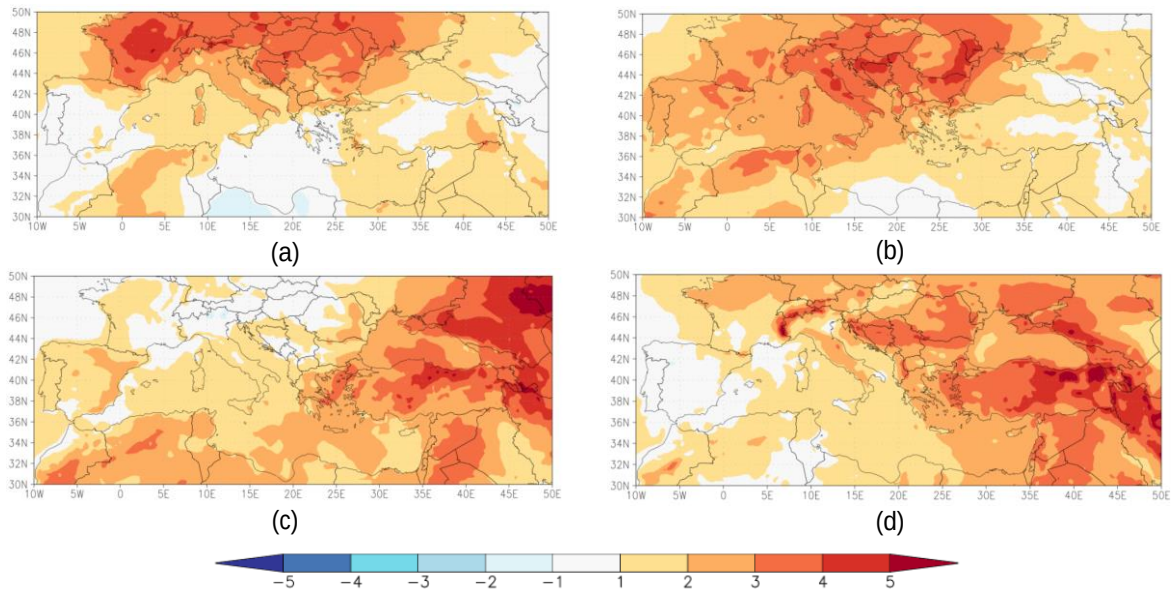


Figure 5: Average temperature anomalies (ERA5, baseline 1991-2020) in 2023, computed for (a) September, (b) October, (c) November, and (d) December. Source: The KNMI Climate Explorer.[5]

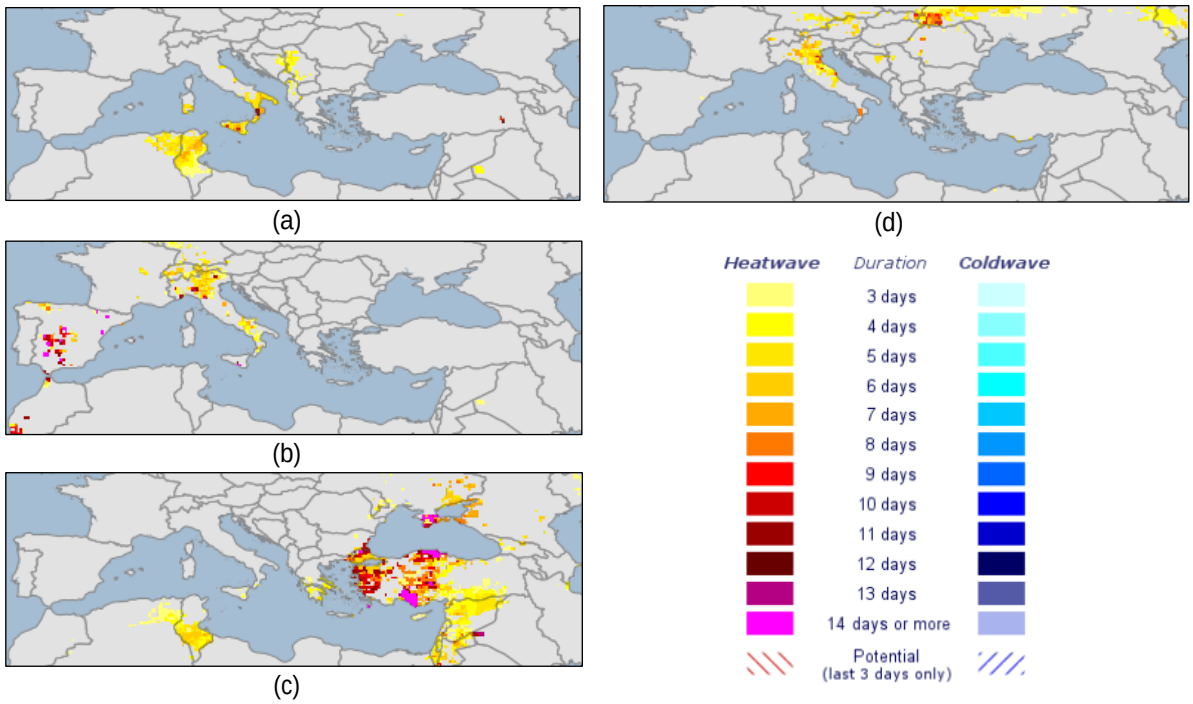


Figure 6: Duration (in days) of the heatwaves and warm spells in 2023, computed on (a) 20 September, (b) 9 October, (c) 1 November, and (d) 30 December, based on the Heat and Cold Wave Index (HCWI). The yellow-to-purple colour scheme represents increasing duration.[4]

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

Snow Water Equivalent (SWE)

At the end of January 2024, snow water resources across Italy are well below average conditions. After considerable snowfalls in early November and early January, weather conditions have been dry and warm since the second half of January. As a result, the snow line is higher than usual, and the snowpack thinner than usual. Additionally, snow water resources are depleting across the country, with a current deficit of -63% compared with 2011-2022, placing the SWE indicator for 2024 well below the first quartile of the historical period (Fig. 7). At the end of January 2024, conditions are worse than those ones of 2023 (mean anomaly of -42% compared with 2023). The most significant deficit is in the Apennines, where snow conditions are essentially stable since late autumn.

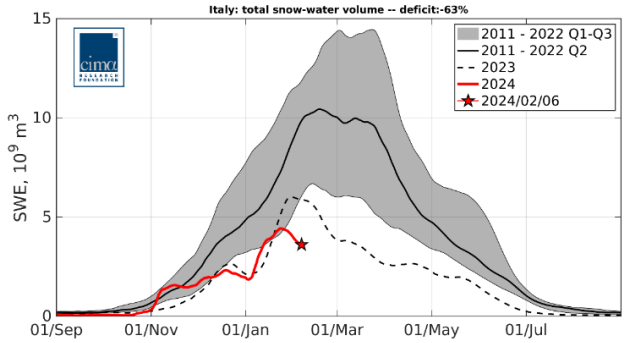


Figure 7: Snow Water Equivalent (SWE) anomaly for Italy, for the 2023-2024 snow season. Total SWE for Italy for the snow seasons of 2023-2024 (red line) and 2022-2023 (black dashed line), compared with the 2011-2022 climatology. The black line represents the median or second historical quartile (Q2), while the grey area encloses the range between the first (Q1) and third (Q3) quartiles. Source: CIMA Research Foundation.[6]

Considering the entire Alps in terms of snow covered area, two extensive snowfall periods have been observed in early November 2023 and early December 2023, reaching an extent of snow covered area even above the long term average. However, the above average temperature caused a rapid and anticipated snowmelt and the depletion of the snowpack afterwards. After a less relevant and shorter snow event in mid-January 2024, the snow covered area dropped to its minimum value by early February 2024 due to the warm temperature and the lack of precipitation (Fig. 8).

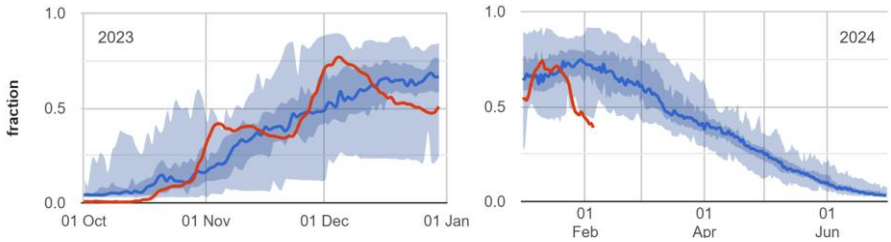


Figure 8: Snow covered area fraction over the Alps for the snow season 2023-2024 (red line) compared to the climatology (median – blue line, 25th and 75th percentiles - darker area, min and max – lighter area). Source: Alps Snow Monitor[7]

[6] The analysis over the Italian Alps is based on data and information provided by the operational snow monitoring system for Italy (S3M -Italy) developed and maintained by CIMA (International Centre for Environmental Monitoring) Research Foundation on behalf of the Italian Civil Protection Department (DPC). This system provides hourly snapshots of snow depth and mass content (SWE) at 200 metres resolution (Avanzi et al., 2023; https://essd.copernicus.org/articles/15/639/2023/essd-15-639-2023.html).

[7] Alps Snow Monitor – Séries Temporelles (obs-mip.fr). For the methodology see Gascoin, S., Monteiro, D., Morin, S. (2022) Reanalysis-based contextualization of real-time snow cover monitoring from space, Environ. Res. Lett. 17 114044 https://doi.org/10.1088/1748-9326/ac9e6a

Soil moisture

At mid-January 2024, the Soil Moisture Anomaly indicator[8] (Fig. 9) is negative over most of the Mediterranean region, particularly in northern Africa, the southern and eastern Iberian Peninsula, the Mediterranean islands, central Greece and some regions of Italy (see Fig. 9). These conditions are a continuation of the severe droughts that had hit Europe in the previous two years, due to a combination of low precipitation and high temperatures. The drier than normal soil moisture pattern is consistent with the precipitation deficit of the previous months, as shown by the SPI-3 (see Fig. 3 and Fig. 4, last panel). Some of the regions with the strongest precipitation anomalies were also affected by high temperatures, which also accelerated water loss from the soil. Some areas show a Soil Moisture Anomaly below -2, corresponding to the driest class for this indicator.

Figure 10 shows the evolution of the Soil Moisture Anomaly for autumn and early winter 2023. In September, moderate dry conditions affected most of the Mediterranean region, the only exceptions being the Iberian Peninsula and Greece. In October 2023, soil moisture anomalies became drier over the same regions and expanded also over Greece and the Mediterranean coast of the Iberian Peninsula. Then, in November and December 2023 a shift towards wetter-than-normal conditions was observed over the northern side of the Alps and Europe; while northern Africa, southern and eastern Iberian Peninsula, the Mediterranean islands, most of Italy, Greece and central Türkiye experienced further worsening of the dry conditions.

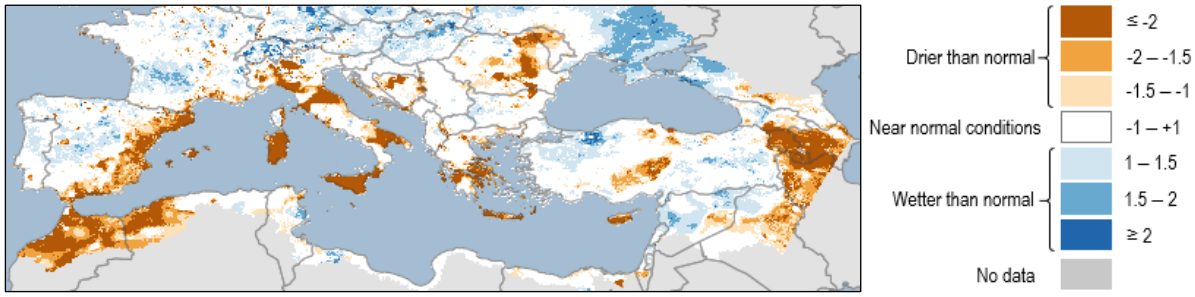


Figure 9: Soil Moisture Anomaly for mid-January 2024.[8]

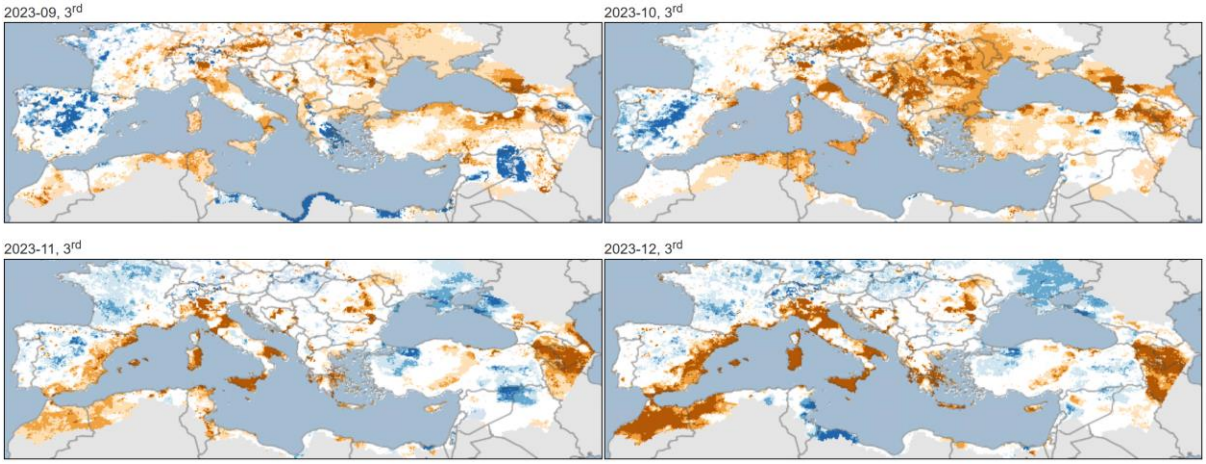


Figure 10: Soil Moisture Anomaly from September to December 2023.[8]

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

Vegetation biomass

In mid-January 2024, the satellite-derived fAPAR anomaly indicator[9] shows some vegetation stress over the southern and eastern coasts of the Iberian Peninsula, southern Italy (Sicily), and northern Africa (Fig. 11).

The evolution of the fAPAR anomaly from September to December 2023 (Figure 12) indicates variable vegetation stress conditions, with relevant spatial differences, and alternating worsening and improvement, in particular in the Iberian Peninsula and the western Mediterranean region. In October 2023, the regions affected by poor vegetation conditions reached the maximum extent, including most of the Iberian Peninsula, southern France, central and north-eastern Italy and most of northern Africa. Later, it decreased (due also to the changing season), with only southern regions of Europe and northern Africa remaining severely affected.

Dedicated information on the agricultural yield forecast for Europe are provided in the JRC MARS Bulletins[10].

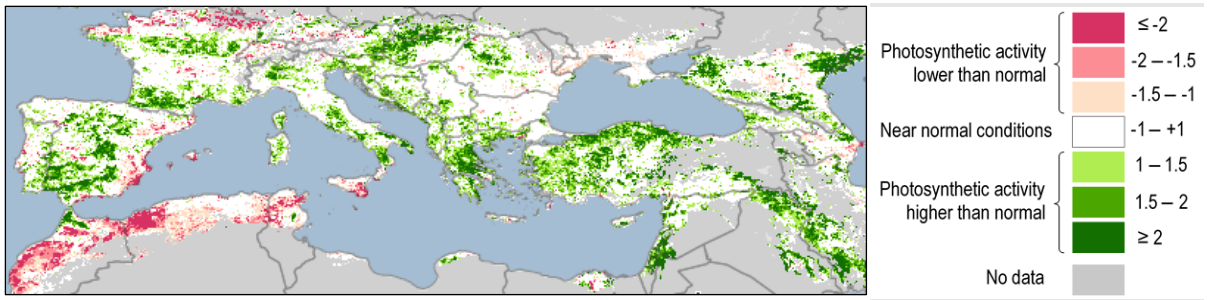


Figure 11: Satellite-derived fAPAR anomaly indicator (measuring photosynthetic activity of vegetation), for mid-January 2024.[9]

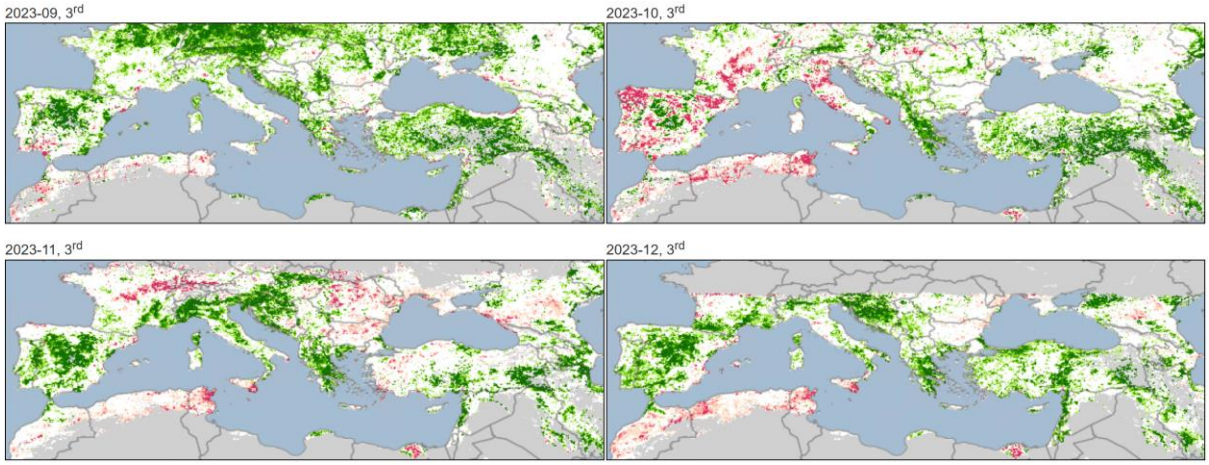


Figure 12: Satellite-derived fAPAR anomaly indicator (measuring photosynthetic activity of vegetation), for the end of each month from September to December 2023. [9]

[9] For more details on the satellite-derived Fraction of Absorbed Photosynthetically Active Radiation (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.
[10] https://joint-research-centre.ec.europa.eu/monitoring-agricultural-resources-mars/jrc-mars-bulletin_en

Large-scale atmospheric conditions

The second half of 2023 was characterized by a dipole of negative (cyclonic) and positive (anticyclonic) geopotential anomalies in, respectively, northern Europe and the western Mediterranean region (Fig. 13). This atmospheric configuration explains the enhanced moisture flow into western, northern, and central Europe from the Atlantic due to a stronger westerly wind, resulting in wetter than average conditions in these areas. On the other hand, the anticyclonic conditions in the western Mediterranean are typical of below-average cloud cover, above-average solar radiation at the surface and below-average precipitation (Fig. 4), leading to (or worsening) drought conditions, particularly in most of the Iberian Peninsula, parts of Italy, the western Mediterranean region, and most of the Maghreb region.

It is worth noting that the atmospheric conditions of July-December 2023 are not exactly the typical ones expected during El Niño[11], which would tend to favour wetter than average summers and autumns in the western Mediterranean region[12]. This highlights once more nonlinearities in the teleconnection between European climatic conditions and El Niño, and points to the role of other external drivers (e.g. Indian Ocean or Atlantic Ocean conditions), climate change, or internal atmospheric variability that may modulate the response and the observed conditions in the region.

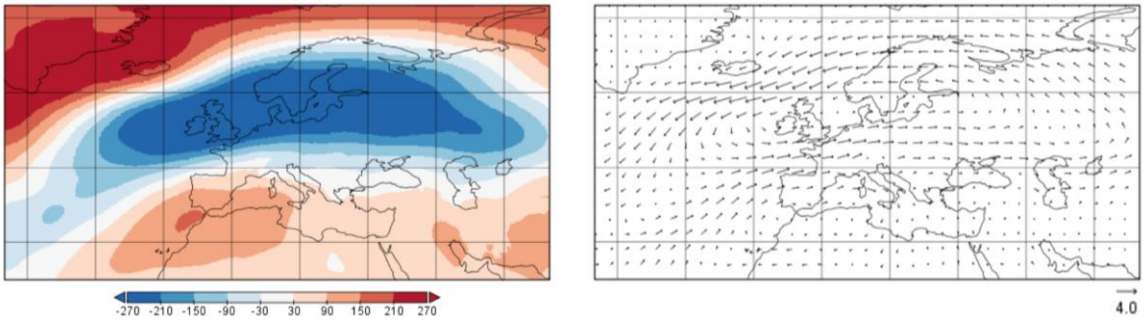


Figure 13: 850 hPa geopotential (m^2/s^2, left) and horizontal wind (m/s, right) anomalies between July-December 2023 (data source: ERA5, baseline 1991-2020). The reference vector wind magnitude is 4 m/s. Source: internal GDO analysis

Fire danger

Fire danger, or wildfire hazard, is a direct result of elevated temperature anomalies and surface dryness, combined with the availability of fuel (dry litter and wood). The CEMS European Forest Fire Information System (EFFIS) provides mapping services of the fire danger, forecast all over Europe[13]. Up to 26 January 2024, EFFIS shows very high to extreme fire danger in most of northern Africa, and moderate to high fire danger in south-eastern Spain (Fig. 14).

[11] "El Niño" is the warm phase of the "El Nino Southern Oscillation" (ENSO) climate pattern, with the other (cold) phase being "La Niña".

[12] Shaman, J., and E. Tziperman, 2011: An Atmospheric Teleconnection Linking ENSO and Southwestern European Precipitation. J. Climate, 24, 124–139, https://doi.org/10.1175/2010JCLI3590.1

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

Figure 14: Fire danger expressed by the Fire Weather Index up to 26 January 2024. Data source: European Forest Fire Information System (EFFIS).[13]

Seasonal forecast

From February to April 2024, as shown in Figure 15, close to average or slightly wetter than average conditions (compared with the 1981-2016 baseline) are predicted for the northern Mediterranean region, with larger wet anomalies forecast for eastern Europe. Drier than normal conditions are predicted for southern Italy, Greece, the Mediterranean islands, and northern Africa.

Based on the Copernicus Climate Change Service (C3S) seasonal forecasts[14] (not shown here), warmer than usual conditions are likely to occur in Europe up to April 2024, with larger positive anomalies in the southern Mediterranean region. Precipitation forecasts are close to average or slightly wetter than average for the northern Mediterranean region, and mostly slightly drier than average in the southern Mediterranean region. Some variability between the models is present.

As shown in Figure 16, most of Italy, northern Africa, North Macedonia, eastern Greece, and eastern Türkiye are expected to be affected by very low flow conditions in February-March 2024. The seasonal hydrological outlook for February-March 2024 foresees more critical conditions for the first half of February, while, later-on, a partial mitigation of low flow conditions is expected, in favour of river flow values slightly closer to the seasonal mean water balance. A couple of examples of this pattern are shown in Figure 17 for northern Italy (left) and eastern Greece (right). In the regions highlighted in Figure 16, the prolonged lack of precipitation and warmer than average temperatures are potentially affecting river flows, with direct impacts on agriculture, ecosystems and energy production. Water resource management should be planned cautiously, to limit impacts and to identify adaptation strategies.

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

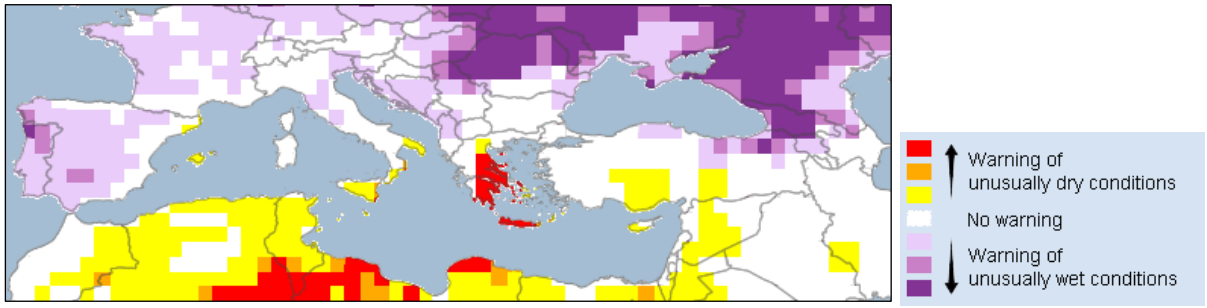


Figure 15: Indicator for Forecasting Unusually Wet and Dry Conditions, for February to April 2024 (based on ECMWF SEAS5).[15]

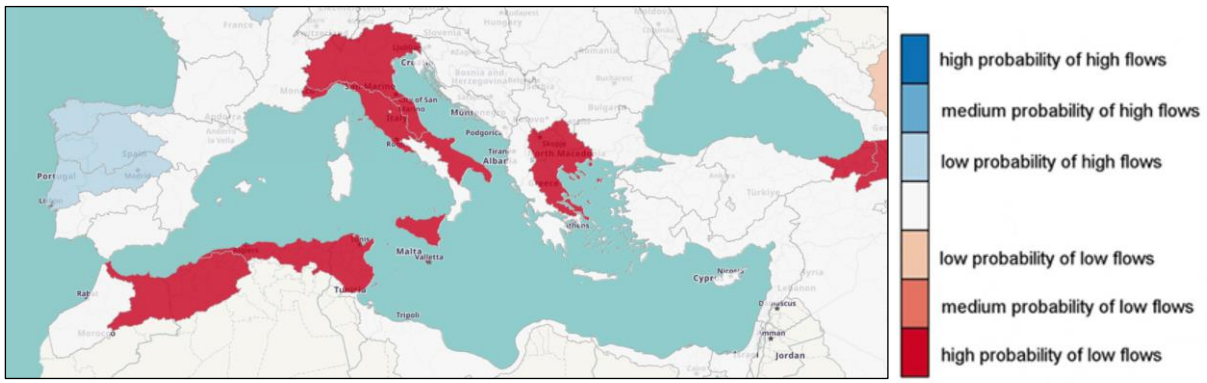
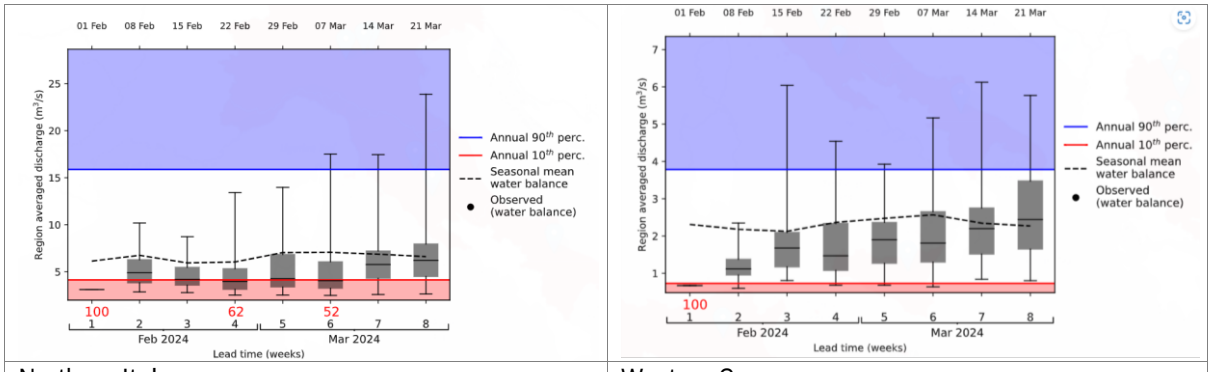


Figure 16: Probability of river flow anomalies for 8 weeks (February - March 2024). The high and low probability thresholds refer to the 90th and 10th percentiles of the simulated discharge from a 29-year model climatology run (1991 - 2019).[16] *(See also Technical Note below).*



Northern Italy | Western Greece

Figure 17: Seasonal Forecast for two of the regions displayed in Fig.15: northern Italy (left) and eastern Greece (right). The boxplots show the probabilistic forecast of river flow per region over 8 weeks. The blue and red line indicate the annual river flow 90th and 10th percentile, respectively. The black dashed line represents the seasonal mean water balance (climatology).

[15] 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.
[16] Source: The CEMS European Flood Awareness System (EFAS): https://www.efas.eu

Technical note:

- *The regions displayed in Fig. 15 were created by merging several basins together, respecting hydro-climatic boundaries. This allows large-scale variability in weather to be captured, and forecast information to be summarized. The map in Fig. 15 shows the forecast river flow anomaly per region over 8 weeks. The probability of a low and high flow anomaly is indicated by red and blue, respectively. The intensity of the colour represents the highest forecasted probability of falling below the low threshold, or exceeding the high threshold, within the forecast horizon.*
- *The analysis results shown in Fig. 15 are based on the LISFLOOD hydrological model outputs driven by 51 ensemble members of the ECMWF SEAS5 seasonal forecast. 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 (https://ec-jrc.github.io/lisflood/)*

Reported impacts

The European JRC MARS Bulletin - Crop Monitoring in Europe, of January 2024[17] reported that the pronounced rain deficit, combined with the record-high temperatures, which were observed along the Mediterranean coast in Spain, Italy, Greece, and the Mediterranean islands, negatively impacted the sowing and biomass growth for winter crops and fruit trees. In Morocco and Algeria the drought is causing reduced crop biomass accumulation. In Tunisia, crop recovery was partially observed, thanks to precipitation in mid-December and early January.

In Morocco, after 6 consecutive years of drought, reservoirs are critically low, reducing the irrigation capacity. The average dam-filling dropped to about 23%. Authorities banned water usage for cleaning roads, parks irrigation and also irrigating some key farming areas. Reduction of the dam-irrigated area is estimated to be almost 50%.[18]

Since November 2023, in Cataluña (Spain) the local authorities already declared a state of pre-emergency, but the worsening conditions have led a drought emergency being declared on 1 February 2024, with strict water restrictions. Water reserves of the region are below 16%. Restrictions will apply to lower priority usage (car washing, garden watering, etc.); in addition, a limit to the water consumption per person will be progressively implemented.[19] [20]

Also in Portugal, specifically in the Algarve, the government ordered water use restrictions, mainly for irrigation of gardens and urban environments. Reservoirs are at their lowest level.[21]

In Sicily (Italy), the precipitation deficit after 5 below-average months, is about 200 mm. Reservoirs are below the alert level. According to the Authority of the Hydrographic District of Sicily, the cumulative volume of the reservoirs on 1 January 2024 was 18% less than on 1 January 2023, which was already 39% lower than on 1 January 2022.[22] The persistent drought conditions have badly affected ripening of oranges and have caused a

[17] https://publications.jrc.ec.europa.eu/repository/handle/JRC136584
[18] https://www.reuters.com/world/africa/moroccos-irrigated-area-shrinks-drought-empties-dams-2024-01-17/
[19] https://www.euronews.com/green/2024/02/01/spain-expected-to-declare-drought-emergency-today-with-big-fines-for-breaking-water-rules
[20] Catalonia: State of emergency declared as region faces worst ever drought - BBC News
[21] https://www.reuters.com/world/europe/amid-drought-water-curbs-portugals-algarve-spains-catalonia-2024-01-18/
[22] https://www.regione.sicilia.it/istituzioni/regione/strutture-regionali/presidenza-regione/autorita-bacino-distretto-idrografico-sicilia

significant yield reduction.[23] Water rationing may be necessary to guarantee minimal services. Livestock is the most affected sector because of lack of fodder.[24]

In Sardinia (Italy), the prolonged drought has led to a reduction of water availability in the reservoirs, estimated at less than 50% of their capacity in December 2023[25]. At the beginning of January 2024, a formal prohibition of any irrigation has been issued for the Posada river district.[26]

[23] https://www.ragusanews.com/economia-acqua-agli-sgoccioli-in-sicilia-arance-al-macero-199102/

[24] https://palermo.repubblica.it/cronaca/2024/01/31/news/sos_siccita_in_sicilia_cinque_mesi_senza_piogge_la_regione_verso_la_dichiarazione_dello_stato_di_calamita-422020394/

[25] https://autoritadibacino.regione.sardegna.it/invasi/

[26] https://www.ilfattoquotidiano.it/2024/01/28/siccita-in-sardegna-bacini-senzacqua-e-divieto-assoluto-di-irrigazione-le-immagini-dalla-diga-di-maccheronis/7423245/

Appendix: GDO and EDO indicators of drought-related information[27]

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

[27] For more details on the GDO and EDO indicators: https://edo.jrc.ec.europa.eu/factsheets

Glossary of terms and acronyms

▪ *CDI: Combined Drought Indicator*	▪ *GDO: Global Drought Observatory*
▪ *CEMS: Copernicus Emergency Management Service*	▪ *GIoFAS: Global Flood Awareness System*
▪ *EC: European Commission*	▪ *HCWI: Heat and Cold Wave Index*
▪ *ECMWF: European Centre for Medium-Range Weather Forecasts*	▪ *JRC: Joint Research Centre*
▪ *EDO: European Drought Observatory*	▪ *KNMI: Royal Netherlands Meteorological Institute*
▪ *EFFIS: European Forest Fire Information System*	▪ *MARS: Monitoring Agricultural Resources*
▪ *ERA5: ECMWF Reanalysis v5*	▪ *SMA: Soil Moisture Anomaly*
▪ *ERCC: European Emergency Response Coordination Centre*	▪ *SPI: Standardized Precipitation Index*
▪ *EU: European Union*	▪ *SWE: Snow Water Equivalent*
▪ *fAPAR: Fraction of Absorbed Photosynthetically Active Radiation*	▪ *VIIRS: Visible Infrared Imaging Radiometer Suite*

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.3.0.2*
▪ *Soil Moisture Index (SMI) Anomaly (SMA)*	*v.2.1.3*
▪ *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

List of Figures

Drought in the Mediterranean Region - January 2024

JRC Global Drought Observatory (GDO) of the Copernicus Emergency Management Service (CEMS) – GDO/EDO data up to 20/01/2024

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