GOVERNMENT OF PAKISTAN
PAKISTAN METEOROLOGICAL DEPARTMENT

Quarterly Drought Bulletin of Pakistan
January-March 2026


National Drought Monitoring and Early Warning Centre
Post Box No. 1214, Sector H-8/2, Islamabad, Pakistan
URL: https://ndmc.pmd.gov.pk/new/

Table of Contents

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 First 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.

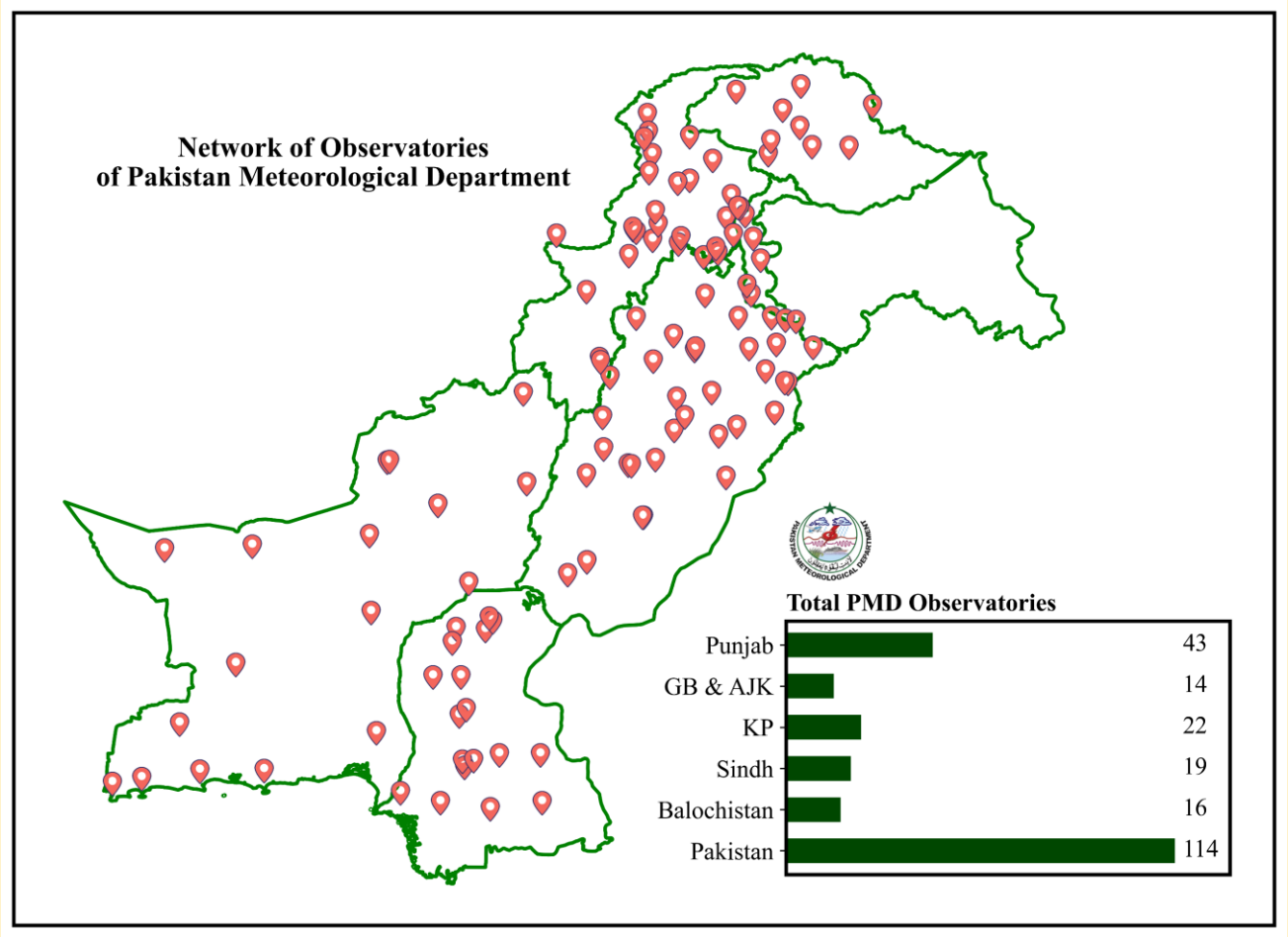

Figure-1: PMD's observatories across Pakistan

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. Recently, in 2025, the western and southwestern parts of Balochistan faced drought conditions due to prolonged rainfall deficit.

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 (January-March 2026)

During the first quarter of 2026 (January-March), Pakistan experienced below-normal precipitation, with a countrywide rainfall departure of -13% from the long-term average. Regionally, Azad Jammu and Kashmir (AJK) recorded a precipitation deficit of -16%, Punjab -37%, Gilgit-Baltistan (GB) -22%, and Khyber Pakhtunkhwa (KPK) -14% below normal. In contrast, above-normal departures in precipitation were observed over Balochistan +6% and Sindh +33% as depicted in Figure 2.

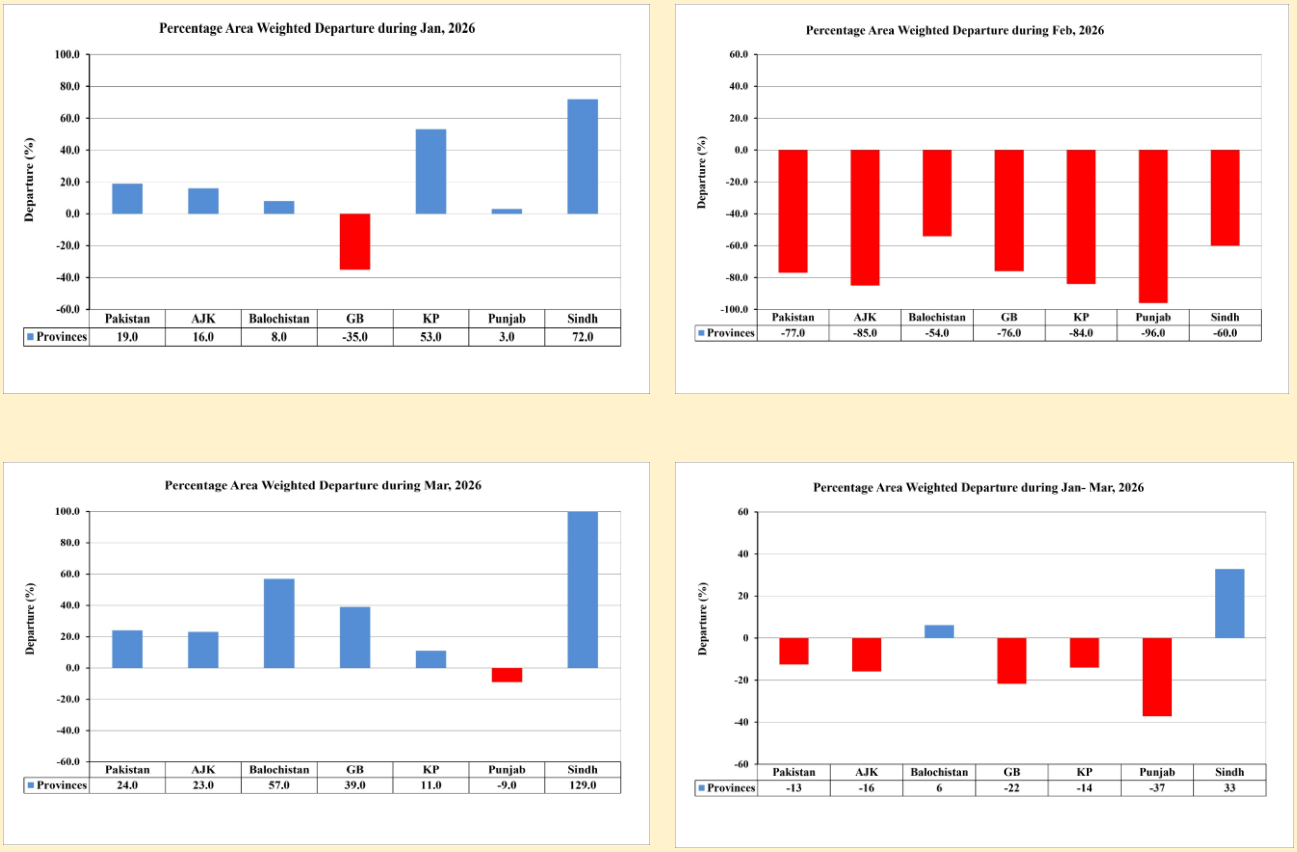

Figure-2: Percentage area weighted departure of rainfall during January-March 2026

The quarterly rainfall analysis indicates that overall Pakistan received near-normal rainfall during the first quarter of 2026. Figure 3 illustrates the spatial distribution of rainfall and its departure from normal for the period January-March. 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, Sindh and Baluchistan. However, rainfall remained below normal over some parts in KPK and AJK. The highest recorded rainfall amounts during this period are presented in Figure 4.

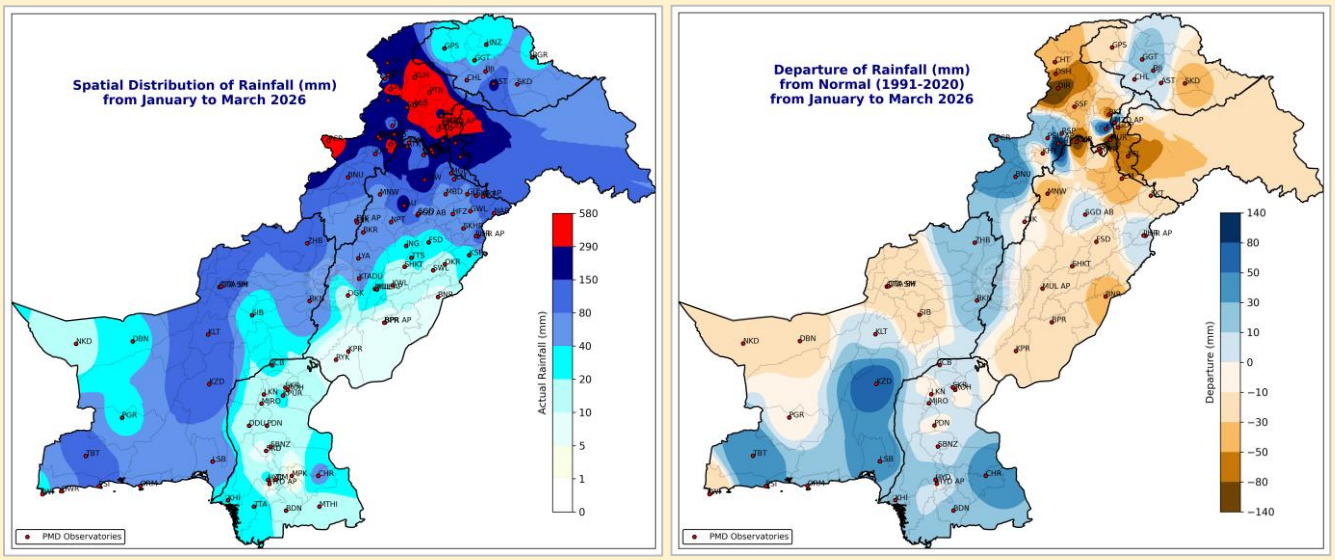

Figure-3: Spatial distribution and departure of rainfall during January-March 2026

3.1 PMD Stations with Highest Rainfall (mm) (January-March 2026)

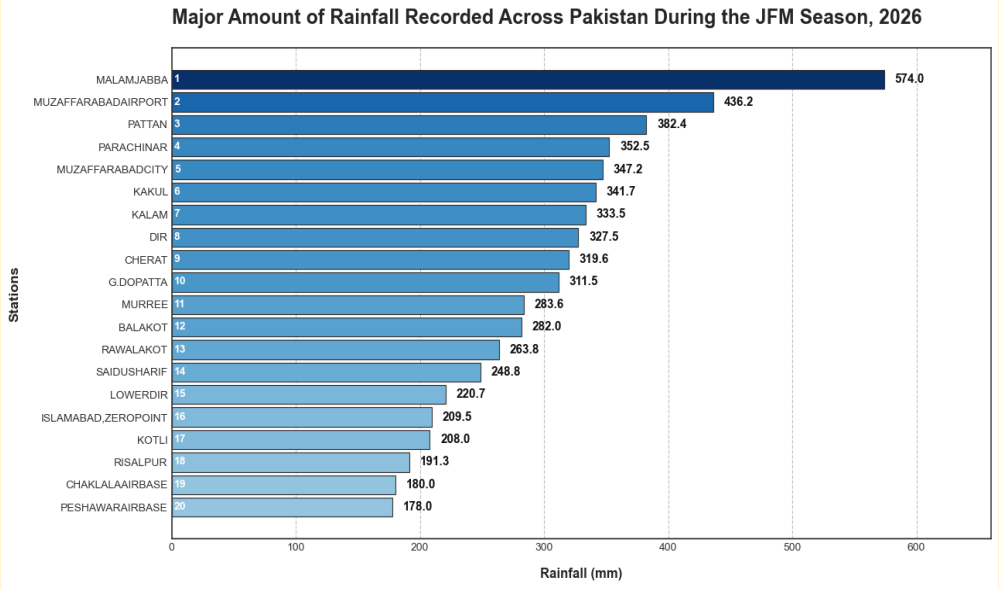

Figure-4: Major amount of Rainfall (mm) during January-March 2026

3.2 The Maximum Length of Dry Spell

The maximum length of dry spell, expressed as Consecutive Dry Days (CDD) from 1st January to 31st March 2026, is illustrated in Figure 5. The longest dry spell was recorded at Bahawalpur, Khanpur and Rahim Yar Khan registering 67 CDD. Recent rainfall associated with a westerly disturbance has terminated the dry spell in parts of southwestern 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.

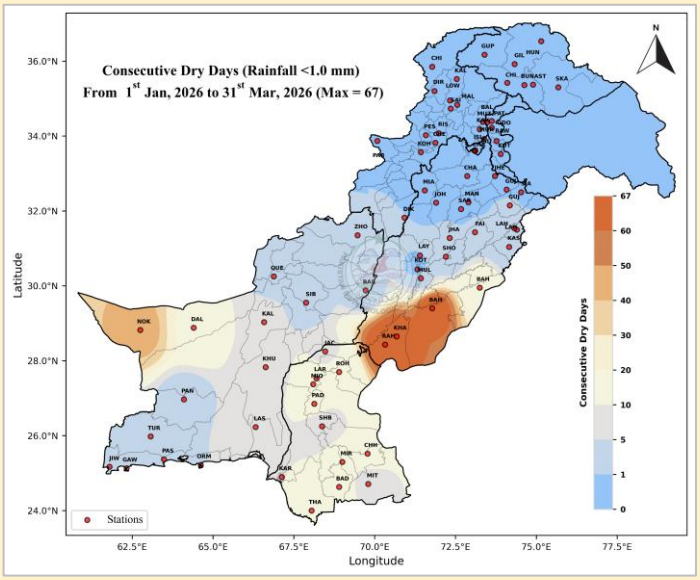

Figure-5: Maximum length of dry spell up to 31st March 2026

4. Drought Products

4.1 Drought Monitor

The drought monitor map for March 2026 (Figure 6) illustrates the district-wise variation in drought conditions across the country. This composite map is based on meteorological analysis, drought-monitoring indices, and ground-based observations from PMD observatories. At present, normal conditions related to drought are prevailing in the country.

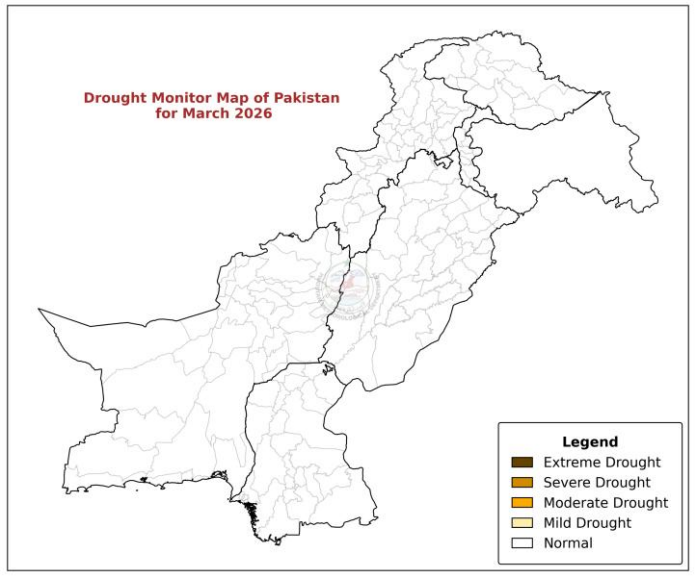

Figure-6: Drought Monitor for the month of March 2026

4.2 Standardized Precipitation Evapotranspiration Index (SPEI)

The Standardized Precipitation Evapotranspiration Index at a 3-month timescale (SPEI-3) quantifies the cumulative climatic water balance by integrating precipitation deficits against evapotranspiration demand over the antecedent January-March 2026 period. The spatial distribution reveals a pronounced negative moisture anomaly concentrated over southern Punjab and western Balochistan, indicative of sustained precipitation deficiency compounded by elevated potential evapotranspiration (PET). Near-normal to mildly wet conditions prevail over coastal Balochistan. Overall, the SPEI-3 pattern underscores a significant hydrometeorological moisture deficit across the southern plains and western parts of Pakistan, as illustrated in Figure 7.

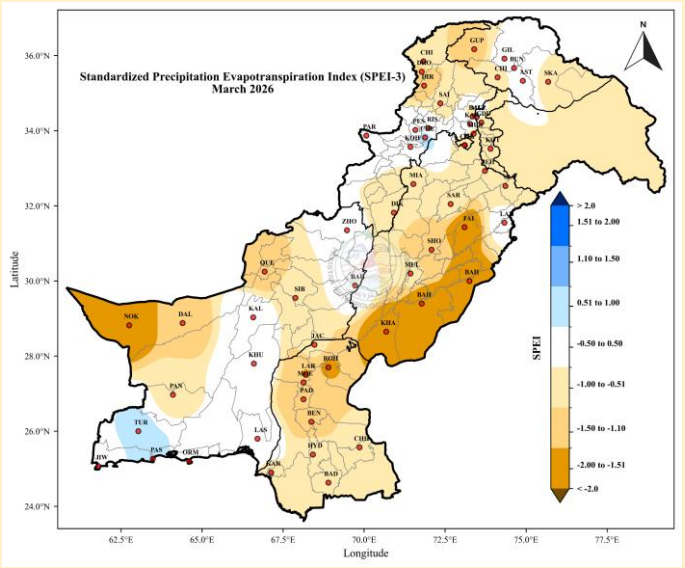

Figure-7: Standardized Precipitation Evapotranspiration Index (SPEI-3)

4.3 Cumulative Precipitation Anomaly (CPA)

The Cumulative Precipitation Anomaly (CPA) was computed for the period from 1st Dec 2025 to 31st March 2026, as illustrated in Figure 8. Notably, southern KPK, central GB, most parts of Sindh, along with northern and most parts of southern Balochistan experienced above-normal rainfall, exhibiting positive anomalies of up to 200 mm. In contrast, Punjab, AJK, northern KPK, parts of western Balochistan observed negative CPA values of up to -200 mm, indicating substantial rainfall deficits.

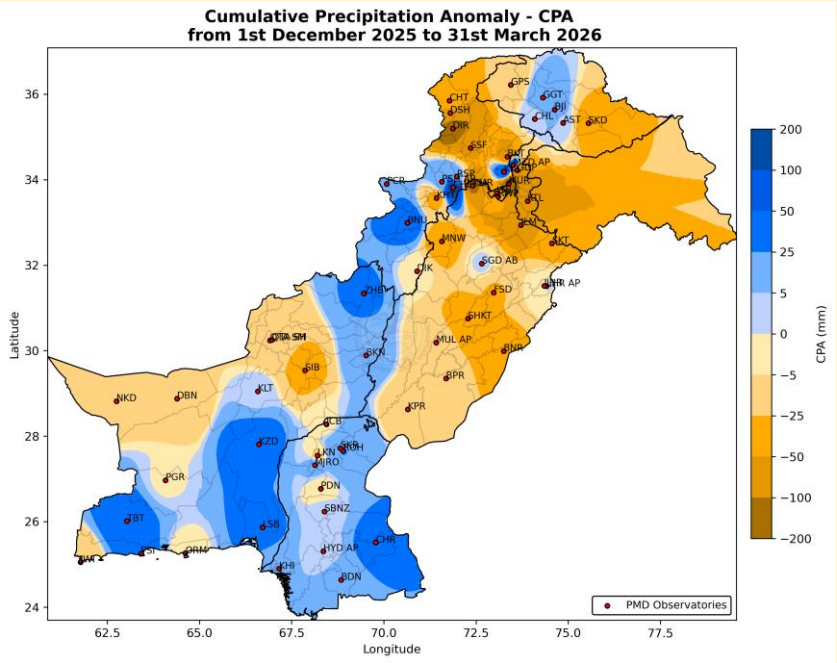

Figure-8: Cumulative Precipitation Anomaly (Till December 2026)

4.4 Soil Moisture Anomaly (SMA)

Current soil moisture conditions across Pakistan remain generally favorable following recent rainfall events in winter season, as illustrated in Figure 9. The national overview indicates adequate to above-normal soil moisture levels prevailing across Sindh, 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 northern KPK.

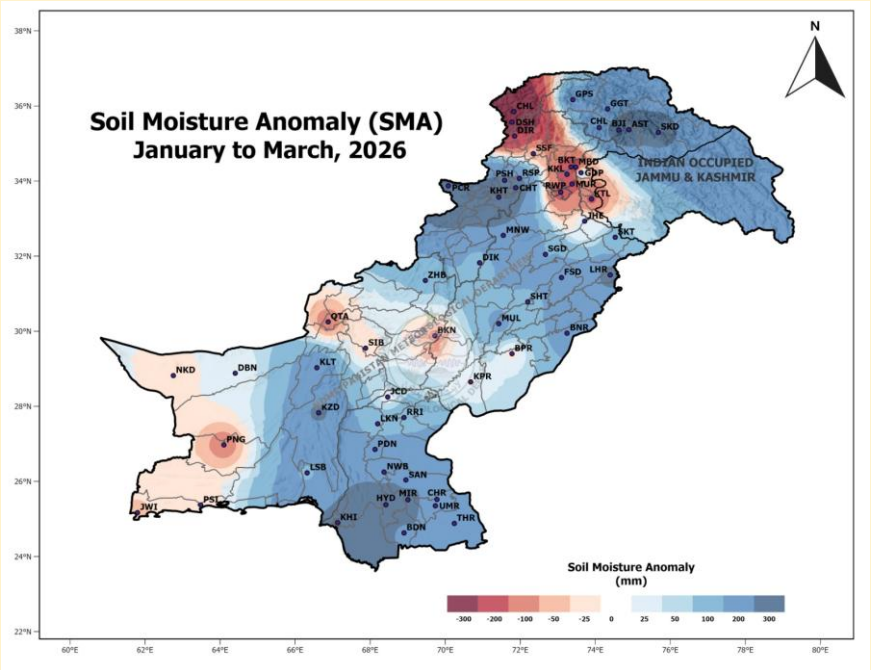

Figure-9: Soil moisture anomaly (January-March 2026)

4.5 Water Level of Reservoirs

Figure 10 presents percent of water level for Tarbela and Mangla dams. Both reservoirs maintained significantly above-average water storage levels throughout January to March 2026, with usable storage consistently ranging nearly double the 21-year historical averages across both facilities. While a steady seasonal decline was observed at both reservoirs across the months, current levels remained comfortably above historical normals, with Tarbela and Mangla retaining 36% and 50% of usable storage by season's end (March), respectively. This above-normal storage at both major reservoirs heading into the Kharif season is a positive indicator for irrigation water availability.

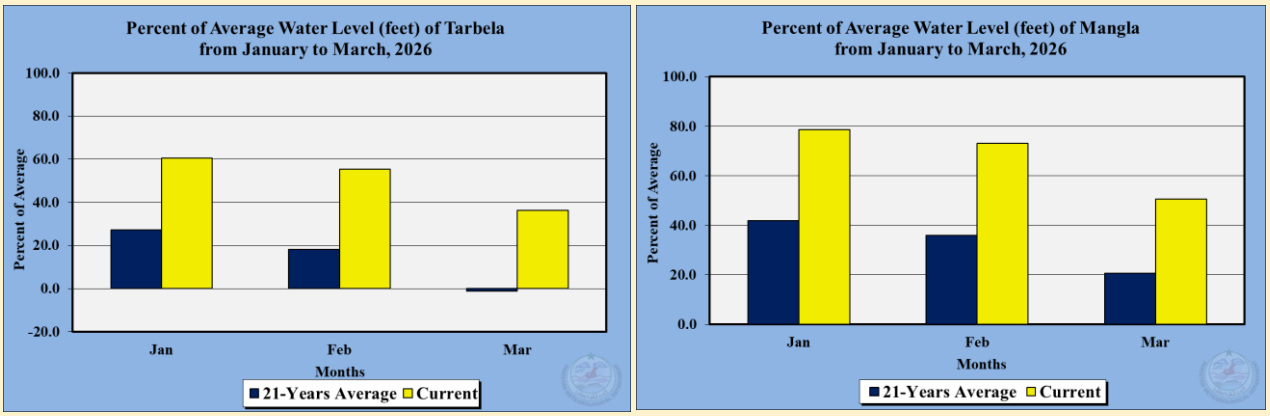

Figure-10: Percent of the water level of Mangla and Tarbela (January-March 2026)

4.6 District-wise Drought Outlook

Currently, normal drought conditions are prevailing over the country. Above-normal rainfall combined with above-normal temperatures is forecasted for the upcoming season (April-June 2026). Consequently, normal climatic conditions are likely to prevail across the country.

4.7 Kharif Season Forecast of Mangla and Tarbela Dams (2026)

The forecasted water availability (in MAF) for the two major reservoirs, Tarbela and Mangla, during the Kharif season (April 2026-September 2026) is presented in Figure 11.

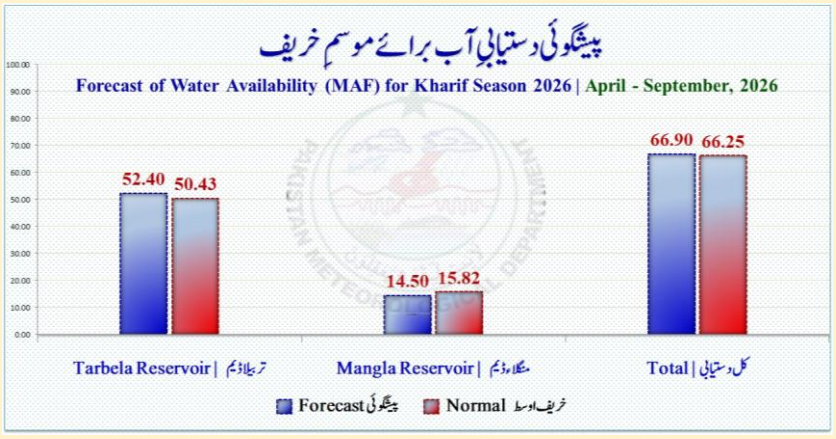

Figure-11: Kharif season forecast of Mangla and Tarbela dams

Summary

During the first quarter of 2026 (January to March), Pakistan experienced slightly below-normal overall precipitation with a national deficit of -13%, though moisture distribution varied significantly by region. While Sindh and Balochistan benefited from above-normal rainfall, notable deficits were recorded across Punjab, AJK, Gilgit-Baltistan, and Khyber Pakhtunkhwa. This uneven pattern contributed to localized dry spells, with consecutive dry days extending up to 67 days in the eastern agricultural belt around Bahawalpur and Rahim Yar Khan. The SPEI-3 highlights development of mild moisture stress in southern plains of Punjab and western arid zones, suggesting the need to constantly monitor drought conditions in these areas. In contrast, recent winter weather has supported adequate to above-normal soil moisture across much of Sindh, Punjab, and central Balochistan. Moreover, the availability of water in major reserves is sufficient, with water storage in the Tarbela and Mangla dams staying well above normal throughout the quarter. Additionally, the crop conditions were largely satisfactory nationwide, supported by adequate soil moisture in both irrigated and rainfed zones. However, crop damage was reported due to rainfall events in Punjab and KP. Harvesting was completed in several parts of Sindh, while Punjab and KPK advanced through later growth stages.

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