

# Pakistan Meteorological Department



## Monthly Drought Bulletin For the Month of November 2024

### Highlights

- During the month of November 2024, light to moderate rainfall received across the country. However, southeast Punjab, Sindh and western Balochistan received very less to no rainfall.
- Mean monthly temperatures were recorded 1°C to 6°C above-normal across the country except Gilgit and Karachi where temperature was recorded below normal.
- During the month of December 2024, below-normal rainfall across the country is expected. However, near-normal rainfall is specifically anticipated in Sindh, Balochistan, and southern Punjab during the forecast month.
- Temperatures are forecasted to remain slightly above normal nationwide, with maximum departure over Gilgit Baltistan and western Balochistan. Whereas eastern Sindh is expected to experience near-normal temperatures.
- Below normal rains during December 2024 may further decrease moisture conditions over drought prone areas of the country.
- Keeping in view the weather forecast for the month of December 2024, disaster management authorities may be requested to plan DRM activities accordingly.

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# 1. Monthly Rainfall and Temperature Analysis for the Month of November, 2024

During the month of November 2024, moderate to heavy rainfall received across the country. The spatial distribution of rainfall is shown in Figure 1. Chief amounts of rainfall was recorded across upper Khyber Pakhtunkhwa (KP) and Khuzdar (Baluchistan). The highest amounts of monthly rainfall are shown in Table1.

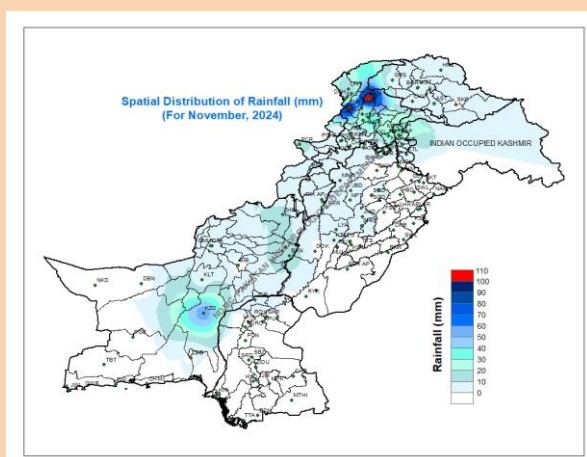


Figure 1: Spatial Distribution of rainfall

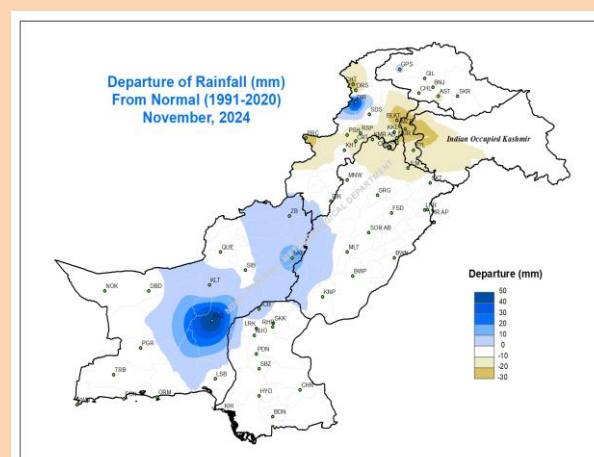
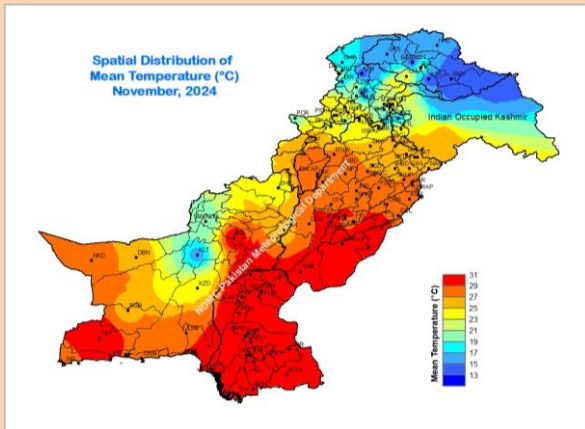


Figure 2: Departure of rainfall from Normal

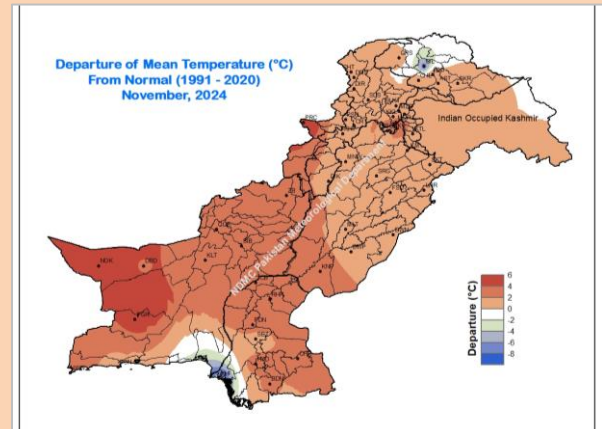
Figure 2 depicts the departure of rainfall from the normal(1991-2020). Above-normal rainfall was recorded over Khuzdar, Barkhan, Zhob and Dir whereas below normal rainfall reported across Kashmir, Potohar region and most of KP.

<b>Table-1: Chief amount of rainfall recorded across Pakistan, November, 2024</b>					
<b>Sr.No.</b>	<b>Station</b>	<b>Rainfall(mm)</b>	<b>Sr.No.</b>	<b>Station</b>	<b>Rainfall(mm)</b>
1	Dir	110.0	11	Barkhan	17.0
2	Kalam	107.7	12	Muzaffarabad A/P	15.7
3	Khuzdar	54.3	13	Mirkhani	14.6
4	Pattan	45.0	14	Murree	14.5
5	Malamjabba	39.0	15	Parachinar	13.0
6	Kakul	36.0	16	Lower Dir	12.6
7	Saidu Sharif	31.0	17	Drosh	12.2
8	Gari Dopatta	24.0	18	Zhob	11.0
9	Muzaffarabad City	19.0	19	Astore	10.5
10	Balakot	19.0	20	Chitral	10.4

Spatial distribution of mean temperature recorded at PMD stations for the month of November 2024 are shown in Figure 3. During the month central and Southern Punjab, Sindh and Southwestern Balochistan experienced the mean maximum temperature up to 31°C.



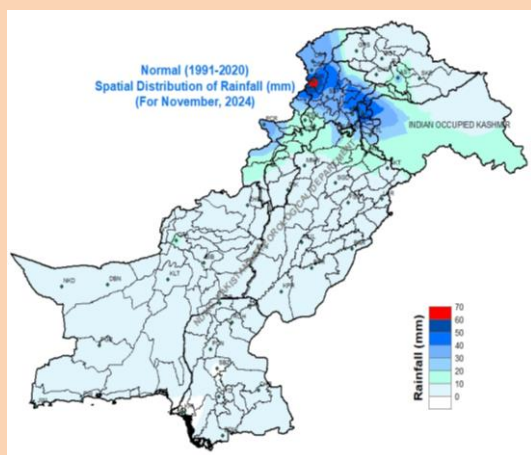
**Figure 3:** Monthly Mean Temperature (°C)



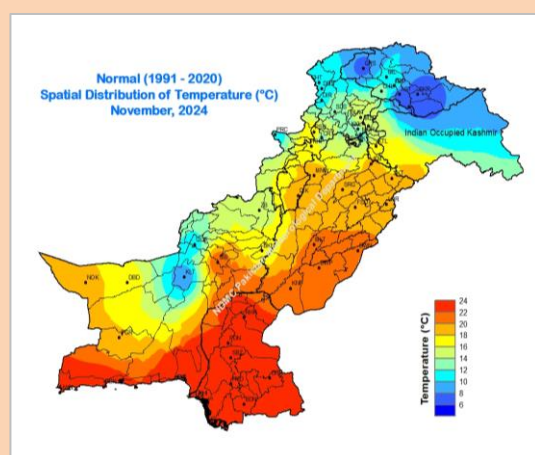
**Figure 4:** Monthly Departure from Normal

Departure of mean temperature from the normal (1991-2020) is shown in Figure 4, which show above-normal mean temperatures across most part of the country except Gilgit and Karachi where temperature was recorded below normal.

Monthly normal (1991-2020) rainfall and monthly normal mean temperature(°C) for the month of November are shown in the Figures 5 and 6 respectively.



**Figure 5:** Monthly Normal Rainfall (mm)



**Figure 6:** Monthly Mean Temperature (°C)

## 2. Comparison of Actual to Normal Monthly Rainfall for November-2024

The comparison of actual to normal rainfall (1991-2020) for month of November 2024 are shown in Figure 7 (a) for Khyber Pakhtunkhwa, Gilgit Baltistan and Azad Jammu & Kashmir in Figure 7 (b), Punjab in Figure 7 (c), Balochistan in Figure 7 (d), and Sindh in Figure 7 (e).

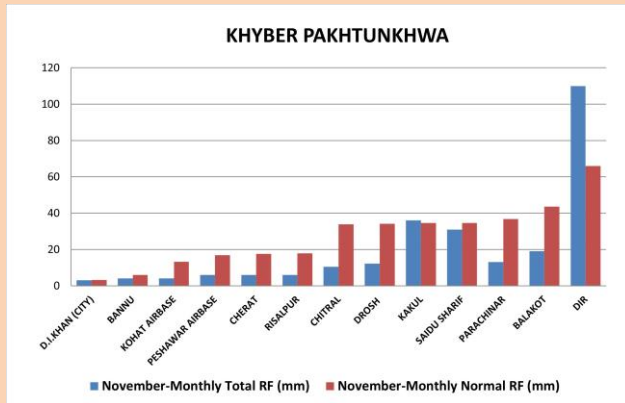


Figure 7a

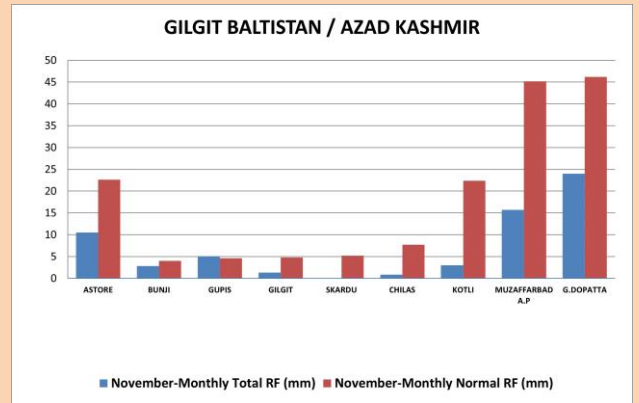


Figure 7b

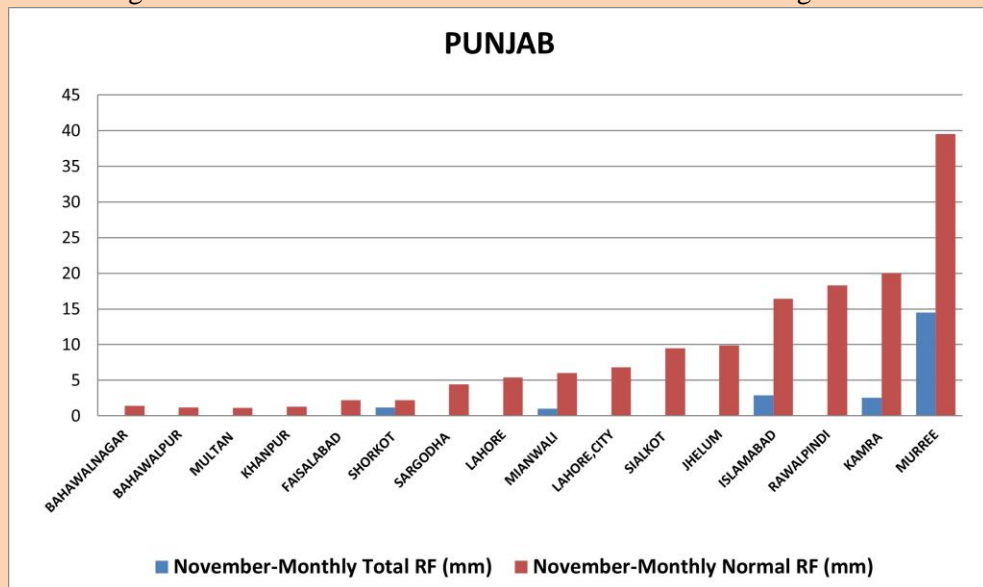


Figure 7c

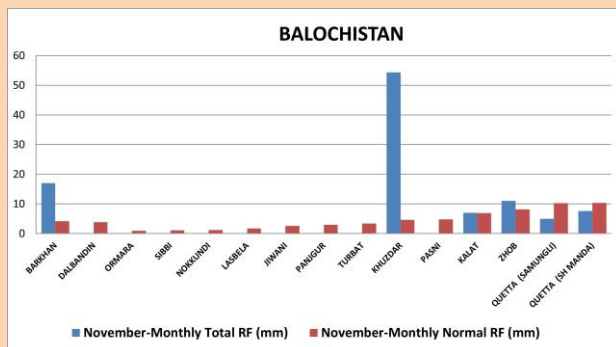


Figure 7d

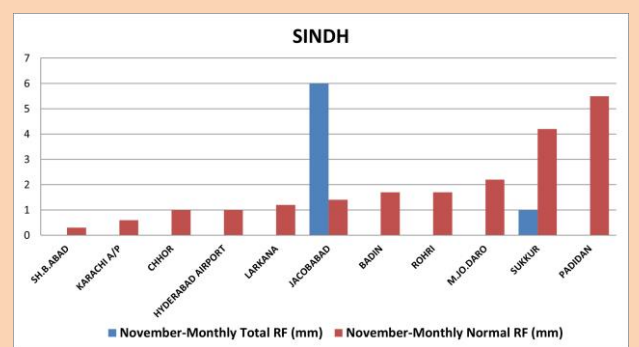


Figure 7e



### 3. Normalized Difference Vegetation Index (NDVI)

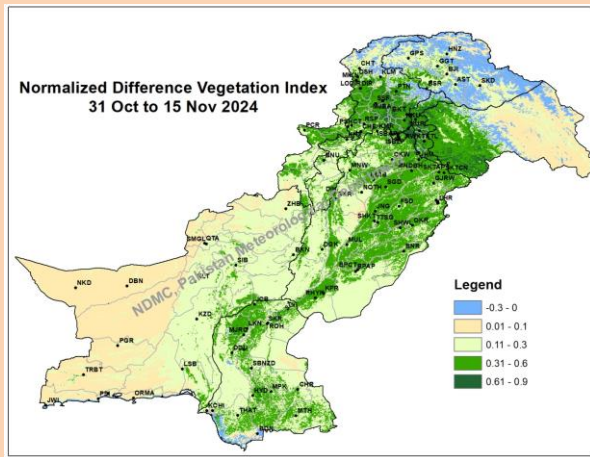


Figure 8: NDVI

Normalized Difference Vegetation Index values for November 2024 are shown in Fig.8. NDVI conditions are high in AJK, Punjab, Khyber Pakhtunkhwa, and along the Indus belt, depicting the widespread vegetation in fields. Such condition nourish the chlorophyll content stored in the plants and enhance the vegetation cover over the fields.

### 4. Land Surface Temperature (LST)

Land Surface Temperatures (LST) for the period 31 October to 07 October 2024 are represented in Figure 9. The central parts of the country (South Punjab, Northeastern Sindh) observed the average daytime temperatures between 30-35°C, while in western parts of Balochistan, the temperature was recorded above 35°C during the period.

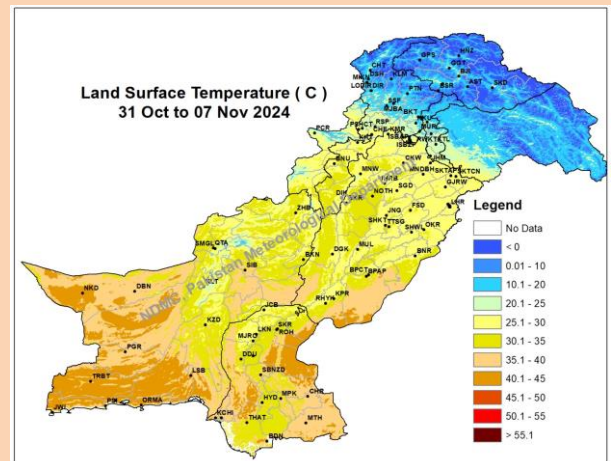


Figure 9: LST (°C)

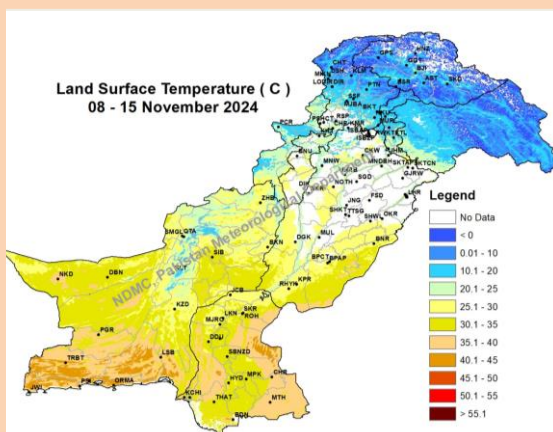


Figure 10: LST (°C)

Land Surface Temperatures during the period 8-15 November are shown in Figure 10. The country experience decrease in temperature over western Baluchistan, northeast Sindh and southeast Punjab. Days are getting shorter and sunshine hours are also decreasing causing the decrease in land surface temperatures.

## 5. Temperature Vegetation Dryness Index (TVDI)

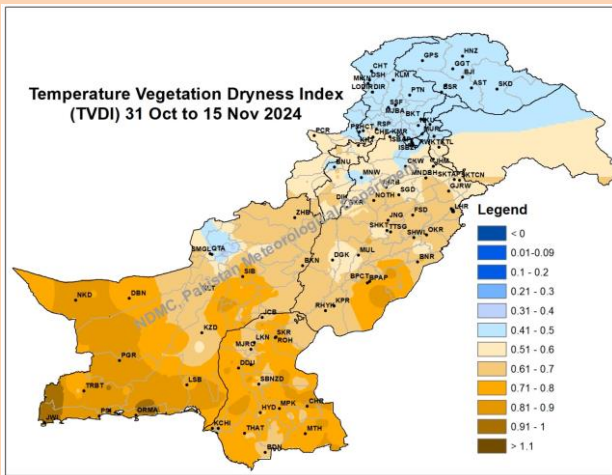


Figure 11: TVDI

Temperature Vegetation Dryness Index (TVDI) derived from MODIS data sets MOD13A2 (NDVI) and MOD11A2 (LST) is shown in Figure 11, which indicates moderate dry like conditions in the west Balochistan, Sindh and Bahawalpur (Punjab) as highlighted by the TVDI Index. It indicates the start of dryness and deficient soil moisture conditions in the western parts and coastal areas of Balochistan, southern Punjab and some parts of Sindh.

## 6. Length of Consecutive Dry Days:

The maximum length of consecutive dry days (CDD) is shown in Figure 12. Number of consecutive dry days has increased from 61 to 197 days across western Balochistan (Nokundi, Dalbandin), while southeast Punjab and most of the Sindh experienced 80 to 100 dry days.

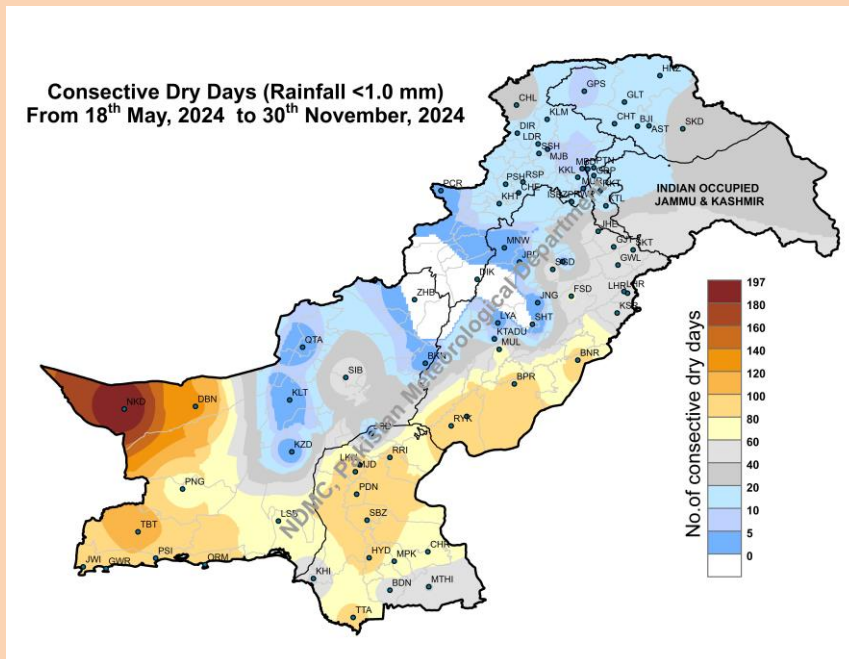


Figure 12: No. of consecutive dry days

## 7. Drought Monitor for the Month of November 2024

Based on the different drought monitoring indices as narrated above and ground station data observed by the Pakistan Meteorological Department across the country, the spatial drought monitor map is represented in Figure 13 below.

Moderate drought like conditions may be observed in Nokundi, Dalbandin while mild drought like conditions may be observed in Jiwani, Gwadar, Turbat, Pasni, Ormara in Balochistan due to below-average rainfall during the past months. Additionally, mild drought conditions are also emerged in in some parts of southeast Punjab and northern Sindh as shown in figure below.

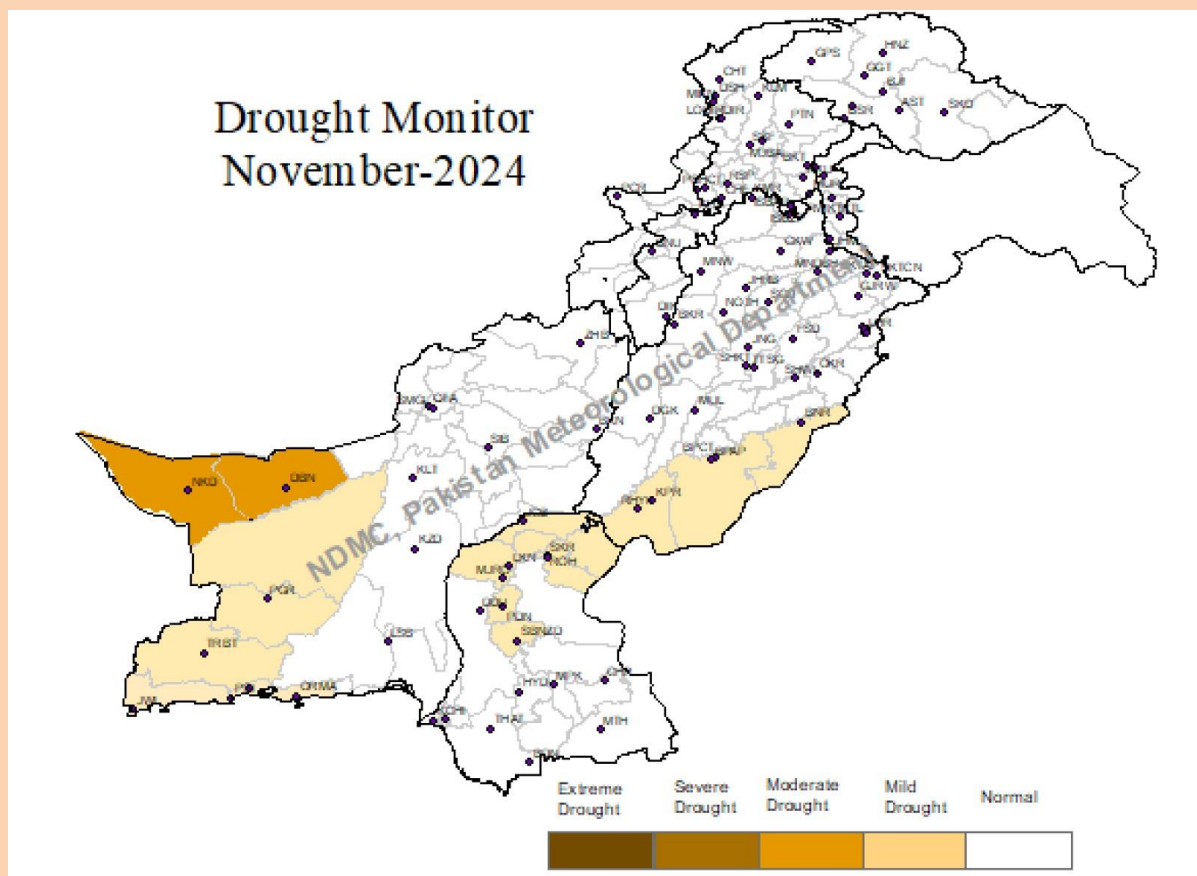


Figure 13: Drought Monitor of Pakistan for the month of November 2024



## 8. Water availability/ Dams flow data:

During the month of November 2024, water inflow, outflow and levels of the Rawal, Khanpur, Tarbela and Mangla dams are shown in Figure 14. The water level at Mangla, Tarbela and Khanpur reservoirs has started to decrease. However, the water level in Rawal Dam remained unchanged.

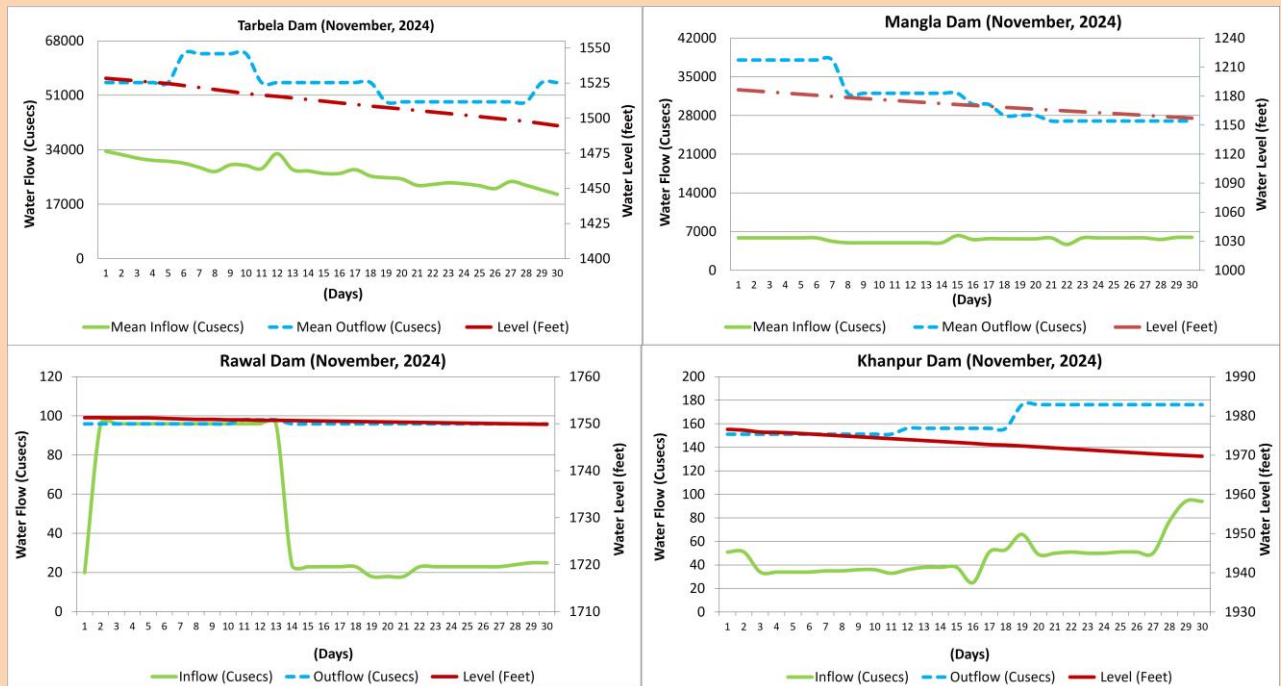


Figure 14: Water inflow, outflow and level of Rawal, Khanpur, Tarbela and Mangla Dams

## 9. Weather Outlook for December 2024

During December 2024, below-normal rainfall across the country is expected. However, near-normal rainfall is specifically anticipated in Sindh, Balochistan, and southern Punjab during the forecast month. Temperatures are forecasted to remain slightly above normal nationwide, with maximum departure over Gilgit Baltistan and western Balochistan. Whereas eastern Sindh is expected to experience near-normal temperatures.

## 10. Drought Outlook for December 2024

Keeping in view the forecast for December 2024, below normal rainfall is expected which will further decrease the moisture conditions in the drought prone areas of Balochistan, Sindh and Southern Punjab. Mild drought like conditions may spread in adjacent areas and already mild drought areas may turned to moderate at isolated placed.

All stakeholders across the country are advised to make efforts to save and judicious use of the available water so that the stored water may be utilized in the upcoming months of deficient rainfalls.

## 11. Crop Condition

- Punjab: Harvested Kharif crops like rice and maize, while preparing fields for Rabi crops such as wheat and vegetables.
- Sindh: Sowing of Rabi crops like wheat and vegetables began, but dry conditions indicated water stress.
- Khyber Pakhtunkhwa: Harvested early maize, prepared land for wheat, and sowed vegetables like cauliflower and onions.
- Baluchistan: Satisfactory conditions for crops and orchards, with fruit harvesting and pulse sowing for Rabi season.
- Gilgit Baltistan: Potatoes and maize growing normally.

## 12. Advice for Farmers

- Reasonable soil moisture is available for sowing of upcoming Rabi crops due to good rainfall events during monsoon season. However, soil moisture stress is also expected during November due to below normal precipitation expected during the past few months.
- Isolated showers / hails/ windstorm may disrupt the harvesting activities of Kharif crops, particularly in the northwestern parts of the country.
- Satisfactory amount of water would be available for irrigation particularly over the upper half, during the forecast period.
- However, judicious use of available water stock is recommended for the lower half of the country.

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