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Executive summary

- Parts of Turkey have been experiencing drought conditions, primarily centre-western regions and the east of the country. A below-average pattern of precipitation since mid-2019, and particularly the second half of 2020, determined a water deficit at the end of the 2020. As a result, GDO indicators show that soil moisture decreased markedly, and evidence of hydrological drought appeared. However, precipitation in January 2021 was abundant and has brought some relief over the affected regions.
- Impacts of the drought are currently limited to agriculture. Reservoirs have dwindled during autumn 2020 and until early January 2021, but then partly recovered. The widespread concerns for water supply have eased by the end of January.
- From February to April 2021, below-average precipitation is forecast only for central-southern areas, with normal or above-average precipitation expected for the rest of the country. Despite some uncertainties, the overall situation is not expected to worsen towards drier conditions in any areas, with the possible exception of central-southern areas.

GDO indicator: Risk of drought impact for agriculture (RDri-Agri)

The RDri-Agri indicator highlights those areas at risk of experiencing impacts from a drought, considering the exposure and socio-economic vulnerability of the areas, and with a particular focus on agricultural impacts.

The indicator shows that the risk of drought impacts on agriculture decreased significantly following the ample precipitation in the second half of January 2021 (Figure 1, bottom), compared with the start of the month (Figure 1, top). By the end of January 2021, the risks of water supply shortages in Istanbul and other major cities of western Turkey had eased, while central-northern regions continued to show moderate risks of drought impacts. These regions are home to about ten million people, and water stress is a recurrent issue for agriculture, which is heavily reliant on reservoirs storage.

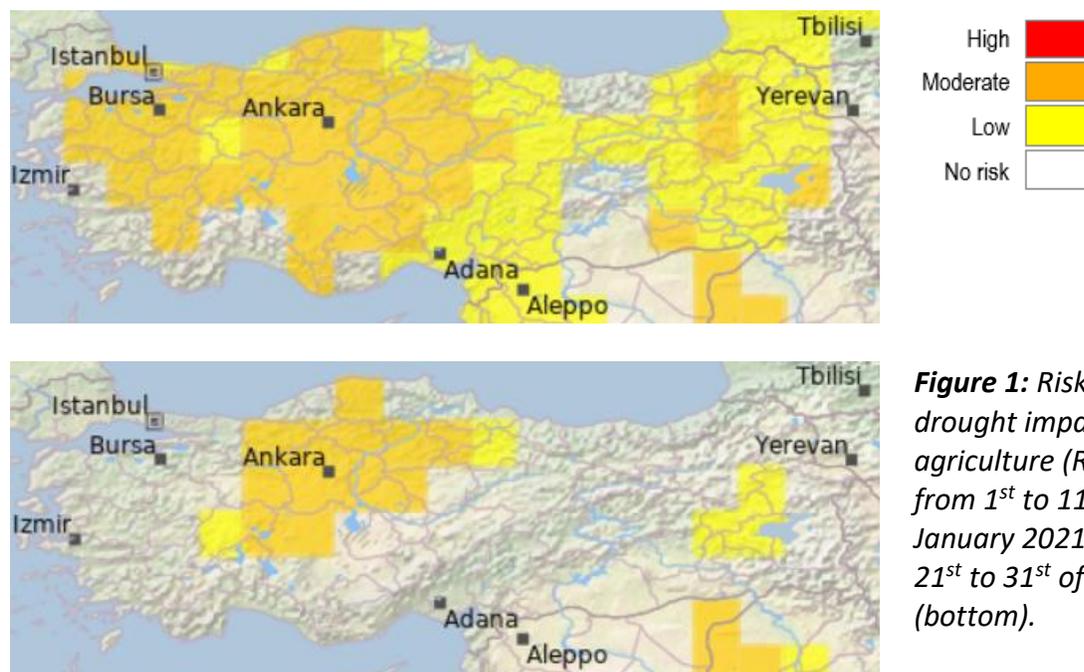


Figure 1: Risk of drought impact for agriculture (RDri-Agri) from 1st to 11th of January 2021 (top) and 21st to 31st of January (bottom).

GDO indicator: Precipitation

The indicator includes total monthly rainfall, snow and hail. During the past 18 months, precipitation was below-average for most months (Figure 2). Despite some monthly intervals recording abundant rainfall - including January 2021 - the accumulated totals over the mid and long-term are below the climatological normal, especially in central and eastern Turkey (e.g. Figure 3, for Mus Province in eastern Turkey). Istanbul area had dry conditions up to December 2020, but the deficit accumulated during the second half of 2020 was offset by exceptional

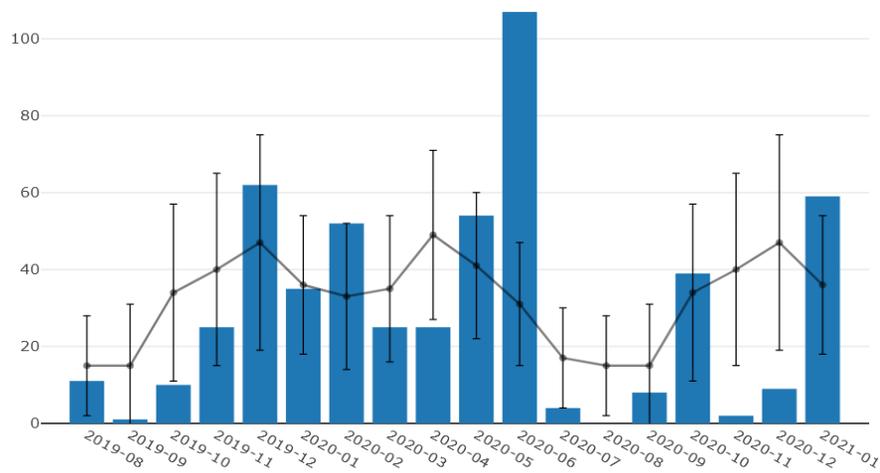
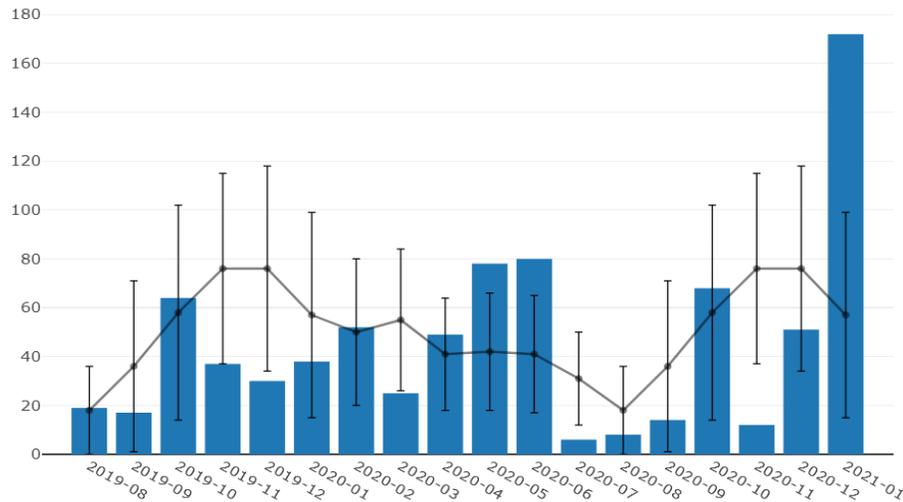
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precipitation during January 2021, with three times as much as the normal (Figure 2, top). On the other hand, Ankara province in central Turkey, and its environs, received around 60% of the long-term normal for the six-month period August 2020 to January 2021 (Figure 2, middle), while a mere 50% was recorded for eastern areas, such as Mus province (Figure 2, bottom).



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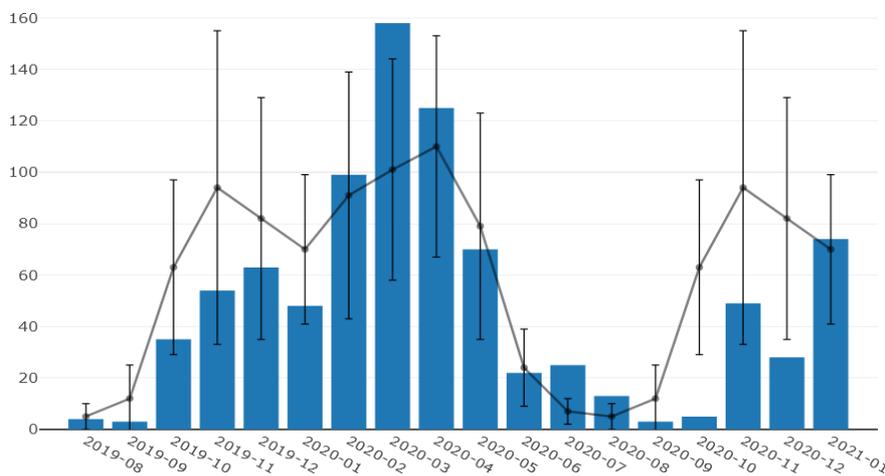


Figure 2: Monthly total precipitation in mm (blue bars) for different regions in Turkey from August 2019 to January 2021, with the long-term monthly averages (1981-2010) and standard deviation (solid lines). Top: Environs of Istanbul and Edirne in north-western Turkey (27.6 E, 41.2 N). Middle: Ankara province in central Turkey (31.9 E, 39.9 N). Bottom: Mus province in eastern Turkey (42.0 E, 38.9 N).

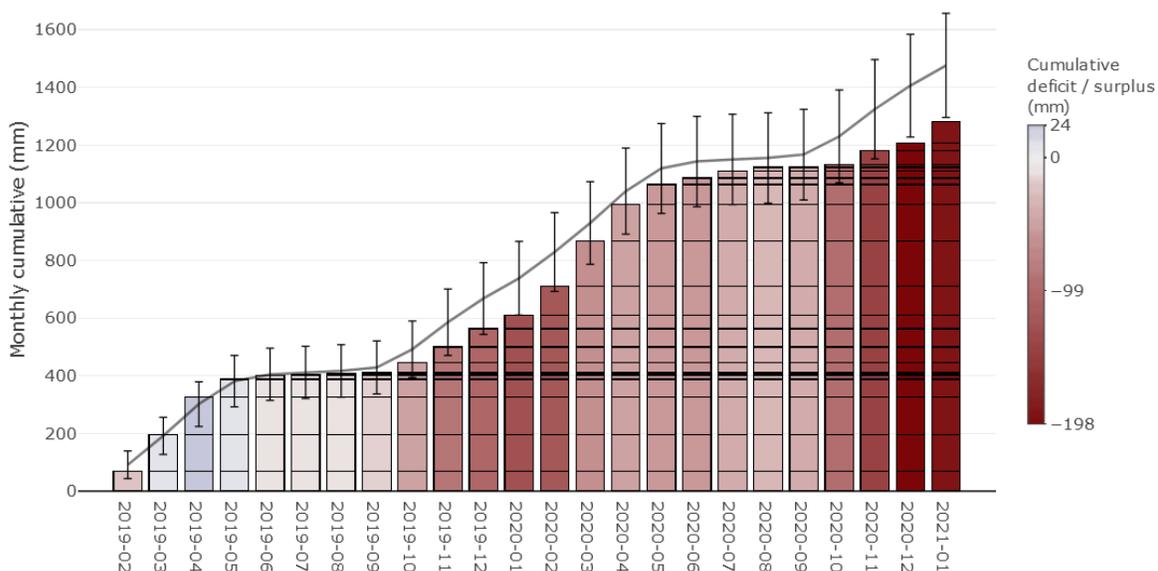
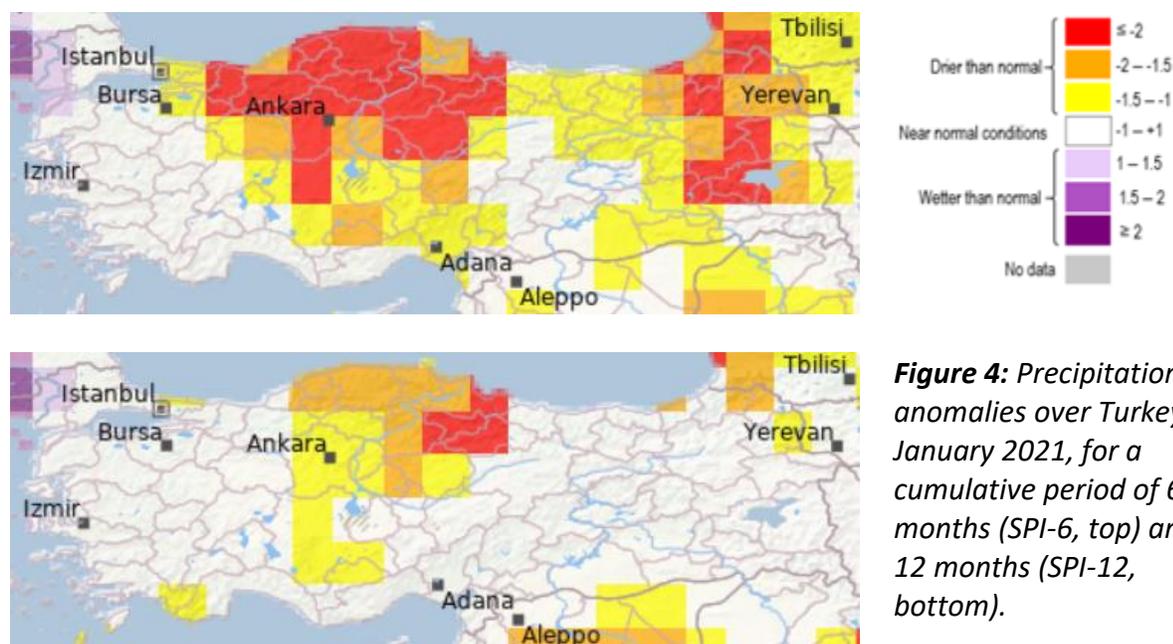


Figure 3: Cumulative precipitation over a period of 24 months in Mus province (27.6 E, 41.2 N). The bar colors indicate the cumulative deficit (red gradient) or surplus (blue gradient), compared to the cumulated monthly long-term average (solid line), for the same time span and location. The boxes overlapping the bars are the monthly totals stacked.

GDO indicator: Standardized Precipitation Index (SPI)

The SPI indicator is used to monitor the occurrence of meteorological drought. The lower (more negative) the SPI value, the more intense is the drought. Figure 4 (top) shows the anomalies of precipitation for the six months from August 2020 to January 2021 (SPI-6), a period that accounts for about half the annual precipitation across Turkey. As can be seen, central-northern and eastern regions display the lowest SPI values, highlighting precipitation totals well below the usual inter-annual variability. In the yearly view (Figure 4, bottom), by January 2021 the precipitation deficit is negligible for most areas of Turkey.



GDO indicator: SPI outlook

During the three-month period from February to April 2021, negative precipitation anomalies are forecasted for the central-southern areas of Turkey, while the rest of the country is expected to receive normal or above average precipitation (Figure 5). Considering that this period is the wettest for eastern Turkey, incoming precipitation should be sufficient to compensate for the current deficit. Concerning central and western Turkey, the same three-month period is set to be relatively rainy as well (albeit not the wettest) and - given the outlook - it is less likely that all regions will receive enough precipitation to fill the gap. However, conditions are not expected to worsen over the whole northern half of Turkey.



Figure 5: SPI outlook for the three months from February to April 2021 (SPI-3), based on ECMWF S5 ensemble forecasts.

GDO indicator: fAPAR anomaly

The “fraction of Absorbed Photosynthetically Active Radiation” (fAPAR) is a satellite-measured biophysical variable that represents the fraction of the solar energy absorbed by vegetation canopies. Anomalies of fAPAR values, specifically the negative deviations from the long-term average over the same period, are a good indicator of drought impacts on vegetation. As Figure 6 suggests, there were no consistent fAPAR anomalies across Turkey at the end of January 2021, with only the north and west showing a slight prevalence of local negative anomalies. For the eastern half of Turkey, not enough fAPAR data were available for a reliable detection of anomalies. It should be borne in mind that, because photosynthetic activity is at a minimum during the cold season and out of the growing stage for vegetation, fAPAR results are of limited use in this case.



Figure 6: fAPAR anomaly values in Turkey for the 10-day period of 21-31 January 2021.

GDO indicator: Soil moisture anomaly

The Soil Moisture Anomaly indicator provides an assessment of the top-soil water content, which is a direct measure of drought conditions – specifically, the difficulty for plants to extract water from the soil. Figure 7 (top) shows the significant extension of dry areas in December

2020, highlighting the much worse conditions of soil humidity at that time. The abundant precipitation of January 2021 improved the situation, as shown in Figure 7 (bottom), which shows the areas of maximum soil moisture anomalies during January 2021, primarily in central and western Turkey. It should be noted that “no data” areas are prevalent in eastern areas, and so the presence of abnormal dryness is also not excluded there.

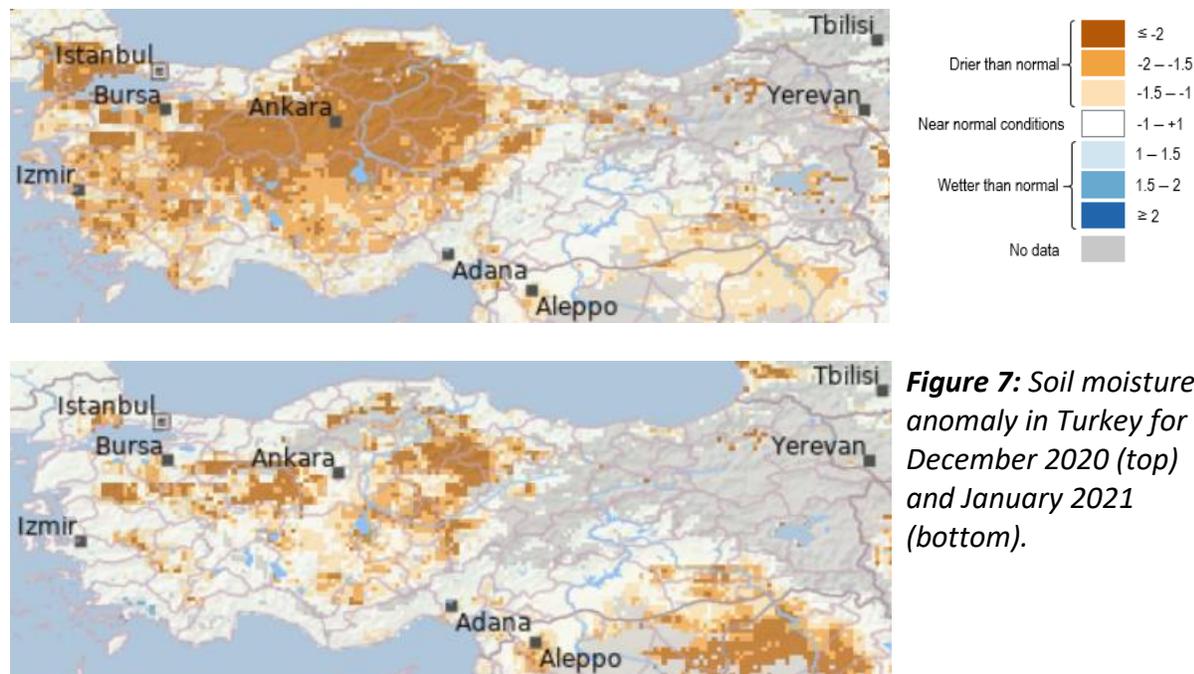


Figure 7: Soil moisture anomaly in Turkey for December 2020 (top) and January 2021 (bottom).

Reported impacts of the drought in Turkey

Up until early January 2021, serious concerns over the water supply were reported for the main western cities, and for Istanbul in particular¹. However, the precipitation of mid-January 2021 partly compensated for the earlier lack of rainfall and significantly reduced the risk of shortages, with water-levels rising above 40% of dam storage capacity by the end of January 2021.^{2,3} In the meantime, in the Istanbul municipality adoption of water storage tanks for

Links accessed 08/02/2021

¹ <https://www.dailysabah.com/turkey/istanbul/water-drama-continues-for-istanbul-as-dam-supplies-drop-to-critical-levels>

² <https://www.iski.istanbul/web/en-US>

³ <https://www.ntv.com.tr/turkiye/istanbuldakuraklik-tehlikesi-gecti-mi,Y3fuCqdyv0W4mRSCVIZ8og>

rainwater were strongly recommended,⁴ and other water saving initiatives were reported to cope with the recurring risk of water shortage.⁵ Other major Turkish cities were reported to be affected by the drought already in late 2020, including Izmir and Ankara.⁶ There were also several calls for the implementation of policies to decrease water consumption and improve management of water resources.^{7,8}

The current drought in Turkey has so far affected primarily farming, with reports of damages to both summer and winter crops. Some stakeholders have foreseen an increase in prices and imports, thus affecting the most vulnerable people, and expected government intervention⁹. Crop damages have been reported especially in the central province of Konya, the north-western province of Edirne, and Izmir in western Turkey.¹⁰ In central-western areas, orchards have been affected and wheat planting has been delayed, while there were complaints of water mismanagement in water conservation for agriculture.^{11,12} There are also warnings for irrigation reserves for the 2021 spring season, in relation to precipitation deficit and warmer than usual temperatures.¹³

⁴ <https://www.middleeastmonitor.com/20210115-istanbul-municipality-to-build-water-tanks-to-overcome-drought/>

⁵ <https://www.hurriyetdailynews.com/drought-threat-looms-over-turkey-as-dams-dry-up-161431>

⁶ <https://www.middleeasteye.net/news/turkey-drought-dams-low-water-level-rain-agriculture>

⁷ <https://www.dailysabah.com/turkey/istanbul/rain-harvesting-gray-water-can-solve-turkeys-drought-expert>

⁸ <https://www.theguardian.com/world/2021/jan/13/turkey-drought-istanbul-run-out-water-45-days>

⁹ <https://www.dw.com/tr/%C3%A7ift%C3%A7iyi-pandemiden-sonra-%C5%9Fimdi-de-kurakl%C4%B1k-vurdu/a-56244457>

¹⁰ <https://www.hurriyetdailynews.com/drought-threat-looms-over-turkey-as-dams-dry-up-161431>

¹¹ <https://www.cumhuriyet.com.tr/haber/turkiye-en-kurak-eylul-ve-ekimi-yasadi-bugday-ekilemedi-zeytin-dalinda-kurudu-1795135>

¹² <https://www.cnnturk.com/saglik/kritik-uyari-covid-19-sonrasi-bu-hastalik-artacak>

¹³ <https://ec.europa.eu/jrc/sites/jrcsh/files/jrc-mars-bulletin-vol29-no1.pdf>

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