### **Drought in Syria and Iraq – April 2021**

JRC Global Drought Observatory (GDO) of the Copernicus Emergency Management Service (CEMS) - 22/04/2021



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### **Executive summary**

- Drought conditions are affecting eastern Syria and northern Iraq since early 2021, especially in the governorates of Al-Hasakah (Syria) and Ninewa (Iraq), after poor winter precipitation. Coping capacity of population is very limited, due to the conflicts that ravaged the whole region in recent years, low-income and limited public services. Impacts are reported for agriculture. The international tensions are exacerbated in the area, due to competing interest in water resources.
- Several months of below average precipitation since Autumn 2020 caused the current drought spell in Syria and Iraq. With a pronounced seasonality of rainfall and a naturally semi-arid climate, the annual water balance of these regions is entirely defined by the precipitation pattern between October and April, and deficits accumulated endure through the rest of the year.
- The precipitation outlook until June 2021 is negative, with anomalous dry conditions to persist. Severe issues for irrigation, pasture biomass and water supply may be expected for several months ahead.

### Risk of drought impact for agriculture (RDrI-Agri)

The indicator RDrI-Agri shows the risk of having impacts from a drought by taking into account the exposure and socio-economic vulnerability of the area, with particular focus on agriculture.

The drought extends over some of the most humid areas of both Syria and Iraq, which are naturally dry for the most of their territory. Agriculture represents a significant part of the economy in both countries, employing about 15% of the workforce. Irrigation, where available,

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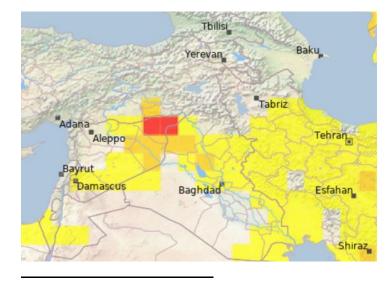
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depends on the major rivers in the area (Tigris, Euphrates) and is key to support the most productive crops and compensate for the dry weather. The rivers originate on the Anatolian plateau in Turkey and flow across different countries, making agriculture and water supply susceptible to competing management goals and political frictions.

The Syrian and Iraqi population is very vulnerable after the devastating wars in both countries in recent years, with consequent destruction of infrastructure, lack of public services and millions of people displaced, including several hundreds of thousands living into refugee camps with limited access to safe water. The COVID-19 pandemic, the financial crisis in both Iraq and Syria resulting from the devaluation of their currency due to the conflict in Syria and the decline of the international oil prices in Iraq have exacerbated already existing vulnerabilities of these communities. For these reasons, Syria and Iraq are amongst the most exposed countries to the risk of humanitarian crises<sup>1</sup>. Indeed, hypotheses are brought forward linking the Syrian civil war to climate change and specifically to the dry conditions experienced by the same regions between 2005 and 2010, although no consensus has been reached to date<sup>2 3</sup>. In the mid and long-term, drought and water scarcity represent a serious threat to the stability of the region, as the competition for the limited resource will increase. Indeed, earlier in 2021 the drought affecting Turkey and the Caucasus<sup>4</sup> proved how such scenario may become common.

At the beginning of April 2021, between three and ten million people were exposed to the current drought to some degree, especially within the area already heavily affected by conflict since 2011 (Figure 1).





**Figure 1:** Risk of drought impact for agriculture (RDrI-Agri) over Syria and Iraq, from 1<sup>st</sup> to 10<sup>th</sup> of April 2021.

<sup>&</sup>lt;sup>1</sup> https://drmkc.jrc.ec.europa.eu/inform-index/INFORM-Risk/Results-and-data

<sup>&</sup>lt;sup>2</sup> https://www.pnas.org/content/112/11/3241

<sup>3</sup> https://theconversation.com/is-syria-really-a-climate-war-we-examined-the-links-between-drought-migration-and-conflict-80110

<sup>4</sup> https://edo.jrc.ec.europa.eu/documents/news/GDODroughtNews202102\_Turkey.pdf

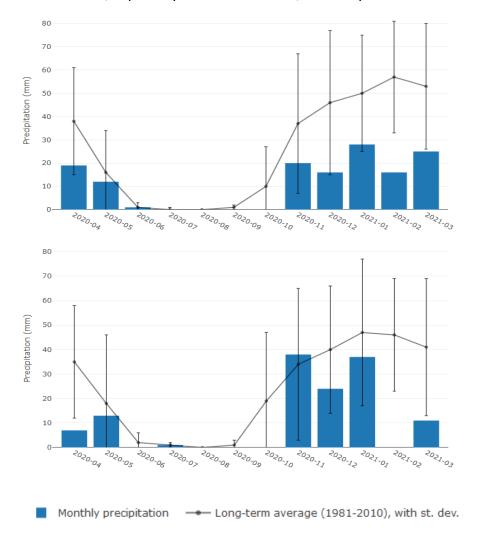
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### **Precipitation**

Precipitation includes monthly total of both rainfall and snow. As shown in Figure 2, the region presents a marked seasonality, with the year split in two: the one half across the winter is relatively wet, while the other is very dry. On the whole, the absolute annual precipitation amounts are limited and the climate is semi-arid, with significant fluctuations around the long-term average, thus increasing the chance of harmful dry spells. The precipitation during the last rainy season were clearly below average; with no months reaching their normal, large deficits accumulated, especially in December 2020, February and March 2021.



**Figure 2:** Monthly total precipitation near Tal Afar (upper chart, Ninewa, Iraq, coordinates: 35.6 N, 41.8 E) and Al-Hasakah (lower chart, Al-Hasakah, Syria, coordinates: 36.4 N, 40.7 E), with the long-term monthly average and standard deviation (1981-2010).

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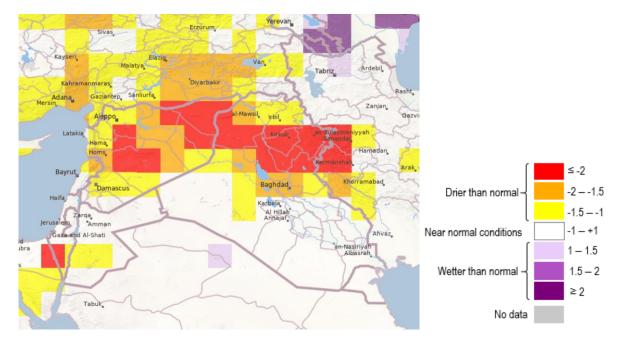
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### Standardized Precipitation Index (SPI)

The SPI indicator is used to monitor the occurrence of meteorological drought. The lower (i.e. more negative) the SPI, the more intense is the drought.

The map of Figure 3 shows SPI at the 6-month accumulation period, encompassing all the normally wettest months of the year, hence highlighting the areas that accumulated the highest precipitation deficit since autumn 2020, compared to the long-term average. Most of Syria, the north of Iraq and neighboring Iranian and Turkish areas display evidence of meteorological drought. The index is significant especially by considering the role of precipitation anomalies at such critical stage for the annual water balance.



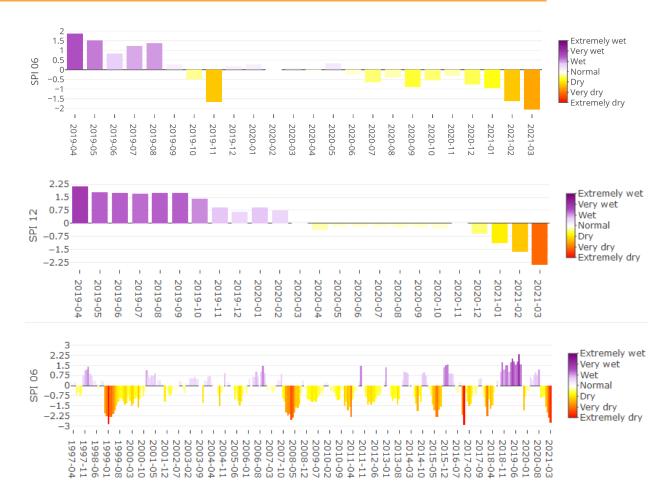
**Figure 3:** Anomaly of precipitation for the period October 2020 to March 2021 (SPI-6), over Syrian and Iraq.

The charts of Figure 4, generated for two representative locations, describe the downwards trend of precipitation anomalies in the past few months, by means of SPI-6 and SPI-12 (top and centre respectively). The former illustrates the overall decrease as precipitation totals stood well below normal month after month since October 2020. The latter indicates how the previous consistent surplus of rainfall was progressively depleted and the annual balance became strongly negative. Despite the high frequency of meteorological droughts in the past 25 years, the current drought stands out as one of the worst over the same period (Figure 4, bottom).

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**Figure 4:** SPI for a cumulative period of 6 and 12 months near Al-Hasakah (top and middle respectively, Al-Hasakah, Syria, coordinates: 36.49 N, 40.74 E) and near Tal Afar (SPI-6, bottom; Ninewa, Iraq, coordinates: 35.5 N, 41.8 E)

### 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 beginning of April, the only negative fAPAR anomalies detected in the wider region were across the Al-Hasakah and Ninewa governorates, in a situation of neutral to positive anomalies elsewhere (Figure 5). The conditions during the previous months were of stable positive anomaly, suggesting a relative decrease of photosynthetic activity only in recent weeks. Nevertheless, most of Iraqi and Syrian territories display no data, due to the sparse vegetation

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typical of naturally dry areas, whilst the denser vegetation is found in proximity of rivers and the coast. The trend is confirmed by other analytical platforms<sup>5</sup> <sup>6</sup>.

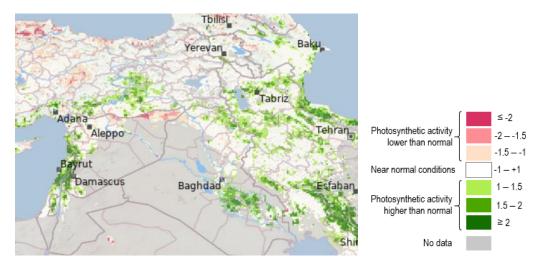


Figure 5: fAPAR anomaly over Syria and Iraq for the period between 1st and 10th of April 2021.

### Soil moisture anomaly

The aim of this indicator is to provide 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 6).

The strongest anomalies were recorded in January, when the winter precipitation would normally peak (Figure 6, top-left). Later in February and March, drier than normal conditions persisted in eastern Syria and northern Iraq, albeit significant improvements can be observed in Syria and western Iraq (Figure 6, top-right and bottom-left).

The time-series for Ninewa (northern Iraq) and Al-Hasakah (eastern Syria) show the persistence and intensity of the negative soil moisture anomaly throughout the year, covering a good proportion of those areas, basically unchanged since January 2021 (Figure 7).

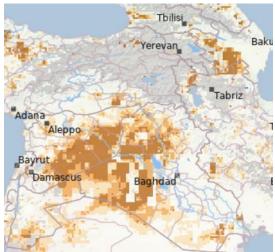
<sup>&</sup>lt;sup>5</sup> http://www.fao.org/giews/earthobservation/country/index.jsp?lang=en&code=SYR

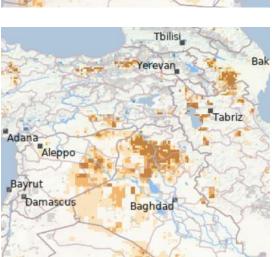
<sup>6</sup> http://www.fao.org/giews/earthobservation/country/index.jsp?lang=en&code=IRQ

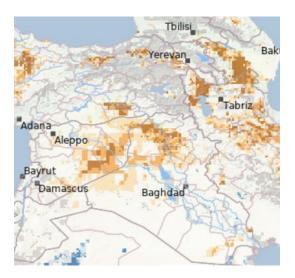
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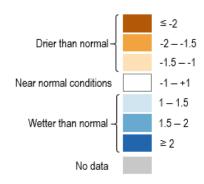
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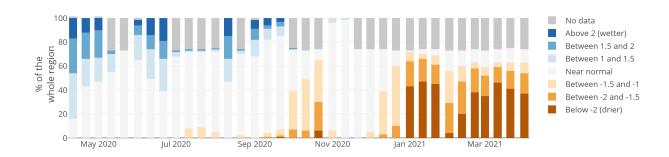








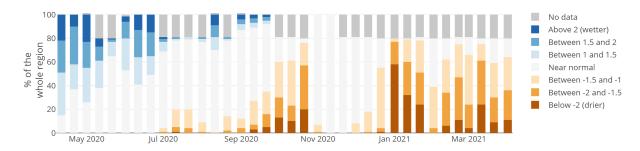
**Figure 6:** Soil moisture anomaly over Syria and Iraq, for January (top-left), February (top-right) and March 2021 (left).



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**Figure 7:** Soil moisture anomaly, evolution over time in Ninewa (Iraq, upper chart) and Al-Hasakah (Syria, lower chart).

#### **SPI** outlook

The period from April to June 2021 is forecasted much drier than usual, being the last trimester with significant rainfall before the long and dry summer. The deficit accumulated over the past few months therefore can't be compensated, even partially, but may rather increase larger and endure until October at least. In case of particularly high temperatures, conditions will worsen further. The wider region seems affected by scarce rainfall too, including the southern coasts of Caspian Sea (Iran, Azerbaijan).

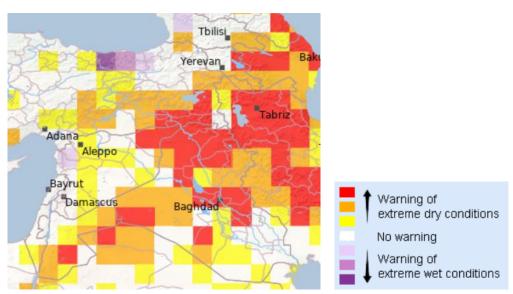


Figure 8: SPI forecast for the trimester April to June 2021.

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### **Reported impacts**

Concerning the humanitarian situation, and the displaced population in particular, no specific impacts were found in relation to the current drought. However, given the high number of people involved and living under extremely precarious conditions, it can be assumed a high risk of impacts on their livelihood, e.g. access to sufficient and safe water.

Up until February, according the FAO GIEWS<sup>7</sup>, the crop conditions in the main cereal producing areas were still favourable and sowing of the 2021 winter cereal crop was completed by mid-December. However, as of April, reduced or missing cereals biomass was observed for eastern Syria (Al-Hasakah) and northern Iraq (Ninewa and Erbil governorates) <sup>8 9</sup>. Therefore, the FAO is closely monitoring the situation in the region, in particular given that a large fraction of cereals are produced under rain-fed cultivation<sup>10</sup>. Reportedly, farmers downstream in Iraq are affected too, due to the lack of river flow to irrigate fields<sup>11</sup>. Livestock are short of forage and herders from the most affected areas are leaving villages in search for green pastures, or moving to the cities to find other jobs<sup>12</sup>. Concerns for water resources in general are brought forward at institutional level<sup>13</sup>, especially in sight of the many dry months ahead, but no official statements of drought impact have been reported from in the region yet<sup>14</sup>.

Drought and water scarcity issues and ensuing frictions between countries on the management of rivers and groundwater have been and remain common in the wider region<sup>15</sup> <sup>16</sup>. The already dry climate is further exacerbated by more structural problems affecting water availability in the region, such as dam building in neighbouring countries, unsustainable water consumption, due to population growth, and an old and inefficient irrigation infrastructure<sup>17</sup>.

<sup>&</sup>lt;sup>7</sup> https://reliefweb.int/sites/reliefweb.int/files/resources/IRQ\_12.pdf

<sup>8</sup> https://mars.jrc.ec.europa.eu/asap/country.php?cntry=238

<sup>&</sup>lt;sup>9</sup> https://mars.jrc.ec.europa.eu/asap/country.php?cntry=118

<sup>10</sup> https://info.undp.org/docs/pdc/Documents/IRQ/Agricultural%20Study%20-KRI%202019.pdf

<sup>11</sup> https://www.rudaw.net/english/middleeast/iraq/240320211

<sup>12</sup> https://www.rudaw.net/english/kurdistan/04042021

<sup>13</sup> https://www.nrttv.com/EN/News.aspx?id=27460&MapID=1

<sup>&</sup>lt;sup>14</sup> Communication from DG ECHO, Erbil and Bagdad contact points.

<sup>15</sup> https://www.rudaw.net/english/middleeast/iraq/130320214

<sup>16</sup> https://www.rudaw.net/english/kurdistan/060420212

<sup>&</sup>lt;sup>17</sup> Communication from DG ECHO

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