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Executive Summary

- For the third consecutive year, unexpectedly dry conditions affect central Europe. Following the dry spell of spring 2020 across central and western Europe, July was much drier than usual in France, Belgium and southern Germany. Combined with the spring rainfall totals, relevant deficits of precipitation and soil moisture persist mainly over north-east France and through northern Germany. Since August, central Scandinavia and Iceland show dry conditions too. Ireland and the UK recovered from the dry spell, as well as southern Europe and the western Balkans. However, increasing soil moisture deficits are appearing around the western Black Sea coast.
- The precipitation outlook for the trimester September-November 2020 is mostly neutral for affected areas of France and Germany, wet for the rest of central and northern Europe, neutral with a dry tendency in the Balkans.
- River levels are at their normal across Europe, including those previously lower in Germany, with the exception for north-east France and surroundings (rivers Seine and Meuse).
- The recurring dryness in central Europe determined a reduction of crop yield prospects. Water supply issues were reported for both consumption and industrial cooling. Forests in France are under stress due to dry conditions.

This document builds on the previous report published in June 2020¹, please refer to it for more insight on the drought and earlier reported impacts.

¹ https://edo.jrc.ec.europa.eu/documents/news/EDODroughtNews202006_Europe.pdf

Combined Drought Indicator (CDI)

The EDO Combined Drought Indicator (CDI) is based on the analysis of precipitation, soil moisture and the fraction of Absorbed Photosynthetically Active Radiation (fAPAR). Combined, they identify areas that are at potential risk to suffer drought, areas where drought manifests through a significant soil moisture deficit, and areas where vegetation is already affected by drought conditions. Areas in the process of recovery to normal conditions after a drought episode are also shown.

Central Europe already suffered from droughts in 2018 and 2019, with relevant crop damages, water supply restrictions and industrial slowdown due to low river levels. Therefore, the current event marks the third year in a row of widespread dry conditions.

The CDI for mid-August highlights the combination of soil moisture and rainfall deficits over most of France and Germany (Figure 1, left). France in particular displays locations of vegetation stress too. Poland is slightly affected in the very north-west and patches of dry conditions are found in Scandinavia, central Italy and Bulgaria. According to the indicator, recovery from previous deficits was complete for Ireland, the UK and most Scandinavia. A peculiarity is observed in Galicia, north-west of Spain, where combined deficits seem to be as relevant as geographically isolated in mid-August, just to disappear at the end of the month. Indeed, the situation came back to normal in many locations (Figure 1, right), only north-east France and spots across Germany and Poland retained the same or higher hazard levels. On the contrary, Scandinavia saw a significant exacerbation of dry conditions.

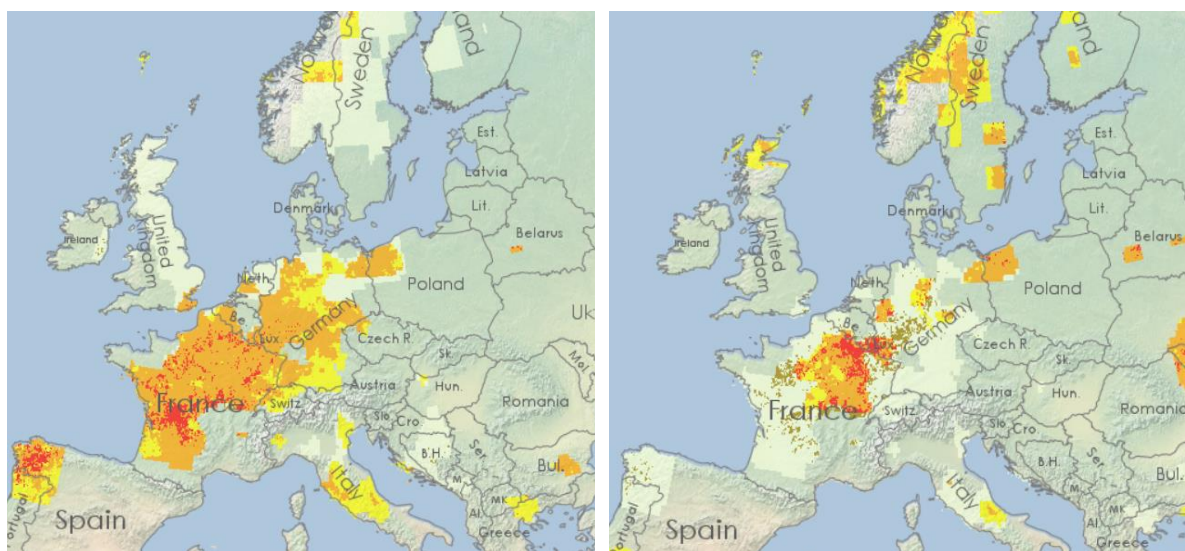


Figure 1: The Combined Drought Indicator (CDI) for the second and third decades of August 2020 (left and right respectively).

- Alert: vegetation stress with rainfall / soil moisture deficit ■
- Warning: soil moisture deficit ■
- Watch: rainfall deficit ■
- Partial recovery of vegetation ■
- Full recovery of vegetation to normal conditions ■

Precipitation

Figure 2 shows the monthly precipitation totals for selected locations across affected areas. There, the winter 2019/20 was generally wet or within the expected variability. However, several months recorded low rainfall from March, especially July, concerning the summer months. August was poor too, in the locations currently with the highest precipitation deficit (France, Scandinavia).

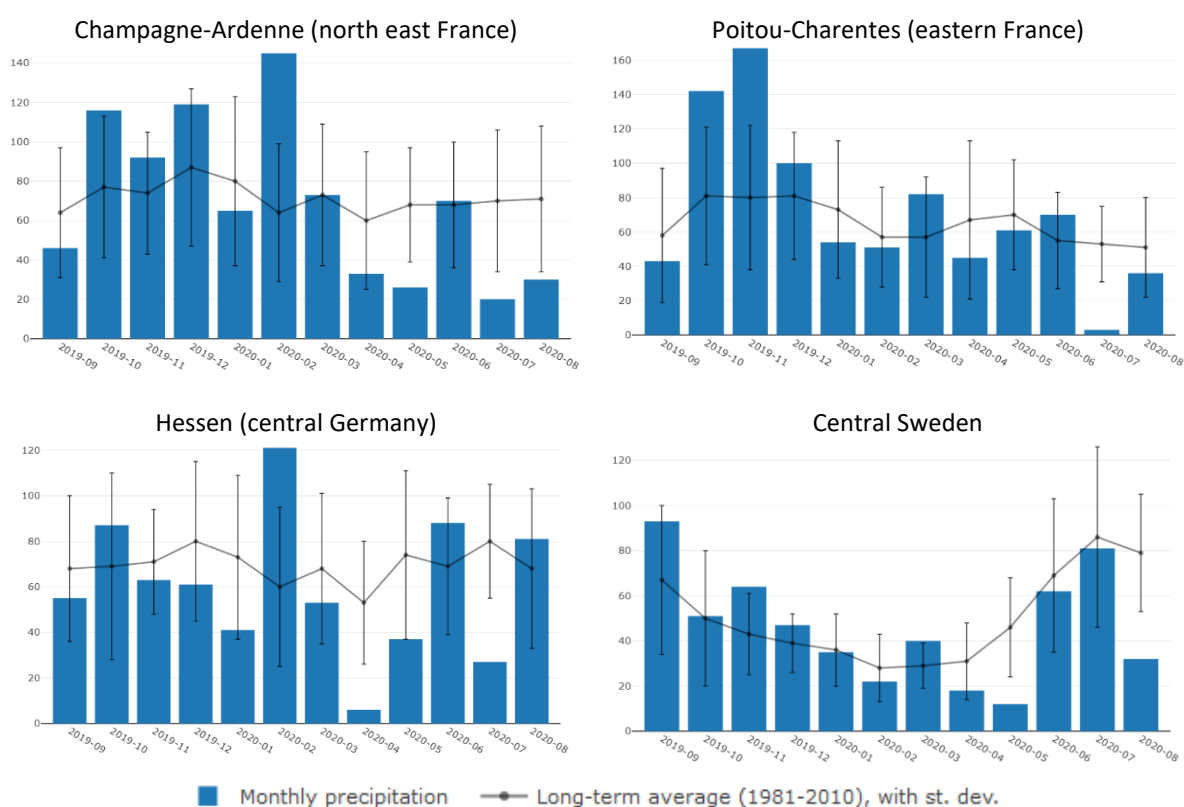


Figure 2: Monthly precipitation from September 2019 to August 2020 in selected representative locations. Bars show observed monthly precipitation (mm). Lines show the long-term monthly average with one standard deviation.

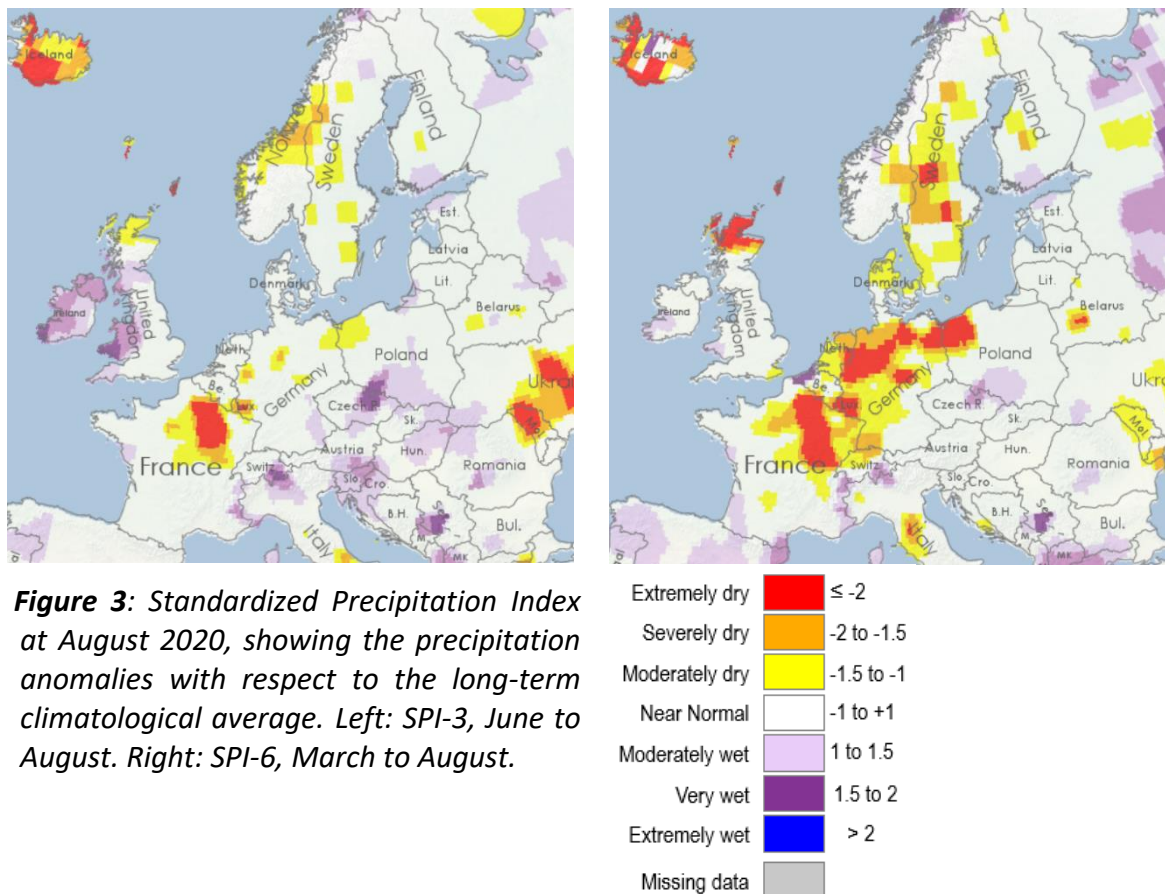
Standardized Precipitation Index (SPI)

The SPI measures precipitation anomalies based on the long-term records. The lower (more negative) the SPI, the more intense is the drought.

The south and east of Europe, as well as Ireland and the UK, had a normal to wet summer, compared to long-term records (Figure 3, left). Only parts of the north and central Europe recorded relatively low precipitation, unable to compensate for the previous deficits.

Coupled with the precipitation of spring 2020, negative balances intensified in central Scandinavia and appeared in north-east France and Iceland (Figure 3, right). Despite normal summer precipitation, the Netherlands, western and northern Germany retained previous

deficit, with a slight improvement only in the south. Over the six months, deficits were compensated by summer rainfall across Ireland and the UK (northern Scotland excepted). Eastern Europe and northern Italy recovered from poor precipitation in early spring too.



Temperatures

High temperatures increase massively the evaporation rate of water from the ground, and cause much higher water demand for consumption, thus contributing substantially to drought severity, even in absence of relevant rainfall deficits.

A heatwave during the first half of August involved Belgium, the Netherlands and most of Germany and France, as well as southern England (Figure 4, left), thus marking a very hot month compared to the long-term records for August. Overall, the European summer was generally warmer than average (Figure 4, right), but not remarkably so compared with other recent years². Nevertheless, the heatwave played a role in exacerbating the existing rainfall deficits.

² Copernicus Climate Change Service, <https://climate.copernicus.eu/surface-air-temperature-august-2020>

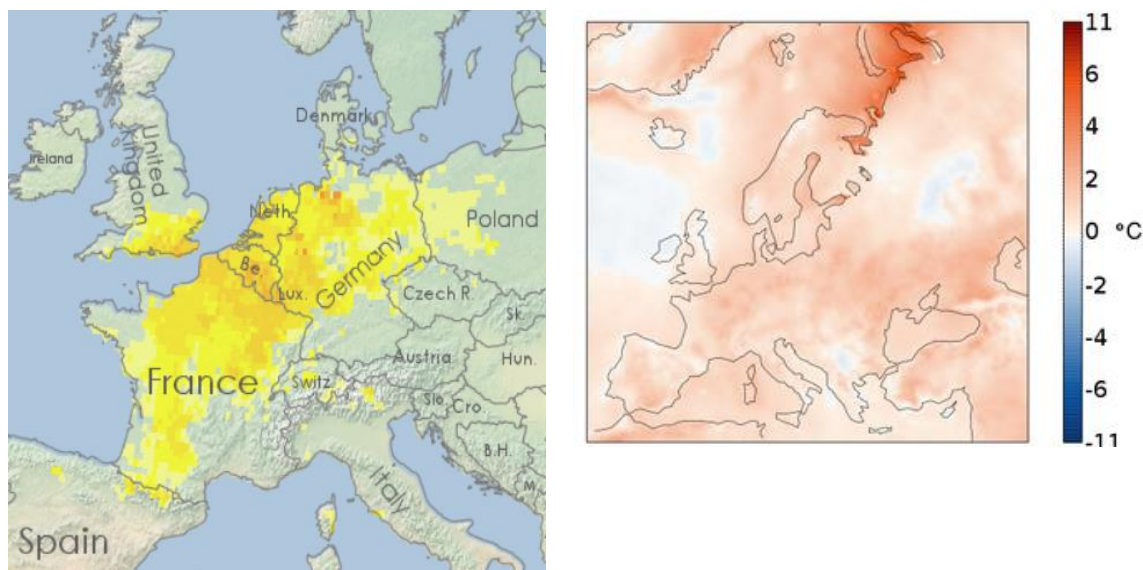


Figure 4: Left: Heatwave recorded from France to Poland in the first half of August. Yellow to red shows increasing duration in days³. Right: the temperature anomalies as reported by C3S for June to August 2020.

Soil Moisture Anomaly (SMA)

The aim of this indicator is to provide an assessment of the topsoil water content, which is a direct measure of drought conditions, specifically indicating the difficulty for plants to extract water from the soil.

From late May, negative anomalies that were already manifest in several areas of Europe (Figure 5, top-left) expanded, especially in France and Germany during July (Figure 5, top right), as well as north-west Spain. At the same time, soil moisture deficit was compensated almost completely across Ireland and the UK, while improving greatly in Scandinavia and Finland. As of early September 2020 (Figure 5, bottom), relevant deficits returned in Scandinavia and the northernmost areas of the UK, while shrinking and intensifying across France, Belgium and western Germany. After several months of normal or wet conditions, mild but widespread negative anomalies emerged again in eastern Europe and Spain, particularly in the areas west to the Black Sea.

³ https://edo.jrc.ec.europa.eu/documents/factsheets/factsheet_heatColdWaveIndex.pdf

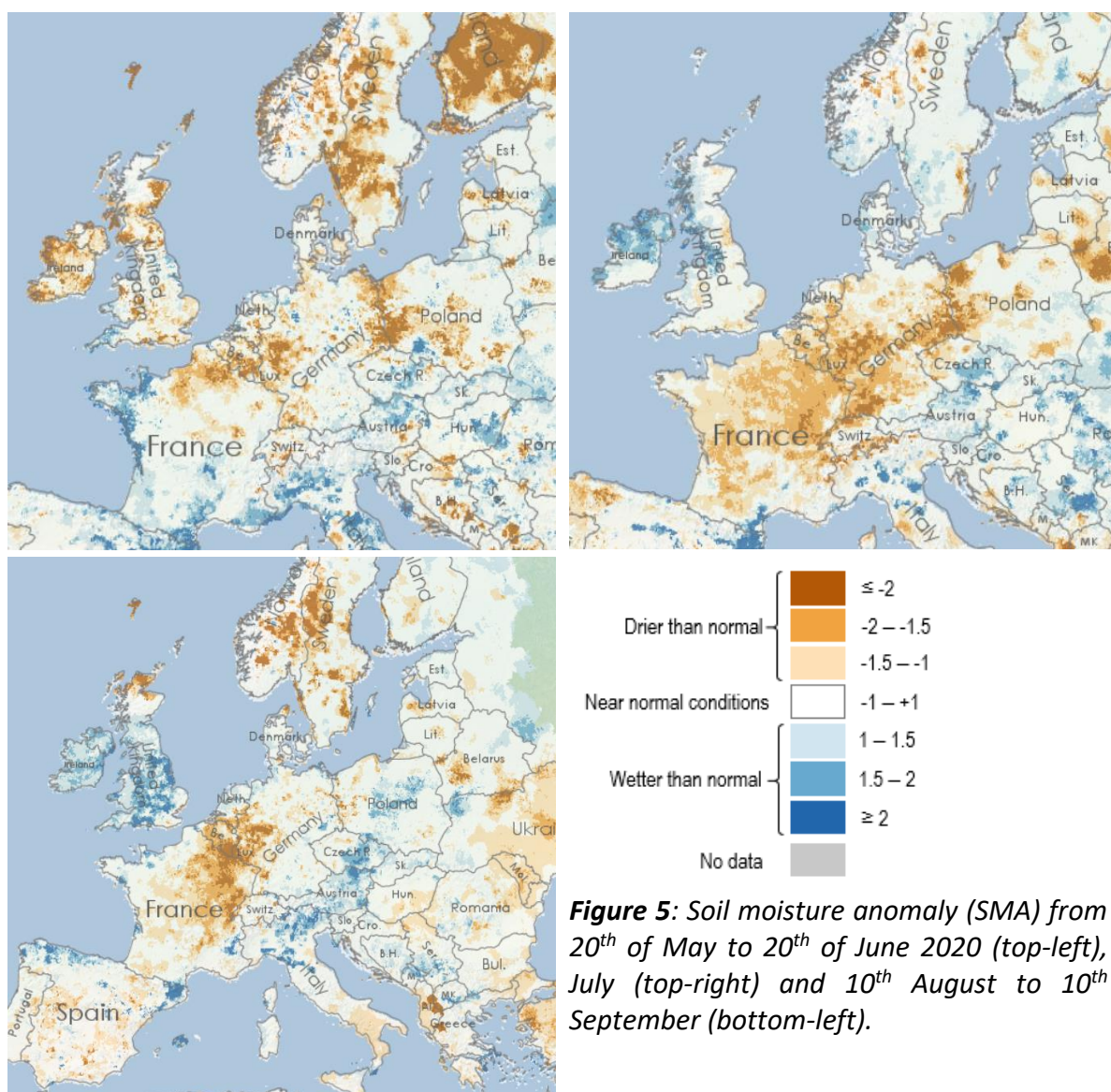


Figure 5: Soil moisture anomaly (SMA) from 20th of May to 20th of June 2020 (top-left), July (top-right) and 10th August to 10th September (bottom-left).

Low Flow Index

The Low Flow Index is an indicator of hydrological drought reflecting the total water deficit of the river discharge, when the latter drops below a minimum threshold.

River levels are generally in line with the seasonal averages across Europe, with the notable exception of the Seine and several of its tributaries in France (Figure 6), and the Meuse along most its course through France, Belgium and the Netherlands. This picture persisted since early August, except for the sharp improvement observed in central and northern Germany.

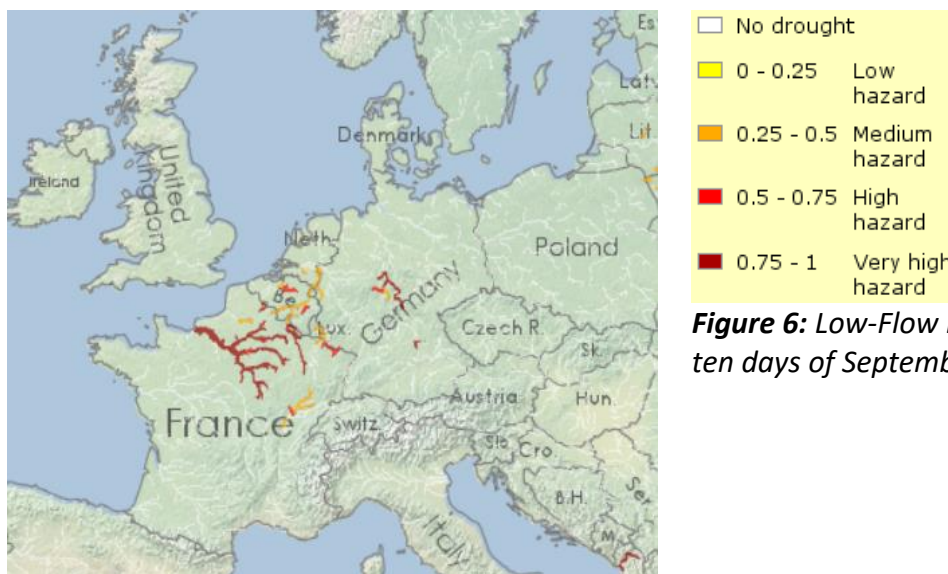


Figure 6: Low-Flow Index (LFI), first ten days of September 2020 (left).

Vegetation Productivity (fAPAR) Anomaly

The fraction of Absorbed Photosynthetically Active Radiation (fAPAR) represents the fraction of the solar energy absorbed by leaves. fAPAR anomalies, specifically the negative deviations from the long-term average over the same period, are a good indicator of drought impacts on vegetation.

At the end of August and beginning of September, the fAPAR anomaly is markedly low in France, central to western Germany and eastern Balkans and these regions may expect some degree of yield reduction for summer crops (Figure 7).

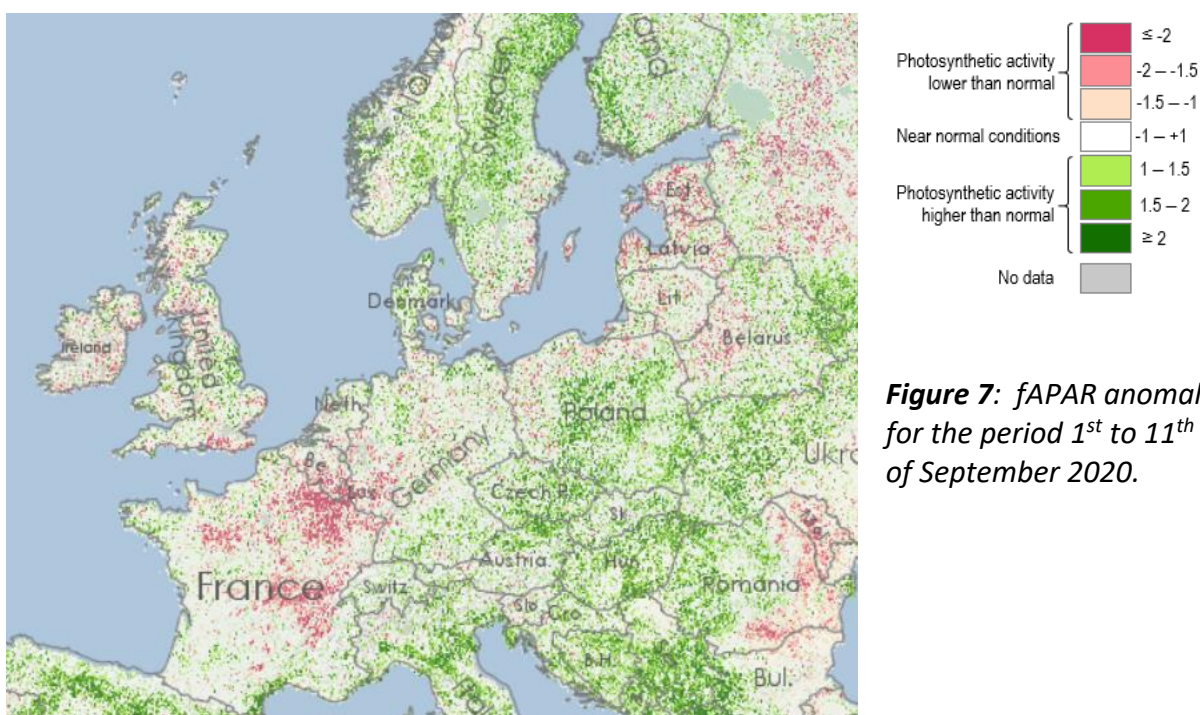


Figure 7: fAPAR anomaly for the period 1st to 11th of September 2020.

SPI outlook

The forecasts of SPI are based on the ECMWF probabilistic seasonal model of precipitation (S5) and the map shows warnings only where the forecast is relatively robust.

No severe negative precipitation anomalies are forecasted anywhere in Europe for the trimester September-November 2020 (Figure 8). The core areas affected by the current dry conditions are not expected to receive more rainfall than the long-term average for the period (France, Belgium, western Germany) and deficit accumulated previously may persist during autumn. South-east Europe is expected to receive slightly less precipitation than normal, which may pull back to drought affected locations. Wetter than normal conditions are expected across central, northern and eastern Europe.

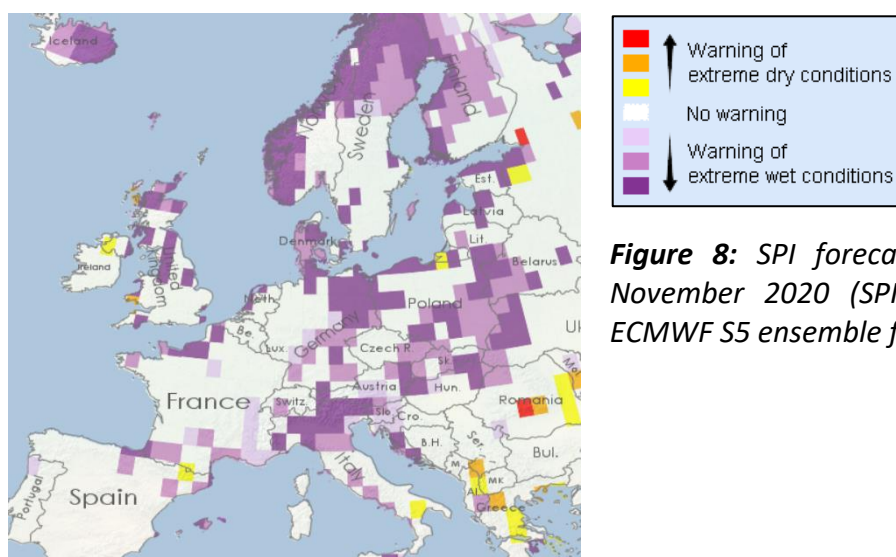


Figure 8: SPI forecast for September to November 2020 (SPI-3, right), based on ECMWF S5 ensemble forecasts.

Reported impacts

Concerning agriculture, for crop-specific information and yield forecasts, please refer to the latest JRC MARS bulletins from August⁴ and September 2020⁵. Specifically, the yield forecasts for almost all summer crops were revised downwards especially in France, Romania, Bulgaria, Germany, the Benelux countries and Poland.

In France, water supply issues were widespread across the centre and north during July⁶. Severe impacts on forest are reported too⁷ ⁸. State of crisis was declared and water

⁴ <https://ec.europa.eu/jrc/sites/jrcsh/files/jrc-mars-bulletin-vol28-no8.pdf>

⁵ https://ec.europa.eu/jrc/sites/jrcsh/files/jrcmars_bulletin_vol28_no09.pdf

⁶ <https://www.rfi.fr/en/environment/20190717-large-parts-france-facing-drought-after-heatwave>

⁷ https://www.francetvinfo.fr/meteo/secheresse/secheresse-des-forets-commencent-a-mourir-en-france-alerte-une-hydroclimatologue_4095725.html

⁸ <https://www.pnn.de/potsdam/folgen-des-klimawandels-das-potsdamer-katharinenholz-leidet-unter-der-trockenheit/26181892.html>

restrictions put in place over many *departements* across the country⁹ ¹⁰. Chooz nuclear power plant, northern France, shut down operations due to lack of cooling waters from the Meuse river¹¹. The event reportedly is affecting French energy provision as a whole¹². No systemic transportation issues, nor industrial water supply interruptions were reported from other European rivers.

⁹ <http://propluvia.developpement-durable.gouv.fr/propluvia/faces/index.jsp>

¹⁰ <https://www.ouest-france.fr/meteo/secheresse/secheresse-78-departements-concernes-par-les-mesures-de-restriction-d-eau-6941136>

¹¹ <https://www.rfi.fr/en/france/20200825-drought-provokes-shutdown-nuclear-reactors-northeast-france-belgium-ardennes-chooz-meuse>

¹² <https://www.spglobal.com/platts/en/market-insights/latest-news/electric-power/090720-french-nuclear-weekly-generation-falls-below-30-gw-to-9-week-low>

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