GOVERNMENT OF PAKISTAN
PAKISTAN METEOROLOGICAL DEPARTMENT

Quarterly Drought Bulletin of Pakistan

October-December 2025

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1. Introduction

Pakistan's latitudinal range contributes to significant variability in rainfall across different seasons. The country's climate exhibits a spectrum from arid to hyper-arid in its lower southern regions, while the northern half ranges from semi-arid to humid. Certain areas experience persistent dry conditions, rendering them vulnerable to drought throughout the year. Prolonged absence of precipitation can exacerbate these conditions, leading to widespread drought impacts. Historically, all provinces of Pakistan have grappled with significant drought events.

In contrast to sudden-onset disasters such as floods, cyclones, and earthquakes, droughts typically develop slowly and last for extended periods. In some cases, however, intense heat waves can lead to the rapid development of flash droughts. Although its impacts are less immediately apparent, they can affect vast regions and a larger population than other environmental hazards.

The Pakistan Meteorological Department (PMD) established the National Drought Monitoring and Early Warning Centre (NDMC) in 2004-05, following the severe drought of 1999-2001. The primary objective of NDMC is to proactively monitor drought conditions nationwide and issue timely advisories.

The NDMC operates a central office in Islamabad, complemented by four Regional Drought Monitoring Centers (RDMCs) in Lahore, Karachi, Peshawar, and Quetta. These RDMCs serve as central hubs for gathering, consolidating, and analyzing drought-related data from all regions of the country. To strengthen monitoring capabilities, Automatic Weather Stations (AWS) have been strategically installed, particularly in drought-prone areas. However, maintenance and regular acquisition of data from the remote regions of the country have always posed a significant challenge.

Figure 1 represents the countrywide network of observatories of Pakistan Meteorological Department. This network ensures sufficient spatial coverage, particularly in drought-prone and vulnerable districts across all four provinces and administrations. The data received from these observatories play a vital role in monitoring precipitation trends, validating satellite-based rainfall estimates, and supporting the assessment of drought intensity and spatial extent.

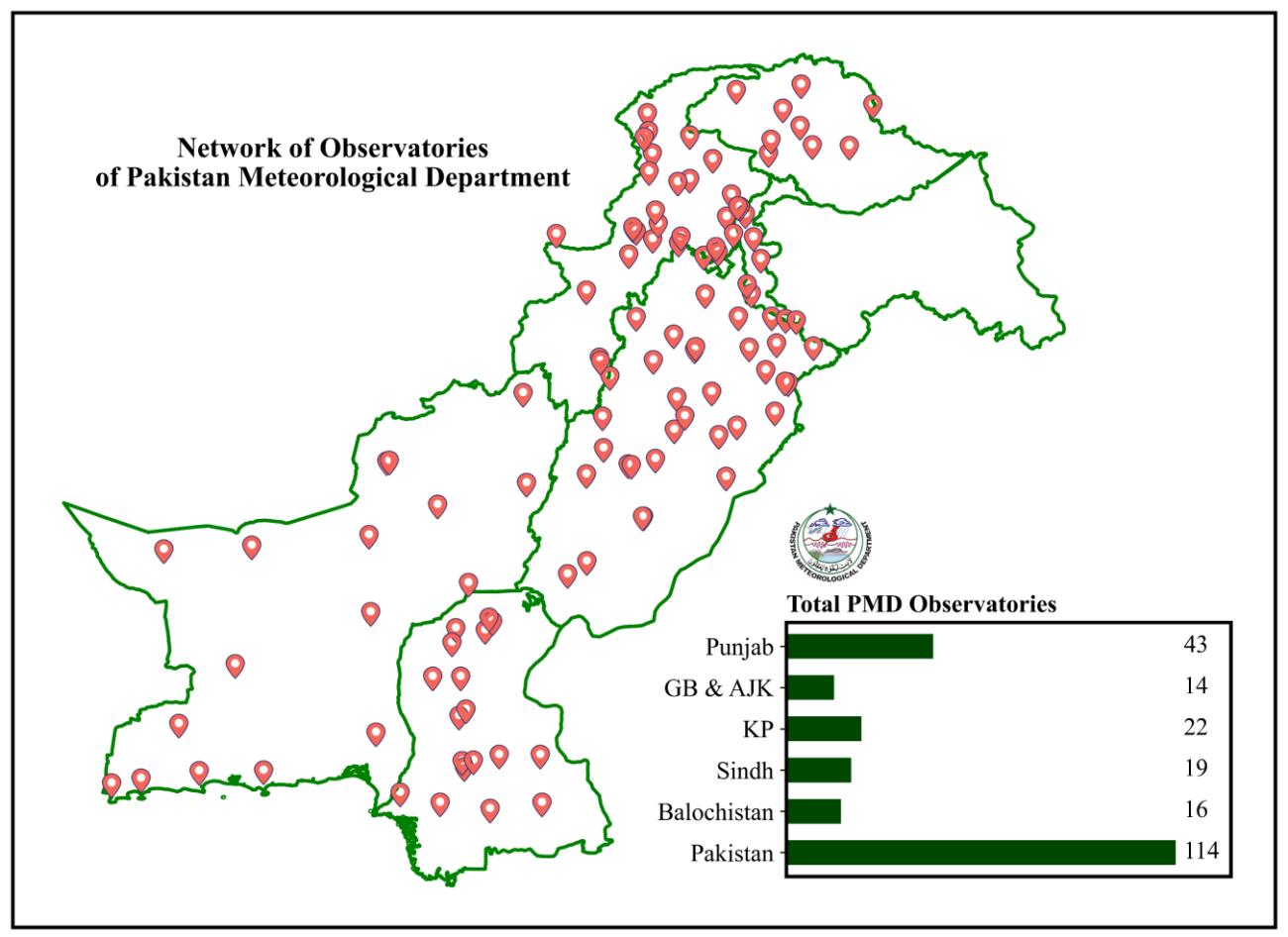

Figure-1: PMD's observatories across Pakistan

2. Historical Background

The tropical monsoon climate of the Indian subcontinent is characterized by pronounced variability in rainfall intensity and spatial distribution. Seasonal and regional shifts in atmospheric circulation associated with the monsoon constitute a fundamental component of the region's climatology. Two primary rainfall systems govern the weather patterns: the Southwest (Summer) Monsoon, which occurs from late June to September, and precipitation associated with mid-latitude westerly disturbances prevailing from December to March.

Pakistan, situated within the monsoon-influenced region of South Asia, receives substantial rainfall during the summer months from the Southwest (SW) monsoon and in winter from western disturbances. The SW monsoon contributes approximately 65% of the country's annual rainfall, primarily between July and September (Waqas and Athar, 2019; Ullah et al., 2021; Ullah et al., 2023). Monsoon rainfall exhibits significant spatial and temporal variability. Droughts in Pakistan mainly arise from deficits in SW monsoon rainfall, while seasonal droughts can also occur due to winter rainfall deficits. Additionally, the strength and variability of monsoon activity are significantly influenced by El Niño and La Niña events.

These droughts around the year 2000-2001 had significantly affected agricultural yield. Major crops experienced a decline of nearly 10% in growth, contributing to an overall negative growth rate of 2.6% for the agricultural sector. The water shortage in Pakistan persisted in 2001-2002, reaching levels of up to 51% below normal supplies, worsening from the 40% deficit in the previous year (Shahid Ahmad, et al 2004).

Pakistan has experienced several significant drought episodes across its provinces. The Punjab province faced severe droughts in 1899, 1920, and 1935, while the northwestern region of Khyber Pakhtunkhwa (KPK) experienced worst droughts in 1902 and 1951. Sindh was affected by major droughts in 1871, 1881, 1899, 1931, 1947, and 1999 (Chandrasekara, S. S. K., et al. 2021). Among the most severe nationwide droughts was the 1999-2002 event, that impacted large parts of Balochistan, Sindh, Punjab, and KPK.

Climate change has altered rainfall patterns, increasing variability between wet and dry periods. This has resulted in heavier precipitation during wet spells and reduced rainfall during dry phases (Weng, X., et al. 2024). Consequently, prolonged dry conditions often trigger droughts, whereas intense rainfall events contribute to various types of flooding, including flash floods, urban floods, coastal floods, and riverine floods.

3. Rainfall Distribution (October-December) 2025

During the last quarter of 2025 (October-December), Pakistan experienced below-normal precipitation, with a countrywide rainfall departure of -20% from the long-term average. Regionally, Azad Jammu and Kashmir (AJK) recorded a precipitation deficit of -14%, Balochistan -43%, Gilgit-Baltistan (GB) -22%, and Khyber Pakhtunkhwa (KPK) -34% below normal. In contrast, above-normal departures in precipitation were observed over Punjab +6% and Sindh +77% as depicted in Figure 2.

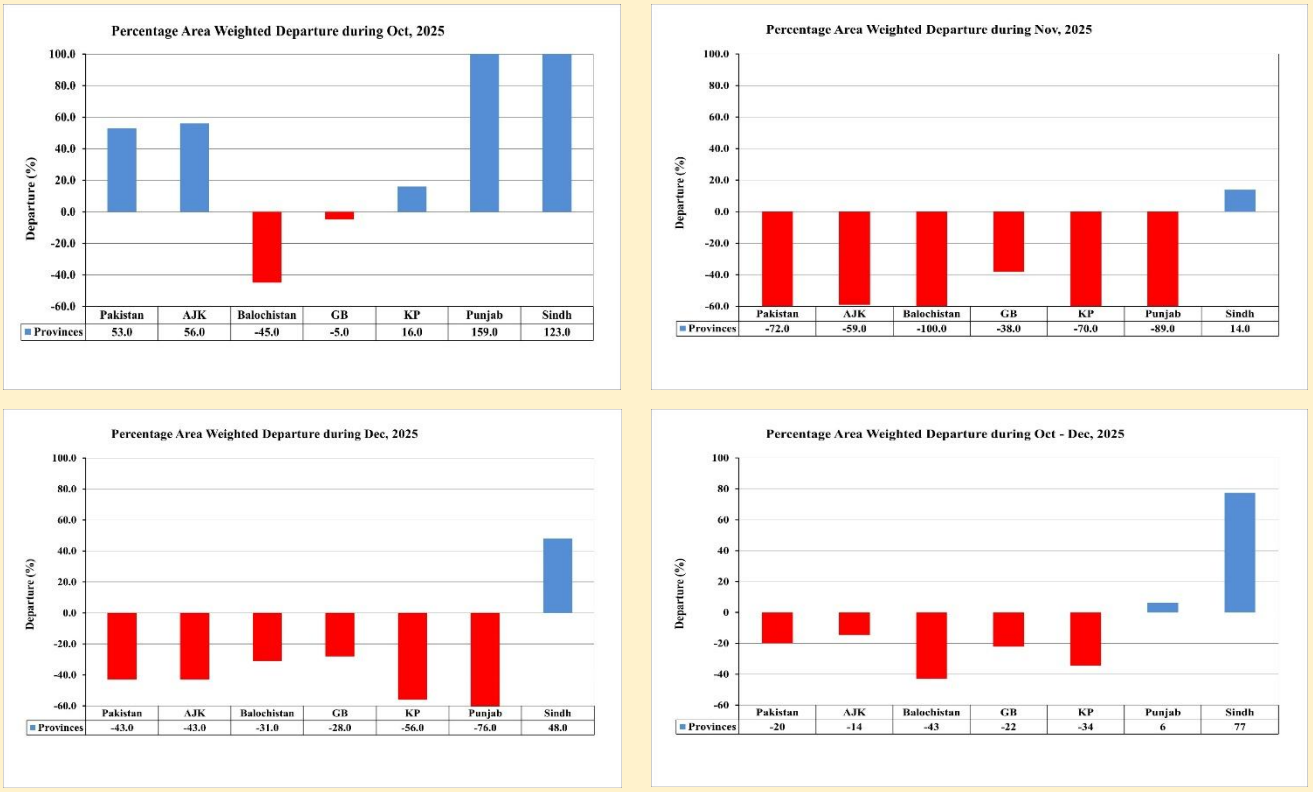

Figure-2: Percentage area weighted departure of rainfall during October-December 2025

The cumulative quarterly rainfall analysis indicates that overall Pakistan received below-normal rainfall during the last quarter of 2025. Figure 3 illustrates the spatial distribution of rainfall and its departure from normal for the period October-December. During this quarter, rainfall events occurred across most parts of the country, with the most notable events were recorded in the upper parts of KPK, AJK, and central Punjab. However, rainfall remained below normal over most regions except for parts of eastern Punjab, western parts of Sindh, and few parts of KPK and AJK where above-normal rainfall was observed. The highest recorded rainfall amounts during this period are presented in Table 1.

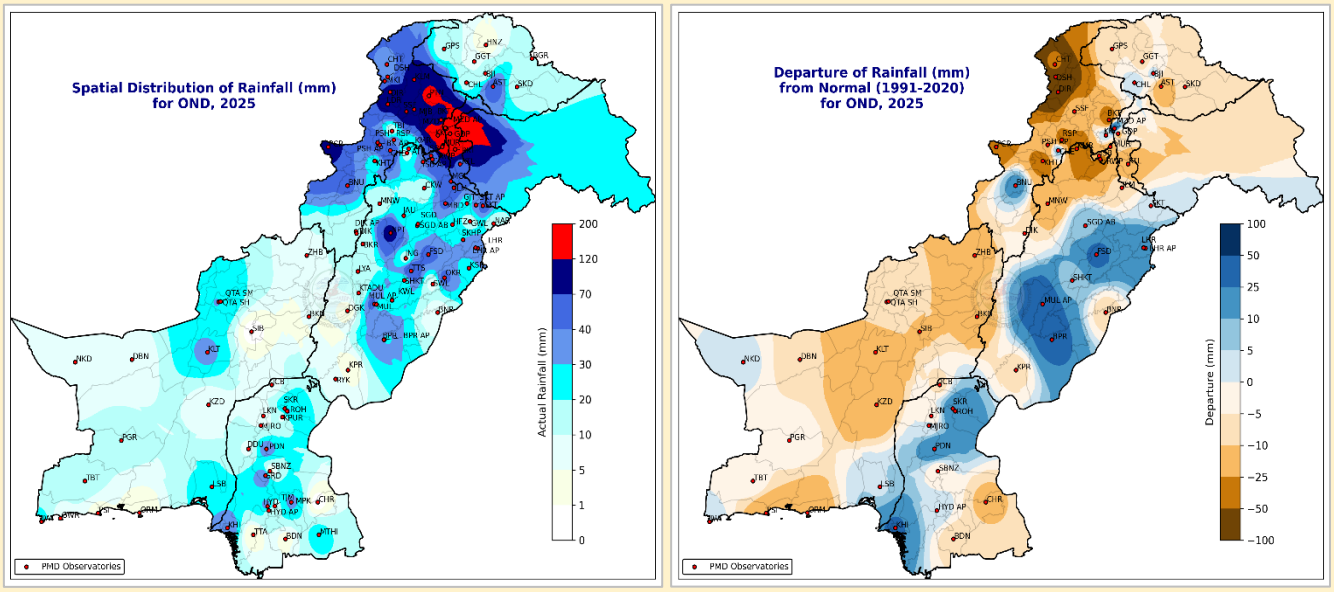

Figure-3: Spatial distribution and departure of rainfall during October-December 2025

3.1 PMD Stations with Highest Rainfall (mm) (October-December) 2025

Table-1: Highest amount of rainfall recorded across Pakistan for OND, 2025

Sr. No.	Station	Rainfall (mm)	Sr. No.	Station	Rainfall (mm)
1	Muzaffarabad AP	167.2	11	Kalam	82.3
2	Muzaffarabad City	150.7	12	Parachinar	80.0
3	Rawalakot	144.8	13	Malamjabba	77.0
4	Murree	133.5	14	Noorpur Thal	75.4
5	Garhi Dupatta	130.0	15	Lower Dir	72.0
6	Pattan	127.0	16	Cherat	66.0
7	Kakul	124.0	17	Kotli	64.0
8	Dir	102.5	18	T.T.Singh	59.0
9	Saidu Sharif	98.0	19	Islamabad ZP	58.4
10	Balakot	93.0	20	Mangla	58.2

3.2 The Maximum Length of Dry Spell

The maximum length of dry spells, expressed as Consecutive Dry Days (CDD) from 11th September to 31st December 2025, is illustrated in Figure 4. The longest dry spell was recorded at Sibi, registering 112 CDD. Recent rainfall associated with a westerly disturbance has terminated the dry spell in parts of western Balochistan. It is pertinent to note that a daily rainfall threshold of 1.0 mm is used to define the termination of a dry spell at any station

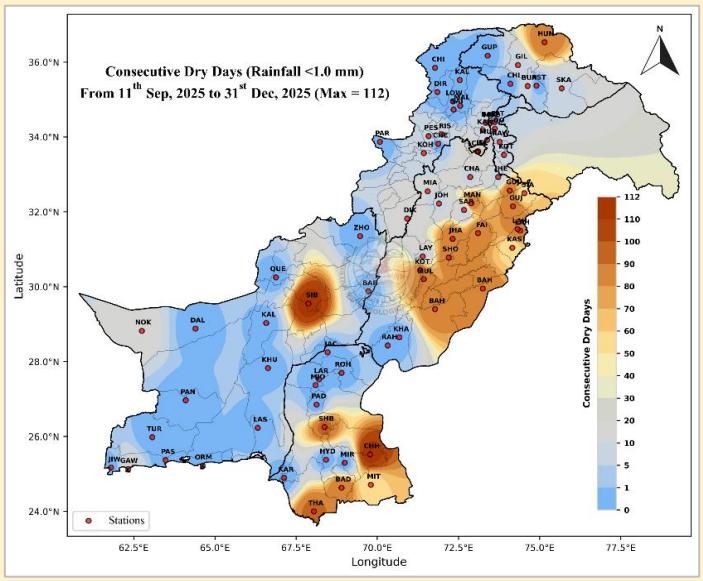

Figure-4: Maximum length of dry spell up to 31st December 2025

4. Drought Products

4.1 4.1 Drought Monitor

The drought monitor map for December 2025 (Figure 5) illustrates the district-wide variation in drought severity across the country. This composite map is based on meteorological analysis, drought-monitoring indices, and ground-based observations from PMD observatories. At present, mild drought conditions are prevailing in the districts of Chagai, Gwadar, Kech, Kharan, Nushki, Panjgur, and Washuk.

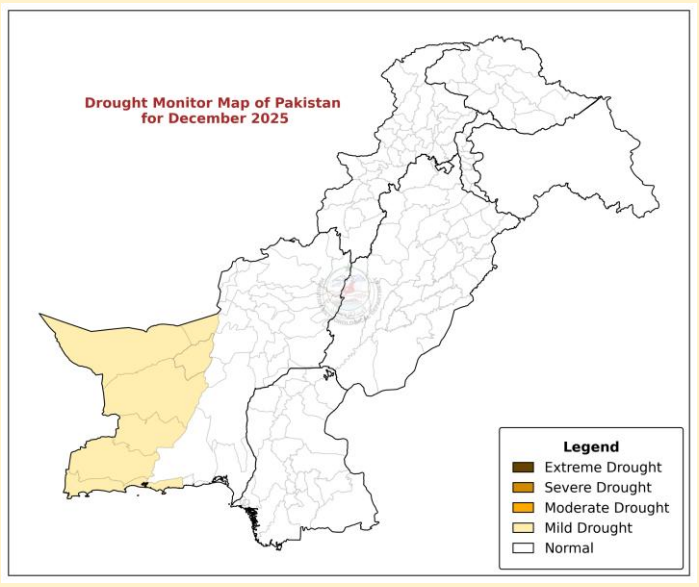

Figure-5: Drought Monitor for the month of December 2025

4.2 Cumulative Precipitation Anomaly (CPA)

The Cumulative Precipitation Anomaly (CPA) was computed for the period from 1st June 2025 to 31st December 2025, as illustrated in Figure 6. Notably, eastern and northeastern Punjab, most parts of AJK and Sindh, along with central and southeastern Balochistan experienced above-normal rainfall, exhibiting positive anomalies of up to 520 mm. In contrast, GB, KPK, northern and western Balochistan, parts of western and southern Punjab, along with southeastern Sindh observed negative CPA values of up to -520 mm, indicating substantial rainfall deficits.

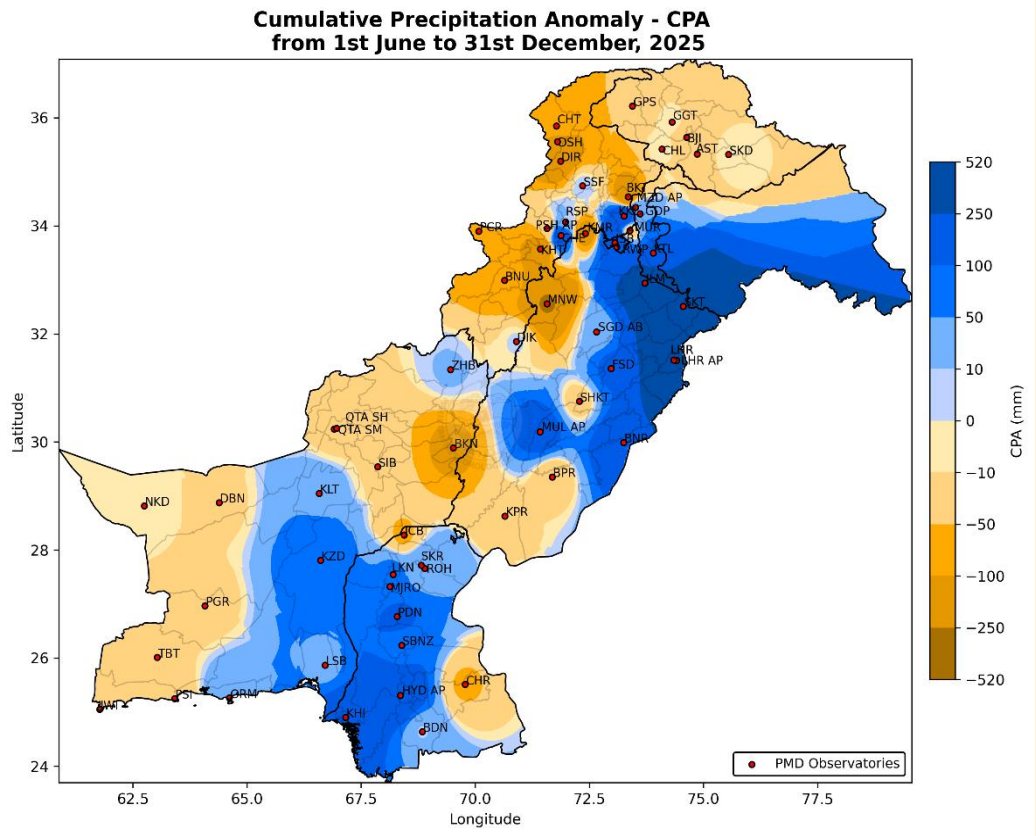

Figure-6: Cumulative Precipitation Anomaly (Till December 2025)

4.3 Soil Moisture Anomaly (SMA)

Current soil moisture conditions across Pakistan remain generally favorable following recent rainfall events and residual effects from the 2025 monsoon season, as illustrated in Figure 7. The national overview indicates adequate to above-normal soil moisture levels prevailing across GB, Punjab, most areas of KPK along with central and eastern parts of Balochistan. However, soil moisture levels remain notably below normal in western Balochistan, the Hazara Division, and northwestern KPK.

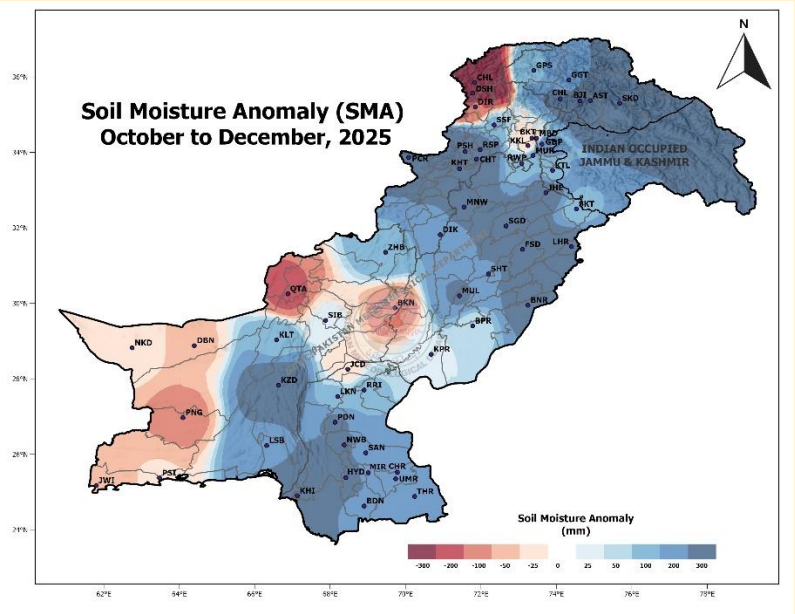

Figure-7: Soil moisture anomaly (October-December 2025)

4.4 Water Level of Reservoirs

Pakistan's two major water reservoirs, Tarbela and Mangla, play a critical role in national water storage and regulation. The dead level of Tarbela Dam is 1,402 feet, with a maximum conservation level of 1,550 feet, while Mangla Dam has a dead level of 1,050 feet and a maximum conservation level of 1,242 feet. Monsoon rainfall and snowmelt are the primary contributors influencing seasonal fluctuations in the water levels of these reservoirs.

In addition to major reservoirs, numerous small dams across the country are replenished during wet periods, supporting agricultural productivity and socio-economic development. Figure 8 presents the average reservoir storage levels (%) of Tarbela and Mangla during the last quarter of 2025, reflecting the combined influence of monsoon rainfall and snowmelt. During this period, storage levels in both reservoirs remained well above normal, indicating adequate water availability.

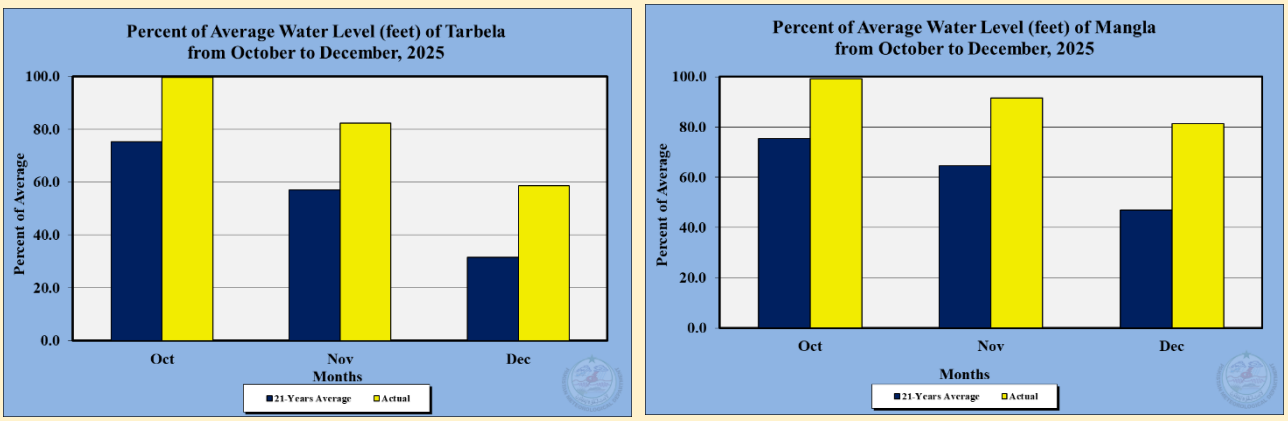

Figure-8: Percent of the water level of Mangla and Tarbela (October-December 2025)

4.5 District-wise Drought Outlook

Currently, mild drought conditions are prevailing in Chagai, Gwadar, Kech, Kharan, Nushki, Panjgur, and Washuk due to prolonged and significant rainfall deficits across these districts of western and southwestern Balochistan. Below-normal rainfall combined with above-normal temperatures is forecasted for the upcoming season (January-March 2026). Consequently, drought conditions are likely to remain prevalent in these districts.

4.6 Kharif Season Forecast of Mangla and Tarbela Dams (2025)

The forecasted water availability (in MAF) for the two major reservoirs, Tarbela and Mangla, during the Rabi season (October 2025–March 2026) is presented in Figure 9.

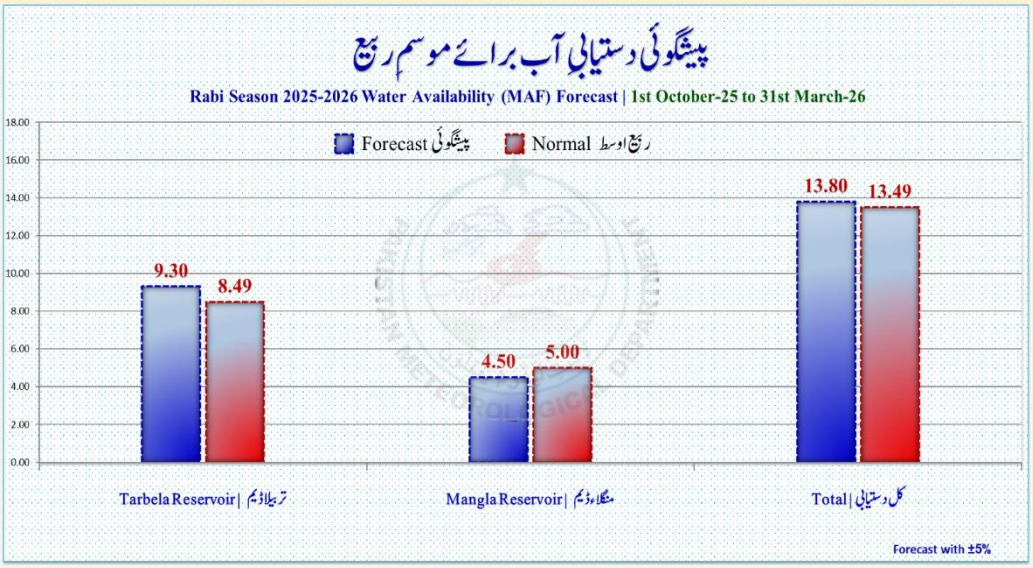

Figure-9: Kharif season forecast of Mangla and Tarbela dams

Recommendations

Natural disasters cannot be prevented; however, each past event provides valuable lessons for improved planning, management, and the adoption of precautionary measures to minimize future impacts. Based on these lessons, the following recommendations are proposed to enhance preparedness and resilience against floods and droughts in Pakistan.

- Pakistan dam's water storage capacity is much less than the normal rainfall of the region especially in the southern parts of the country. There is an urgent need to construct additional large and small dams and water storage facilities in catchment and low-lying areas to effectively conserve rainfall during the monsoon season.
- Enhanced water storage will contribute significantly to national food security by ensuring the availability of irrigation water for crops during drought periods.
- The national Drought Monitoring Center (NDMC) continuously monitors drought situation over the country and regularly updates the stakeholders and general public by issuing drought information on weekly, fortnightly, monthly and Quarterly basis.
- Overall, near normal conditions are prevailing across most parts of the country (except western and south-western Balochistan) during this quarter. For more information regarding the drought situation in Pakistan, please visit http://www.ndmc.pmd.gov.pk/index.htm

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