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## Executive summary

- A combination of poor precipitation during the last winter and early spring in mountainous regions of Hindu Kush and an underperforming monsoon season has determined a drought situation in Pakistan, especially in the southern half of the country (Sindh and Balochistan).
- The drought is one of the worst in Pakistan since 2000. The situation is worsened by recurrent water scarcity problems, due to the rapid demographic growth, challenging natural water regimes and management issues.
- In the arid region of Thar (Sindh) and Balochistan, poverty and lack of coping capacity are the drivers for the severe impacts to the population; deaths linked to malnutrition were reported in some locations. In the rest of the country, endemic risk of water shortages is present.
- The outlook is positive for the northern half of Pakistan, but no improvements may be expected in the south. While contribution to the Indus River from melting snow and glaciers will reduce or halt with the lowering temperatures, the key reservoirs of Mangla and Tarbela currently stand at half of their capacity, with net outflows.

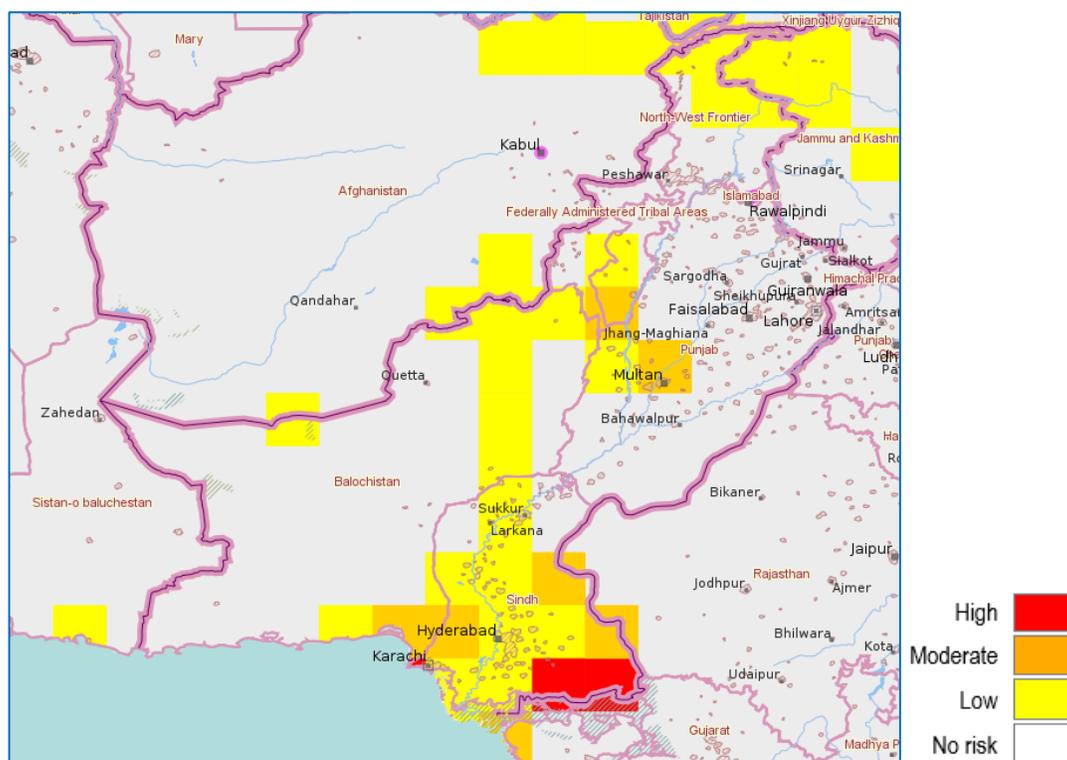
## Risk of drought impact for agriculture (RDrl-Agri)

The indicator RDrl-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 to the agricultural impacts (Figure 1). Southern Pakistan has a naturally dry climate (<200 mm/year), which makes the rivers flowing in from the north particularly important for water supply. Outside the irrigated plains surrounding the Indus river, a poor rainfall season may jeopardize households relying on pastures and subsistence agriculture, many of them in north-western Balochistan and eastern Sindh.

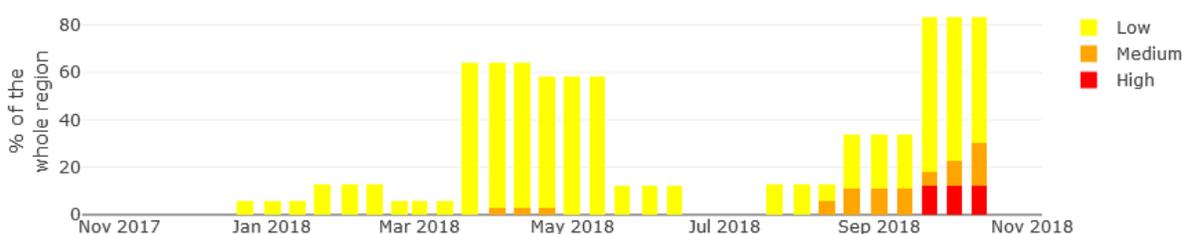
# GDO Analytical Report

## Drought in Southern Pakistan – November 2018

JRC Global Drought Observatory (GDO) and ERCC Analytical Team  
19/11/2018



**Figure 1:** Risk of drought impact for agriculture (RDri-Agri) in Pakistan, from 11 October until 20 October 2018.



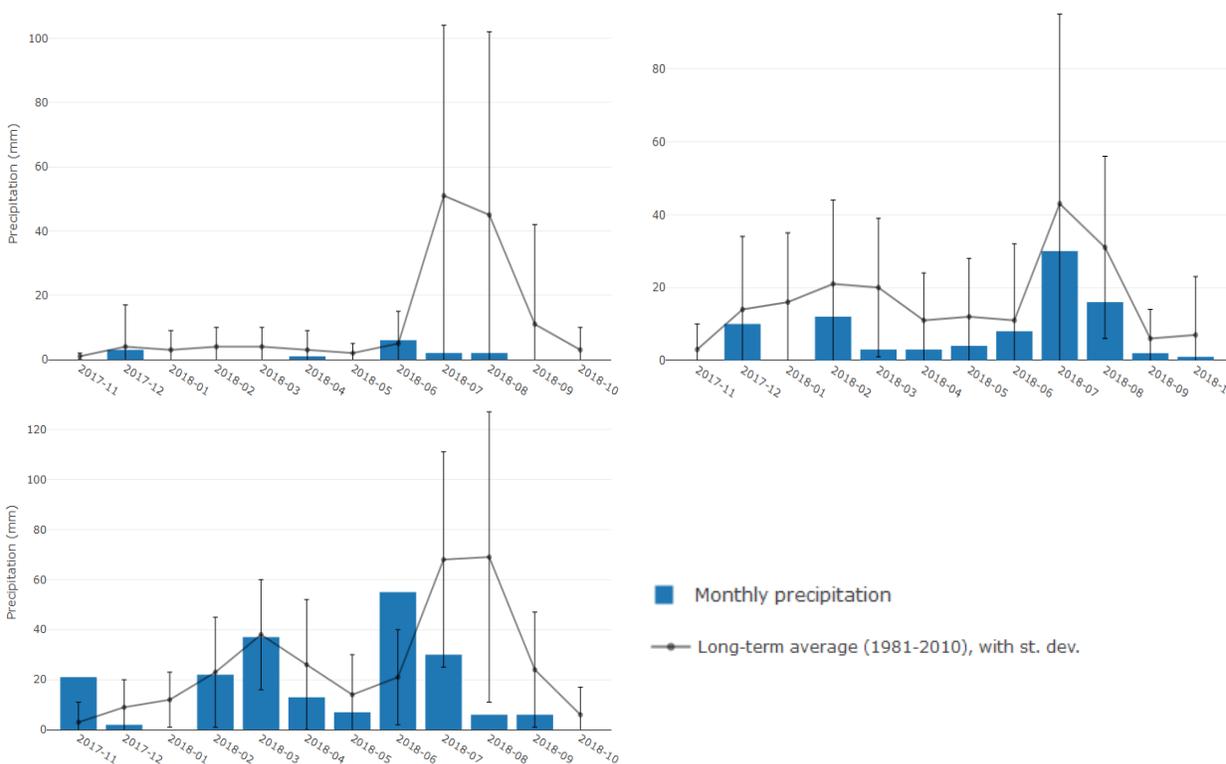
**Figure 2:** Risk of drought impact (RDri-Agri), evolution over time in Sindh (Pakistan).

RDri Class	Population	Area (km <sup>2</sup> )
Low, 1	9,483,852	136,706
Medium, 2	2,896,703	34,841
High, 3	1,803,076	16,696
<b>In affected areas:</b>	<b>14,183,657</b>	<b>188,222</b>

**Table1:** Sindh and Balochistan combined cover 60% of Pakistan. The table shows the population affected by drought, from 11 until 20 October 2018, divided by RDri-Agri class.

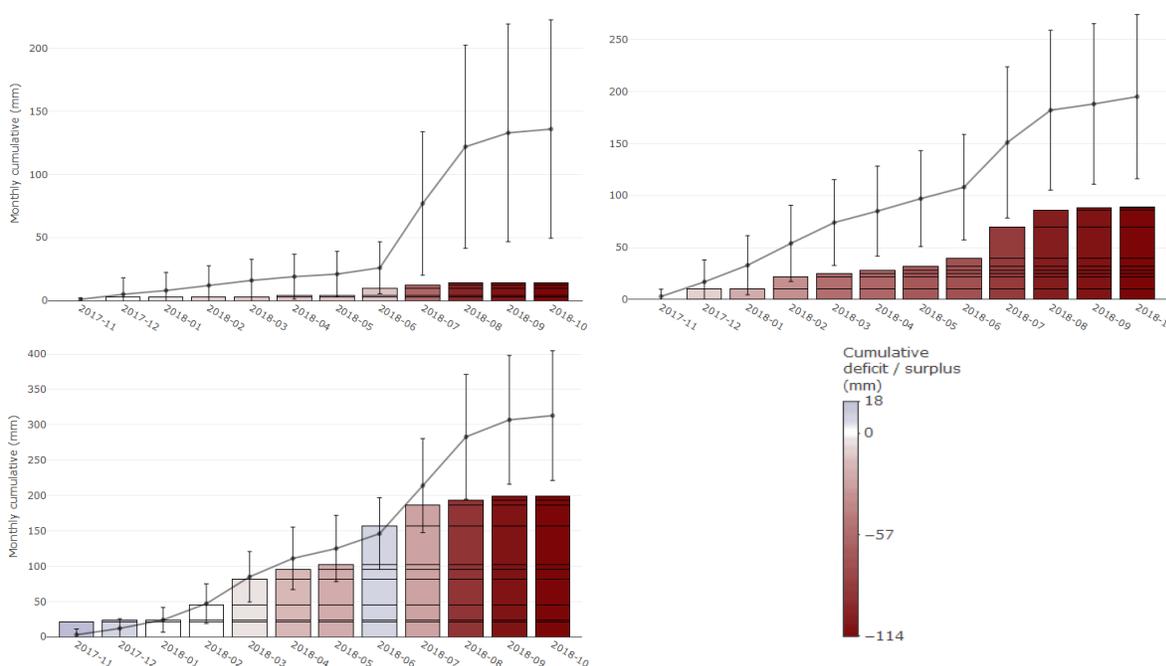
### Precipitation

Precipitation includes total monthly rainfall and snow. The long-term monthly mean for Sindh shows an extremely high variability of precipitation during the relatively wetter period between July and September (Figure 3, upper left). A similar situation, albeit with a slightly different precipitation pattern, is observed for Balochistan (Figure 3, right) and to a lesser extent for the central-north regions (Figure 3, bottom). These wide variations are common to most of Pakistan, meaning that poor precipitation is possible in any given year and may lead easily to a country-wide water scarcity situation. Another challenging feature of the climate is its stark seasonality. Therefore, a failure in precipitation in the wetter season has long lasting effects with possible serious impacts.



**Figure 3:** Monthly total precipitation between November 2017 and October 2018 near Moro (Sindh, coordinates: 26.7 N, 68.4 E; upper left), near Khuzdar (Balochistan, coordinates: 27.3 N, 65.3 E; right) and near Deraismailkhan (NW frontier, coordinates: 31.7 N, 70.5 E), with the long-term monthly averages (1981-2010). Vertical bars show one standard deviation.

With these premises, even though the monthly precipitation in 2018 did not depart from normal variations, the sequence of several underperforming months generated a severe cumulated deficit, with totals at a fraction of the expected (Figure 4). This picture is common to the whole of central and southern Pakistan.



**Figure 4:** Cumulative precipitation over a period of 12 months near Moro (Sindh, coordinates: 26.7 N, 68.4 E; upper left), near Khuzdar (Balochistan, coordinates: 27.3 N, 65.3 E; right) and near Deraismailkhan (NW frontier, coordinates: 31.7 N, 70.5 E). The bar colors indicate the cumulative deficit (red gradient), compared to the cumulated monthly long-term average and standard deviation (solid line and vertical bars), for the same time span and location. The boxes overlapping the bars are the stacked monthly totals.

### Standardized Precipitation Index (SPI)

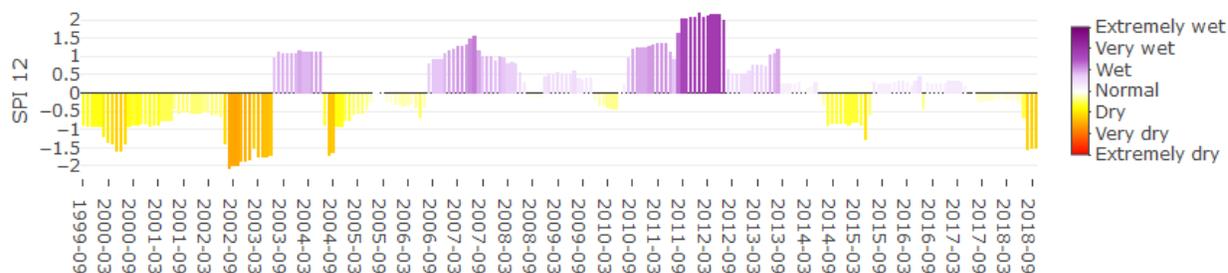
The SPI indicator is used to monitor the occurrence of meteorological drought. The lower (i.e. more negative) the SPI, the more intense is the drought.

Due to the high variability in precipitation and the naturally dry climate, a short term SPI is unlikely to reach extreme values in the most affected regions. Indeed, even strong precipitation deficits do not turn out as strong anomalies of SPI, especially in the drought prone regions of the south. Only looking at longer term SPIs, the current drought stands out as one of the strongest in the last 20 years for Sindh and Balochistan (Figure 5 and 6).

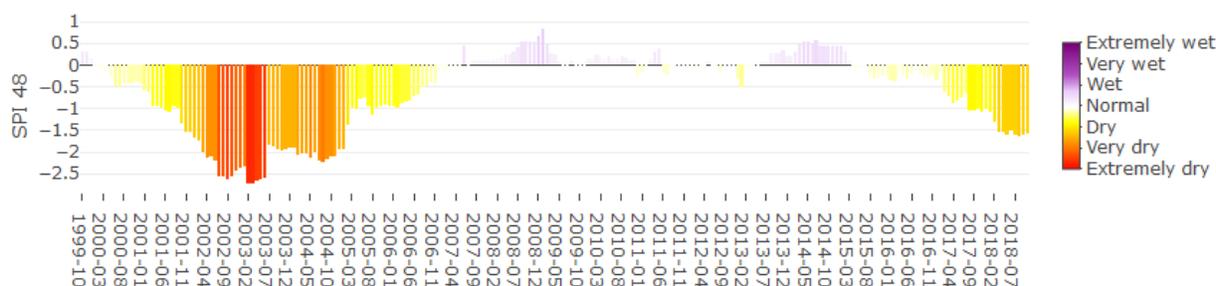
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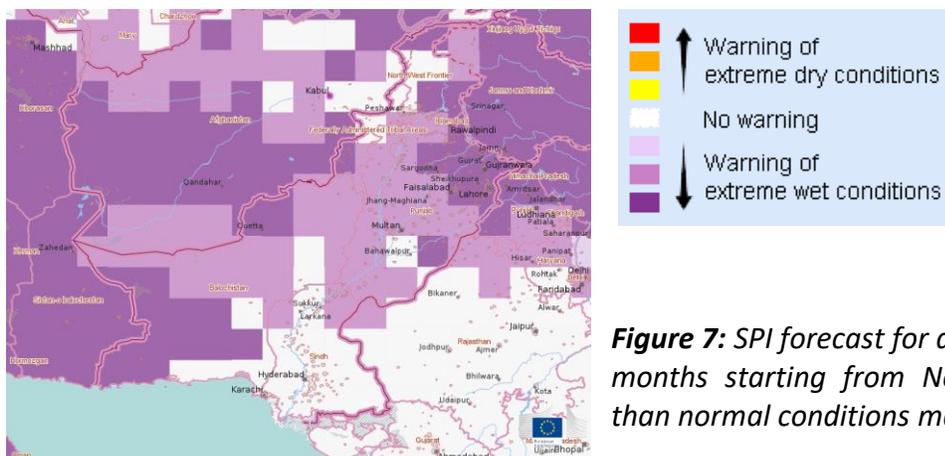
**Figure 5:** SPI for a cumulative period of 12 months near Moro (Sindh, Pakistan, coordinates: 26.75 N, 68.43 E).



**Figure 6:** SPI for a cumulative period of 48 months near Khuzdar (Balochistan, coordinates: 27.3 N, 65.3 E).

### Outlook

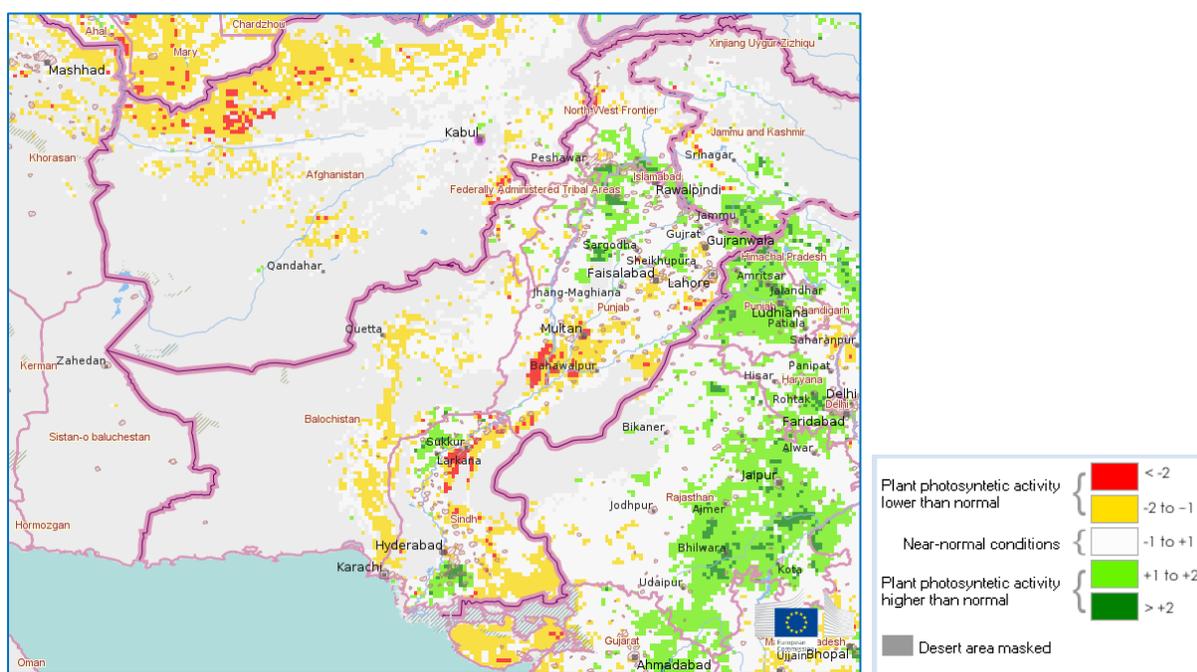
The outlook is positive for the northern half of Pakistan (Figure 7), while in the south precipitation will likely match the usual very low average for the period. Concerning the ongoing drought, no improvements may therefore be expected for the next few months.



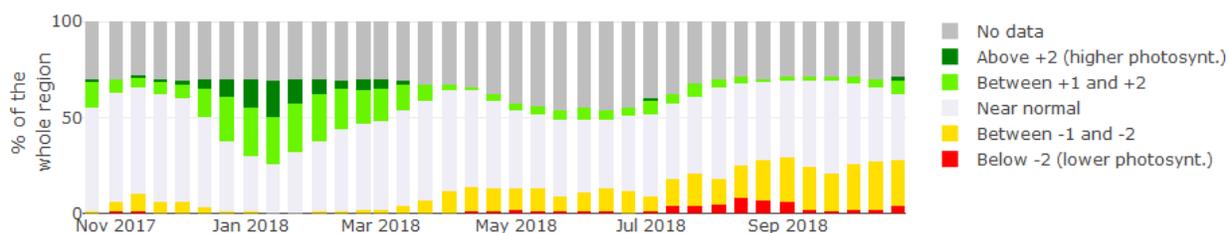
**Figure 7:** SPI forecast for a cumulative period of 3 months starting from November 2018; wetter than normal conditions may be expected.

### fAPAR and soil moisture anomalies

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. The arid climate of central and southern Pakistan allows only sparse vegetation to grow in most locations and consequently fAPAR cannot be computed reliably. Where available, negative anomalies are most common (Figure 8), with a fairly constant distribution in the past 4 months (Figure 9 for Sindh only).



**Figure 8:** fAPAR anomaly between 21 and 31 October 2018.



**Figure 9:** fAPAR anomaly time series over Sindh (south-east Pakistan).

With the exception of southern Sindh, no remarkable **soil moisture anomalies** are detected.

### Reported impacts

In eastern Sindh (Thar) deaths linked to malnutrition among children were reported and an aid package to fight malnutrition was dispatched<sup>1 2 3</sup>. The local government is providing fodder to herders, after heavy losses of domestic animals<sup>4</sup>.

In Balochistan, drought disaster declarations have been claimed<sup>5 6</sup>, while some emergency supplies are distributed in the affected districts<sup>7</sup>. Reportedly, people were forced to leave their homes by drought conditions<sup>8</sup>, while water supply in the town of Quetta is halted<sup>9</sup>.

The same drought event is affecting the neighboring region of Gujarat (India).

The October and November sowing season is highly exposed to the recent lack of precipitation and a diminished irrigation potential from the Indus for most of Pakistan<sup>10</sup>. Furthermore, water contribution to the Indus river from melting snow and glaciers will reduce or halt with the lower temperatures of the winter months.

On top of the ongoing crisis, Pakistan has several important and recurring issues concerning water, as a combination of rapid demographic and abstraction growth, challenging natural water regimes and insufficient management<sup>11</sup>. Due to the wide variations in yearly precipitation and the marked seasonality, water storage is essential for water security. Tarbela and Mangla dams, in the north of the country, are key reservoirs for national water and power supply and could not be filled to their full capacity during the latest snow melting and monsoon seasons. As of mid-November, both recorded the lowest water levels of the last ten years for the same period, standing at half way between the maximum and the minimum level for dam operations, with substantial net outflows. Such minimum level, also known as “dead” level, was reached at least twice during 2018<sup>12 13</sup>, highlighting a recurrent negative balance between water supply and demand.

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<sup>1</sup> <https://www.pakistantoday.com.pk/2018/10/21/pm-directs-preparation-of-relief-package-for-drought-hit-thar/>

<sup>2</sup> <https://www.dawn.com/news/1435348/women-children-in-balochistan-suffering-from-malnutrition-due-to-drought-like-situation>

<sup>3</sup> <https://pakobserver.net/cjp-calls-for-significant-steps-to-improve-situation-in-thar/>

<sup>4</sup> <https://arynews.tv/en/sindh-govt-to-dispatch-rs-50mn-animal-fodder-to-thar/>

<sup>5</sup> <https://www.dawn.com/news/1443858/balochistan-pa-asks-centre-to-declare-drought-hit-areas-as-calamity-affected>

<sup>6</sup> <https://tribune.com.pk/story/1841322/1-balochistan-assembly-demands-relief-package-farmers/>

<sup>7</sup> <https://tribune.com.pk/story/1834930/1-pdma-sends-relief-goods-drought-hit-chagai/>

<sup>8</sup> <https://www.dawn.com/news/1441559/drought-like-situation-in-noshki-forces-residents-to-migrate>

<sup>9</sup> <https://www.dawn.com/news/1430495>

<sup>10</sup> <https://www.dawn.com/news/1436302> Source: Indus River System Authority

<sup>11</sup> United Nations Development Programme Pakistan, 2017. *Water Security in Pakistan: Issues and Challenges*. Development Advocate Pakistan, Vol. 3:4.

<sup>12</sup> <https://tribune.com.pk/story/1667832/1-mangla-tarbela-dams-hit-dead-level-15-years/> --- <https://tribune.com.pk/story/1719307/1-tarbela-mangla-set-reach-dead-level/> --- <https://tribune.com.pk/story/1752309/1-tarbela-dam-touches-dead-level-july/>

<sup>13</sup> <https://nation.com.pk/07-May-2018/tarbela-dam-touches-dead-level>

### Information sources

Global Drought Observatory (GDO) - Joint Research Centre of European Commission

National Drought Monitoring Centre - Pakistan Meteorological Department<sup>14</sup>.

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<sup>14</sup> <http://www.ndmc.pmd.gov.pk>