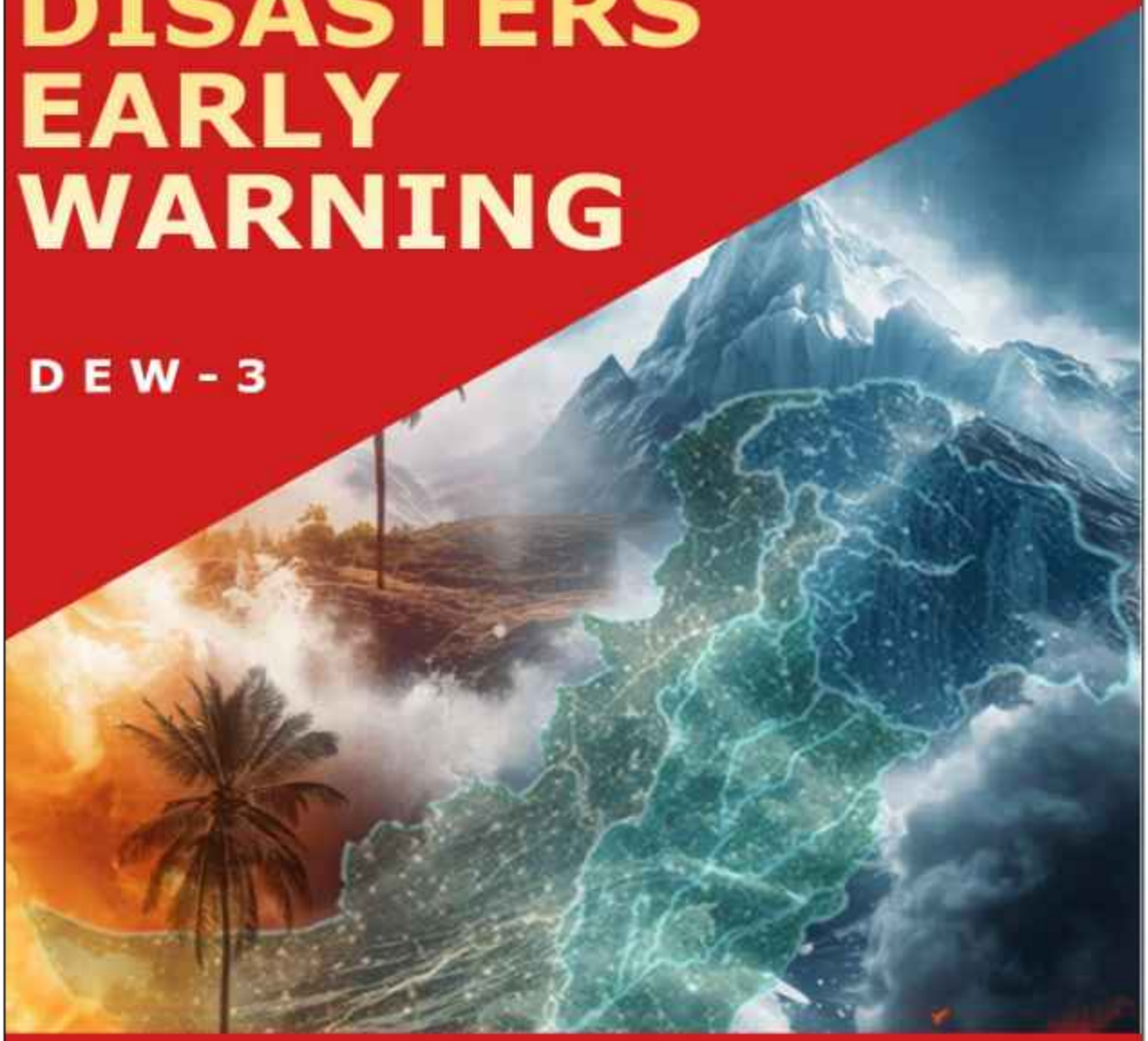
DISASTERS EARLY WARNING

DEW - 3



JULY | AUGUST | SEPTEMBER 2026

PREPARED BY:
TECHNICAL EARLY WARNING WING
NDMA

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DISASTER VULNERABILITY SCAN-PAKISTAN (JULY – SEPTEMBER 2026)

1. Pakistan is entering the core monsoon and late-monsoon period during July to September 2026. This phase is expected to be shaped by **high intra-seasonal variability**, where overall rainfall may remain normal to below normal across many parts of the country, while localized heavy rainfall episodes can still produce flash floods, urban flooding, landslides and GLOF incidents.

2. The June to August 2026 outlook indicates **normal to below-normal rainfall over most parts of Pakistan**, with comparatively wetter signals over Gilgit-Baltistan, northern Khyber Pakhtunkhwa and Kashmir. Temperatures are expected to remain above normal across much of the country, especially Sindh, southeastern Balochistan and central to northeastern Punjab. The broader South Asian Climate Outlook Forum (SASCOF) June to September 2026 outlook also indicates below-normal rainfall over much of South Asia, but with normal to above-normal rainfall possible in northwestern, northeastern and parts of southern regions, alongside above-normal minimum and maximum temperatures.

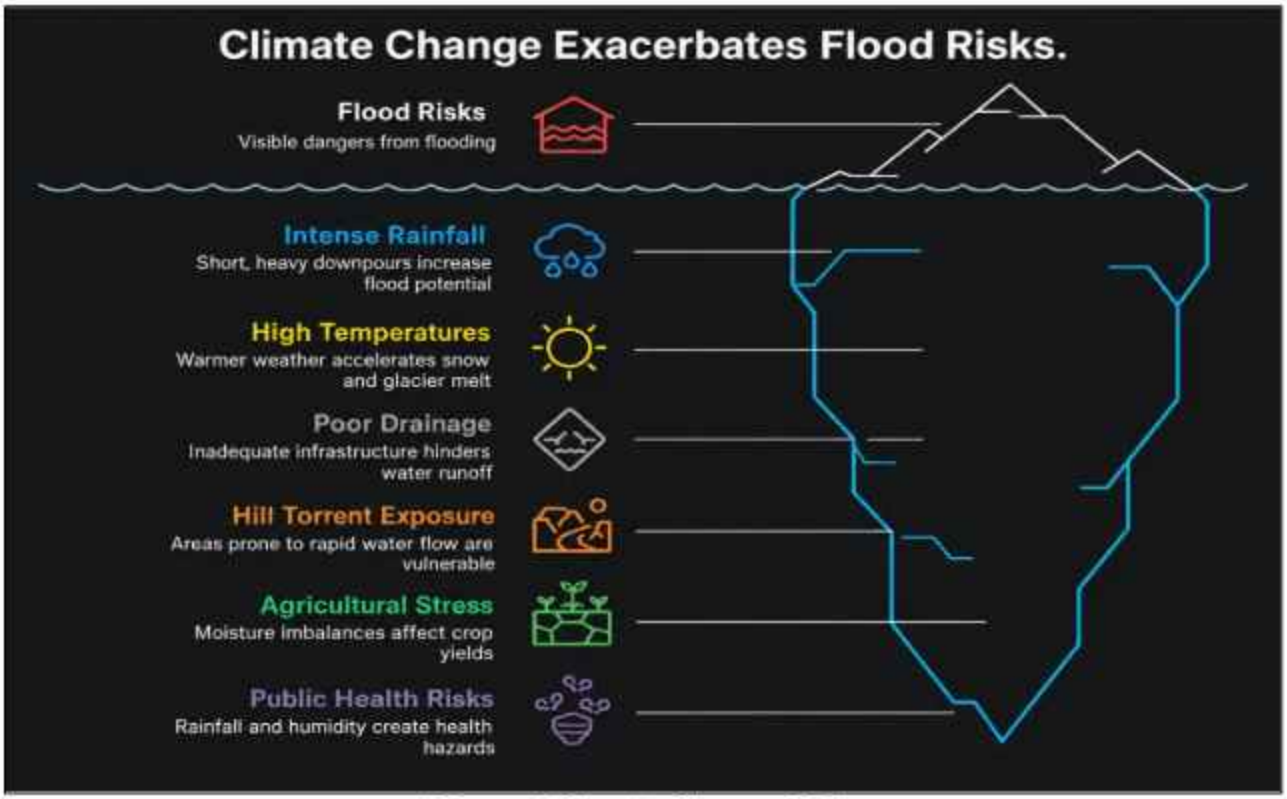


Figure 1 Climate Change Risks

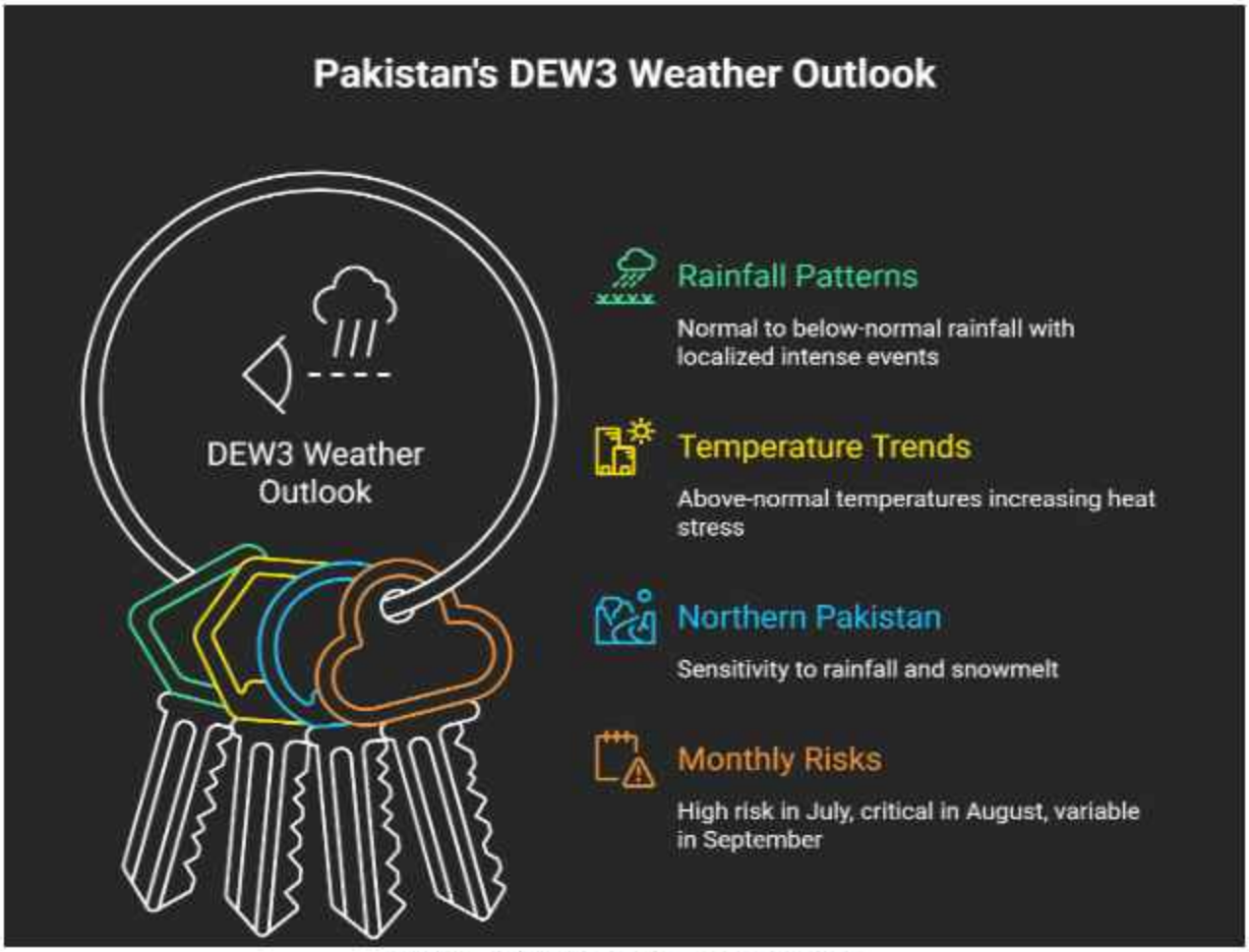


Figure 2 DEW 3 Weather Outlook

3. **Climate Drivers.** The El Niño Southern Oscillation has shifted into a positive phase, El Niño, and is expected to strengthen during the season. The Indian Ocean Dipole is neutral but may shift toward a positive phase by July 2026. The El Niño, may suppress widespread monsoon rainfall in some regions, but they do not eliminate the risk of intense local downpours.

4. **Hazard-Specific Risk Assessment**

   a. **Flash Floods, GLOFs and Landslides, High Risk in Northern Pakistan**

   The most sensitive areas include Gilgit-Baltistan, northern KP and AJK. Above-normal temperatures can accelerate snow and glacier melt, while localized rainfall can trigger sudden runoff, GLOFs, debris flows and landslides. High-risk districts include Hunza, Nagar, Ghizer, Shigar, Skardu, Ghanche, Gilgit, Astore, Kharmang, Swat, Chitral, Upper and Lower Kohistan, Dir, Mansehra and Diamer. NDMA GLOF alert highlights that heat-

driven snow and glacier melt followed by rainfall can substantially increase GLOF and flash flood risk in these glaciated and snow-fed valleys.

b. **Assessment**. Risk is **High**, especially during intense rainfall spells in July and August and during warm periods followed by convective storms.

c. **Urban Flooding, Moderate to High Risk**. Urban flooding remains a major concern even under below-normal seasonal rainfall because flood impacts are often driven by **short-duration high-intensity rainfall**, not only seasonal totals. Most exposed cities are listed below: -

(1) Karachi.
(2) Hyderabad.
(3) Lahore.
(4) Rawalpindi and Islamabad.
(5) Peshawar.
(6) Quetta.
(7) Multan.
(8) Faisalabad.
(9) Gujranwala.

d. Low-lying settlements, informal housing, underpasses, blocked drains and encroached nullahs remain the main exposure points. that heavy rainfall events during the season may lead to urban flooding in low-lying areas of major cities across Sindh, Punjab, Balochistan and KP.

e. **Assessment**. Risk is **Moderate to High**, with highest sensitivity during July and August.

f. **Riverine Flooding, Moderate and Conditional**. Large-scale riverine flooding is not the dominant signal at this stage, but the risk may increase if repeated rainfall occurs over upper catchments or if synchronized inflows develop from snowmelt, glacier melt and rainfall. Most sensitive basins are listed below: -

(1) Indus.
(2) Kabul.
(3) Jhelum.
(4) Chenab.
(5) Swat.

(6) Panjkora.

(7) Neelum and Jhelum tributaries.

g. **Assessment.** Risk is **Moderate**, but may escalate rapidly under sustained rainfall over upper catchments.

h. **Hill Torrents, Moderate to High Risk**. Hill torrent areas in DG Khan, Rajanpur, eastern Balochistan, Koh-e-Suleiman belt and Khirthar-adjoining zones remain vulnerable to sudden runoff. Even isolated cloudbursts can generate destructive flows due to steep terrain, sparse vegetation, dry soils and weak drainage pathways.

i. **Assessment**. Risk is **Moderate to High**, especially in July and August.

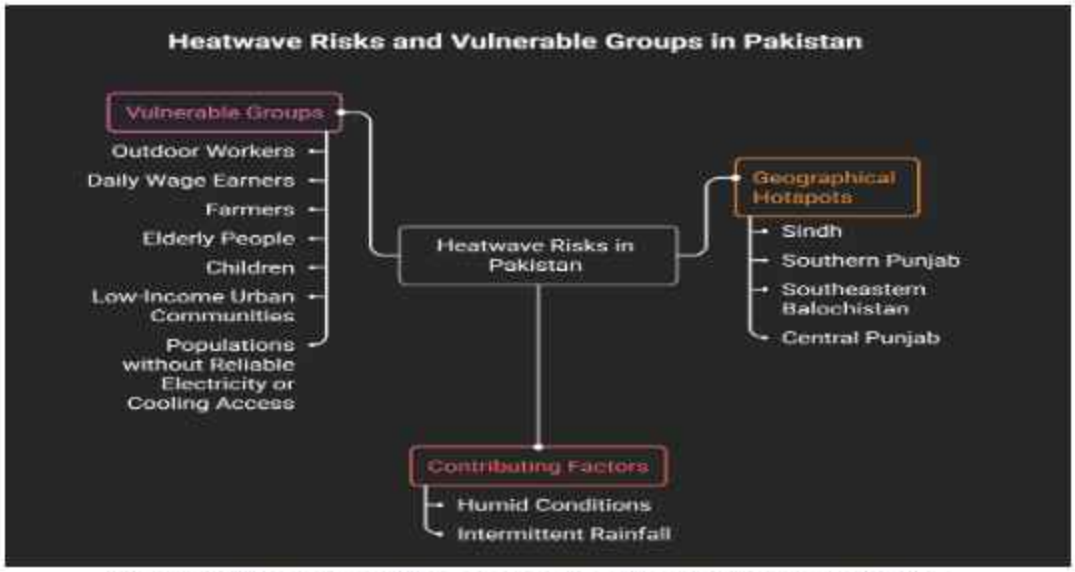


Figure 3 Heatwave risks and vulnerable groups in Pakistan

j. **Assessment**. Risk is **High**, particularly during dry breaks between monsoon spells.

Figure 4 Impact on Kharif Crops

k. **Assessment**. Risk is **Moderate to High**, especially where irrigation access is weak.

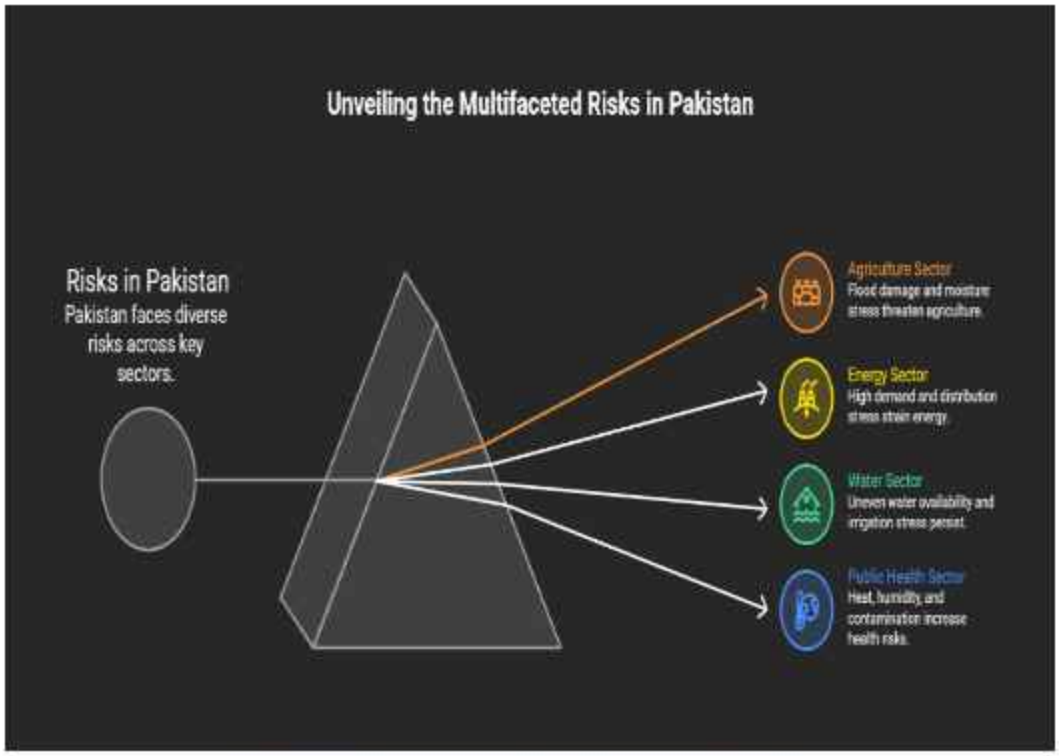


Figure 5 Sectoral Vulnerability Assessment

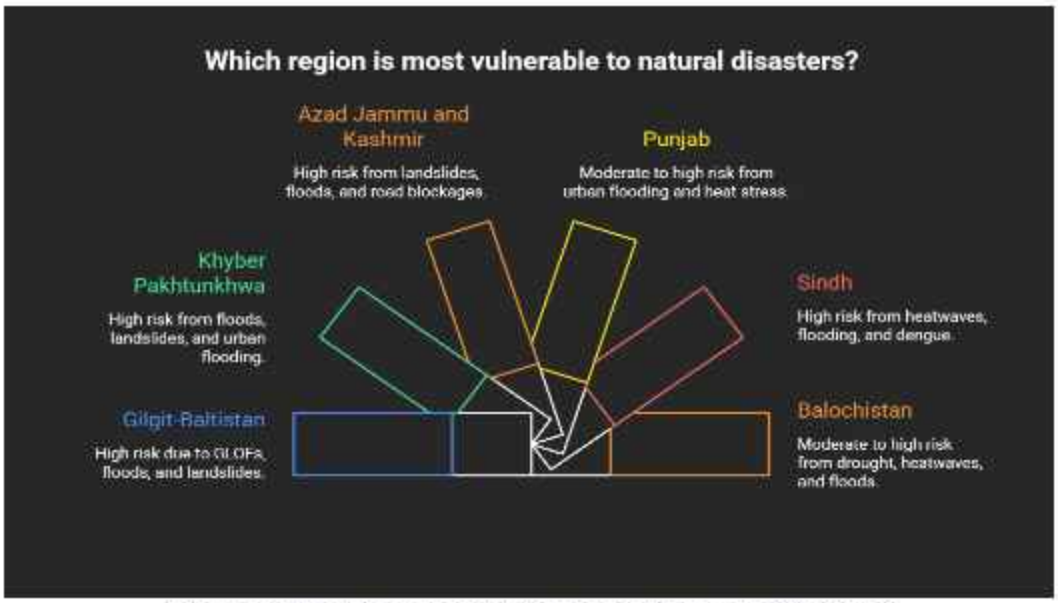


Figure 6 Provincial and Regional Vulnerability Scan

5. **Month-Wise Risk Outlook**

a. **July 2026**. Risk increases with monsoon establishment. Northern regions face GLOF, flash flood and landslide risk. Urban centers face drainage-

related flooding from short intense rainfall. Heat stress continues during dry breaks.

(1) **Overall, July Risk - High**

b. **August 2026**. August is likely to be the most critical month due to peak monsoon moisture, high humidity, crop sensitivity, vector-borne disease risk and cumulative drainage stress. Mountainous areas remain exposed to GLOFs and landslides.

(1) **Overall, August Risk - Very High**

c. **September 2026**. September may bring retreating monsoon variability. Flood risk may reduce gradually but residual waterlogging, disease outbreaks, delayed drainage, crop losses and localized late-season rainfall events may continue.

(2) **Overall, September Risk - Moderate to High**

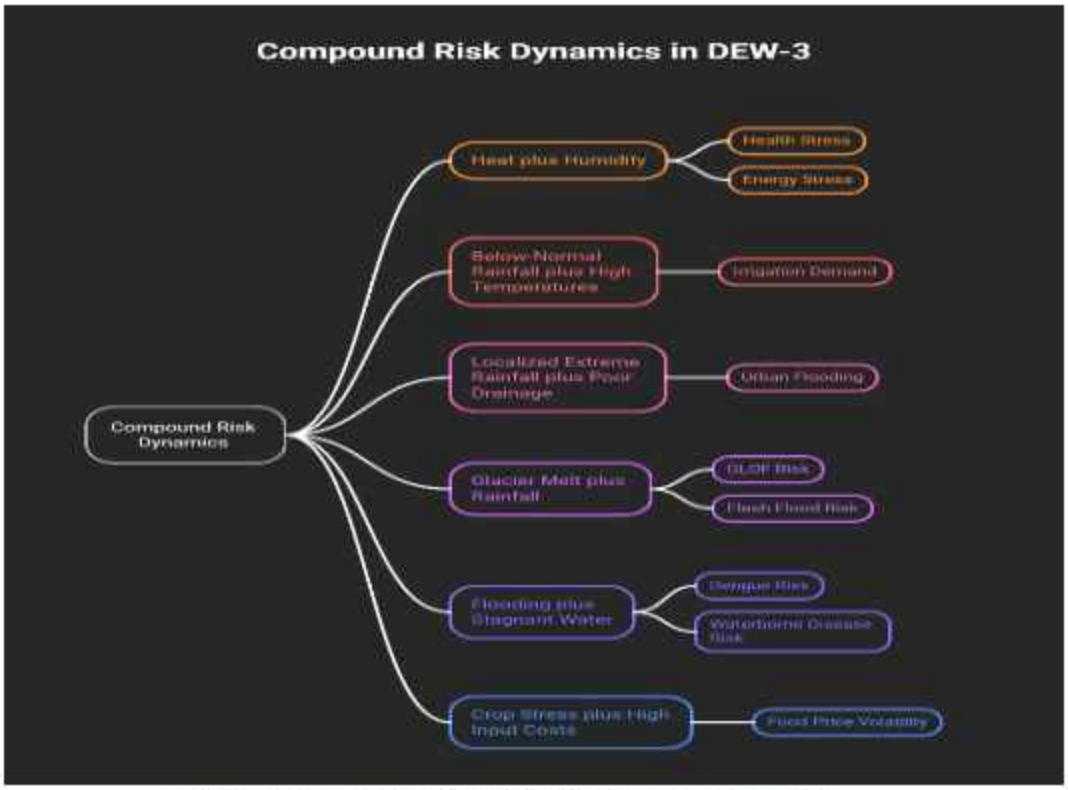


Figure 7 Compound Risk Dynamics in DEW 3

6. **Scenario-Based Risk Outlook**

a. **Best Case Scenario**. Rainfall remains spatially distributed and moderate. Reservoirs improve due to upper catchment inflows. Urban flooding remains limited and heatwave intensity reduces after rainfall spells.

b. **Most Likely Scenario**. Below-normal rainfall affects many plains, while northern and hilly areas receive localized heavy rainfall. Flash floods, GLOFs, urban flooding, heat stress, dengue risk and agricultural moisture stress occur in different regions at different times.

c. **Worst Case Scenario**. Repeated intense rainfall over upper catchments combines with accelerated snow and glacier melt, triggering GLOFs, flash floods, landslides and river surges. At the same time, southern and central plains experience heat stress, crop moisture stress, dengue outbreaks and urban flooding from isolated heavy downpours.

7. **Institutional and Preparedness Gaps**. Key gaps include: -

a. Weak localized early warning dissemination in mountain valleys.

b. Limited urban drainage capacity in major cities.

c. Inadequate monitoring of glacial lakes and high-risk nullahs.

d. Weak contingency planning for heat-health response.

e. Limited pre-positioning of rescue and road-clearance machinery in landslide-prone areas.

f. Insufficient integration of health surveillance with monsoon risk monitoring.

g. Poor drainage and solid-waste management in informal settlements.

8. **Strategic Risk**. Pakistan's DEW-3 period is not expected to be a simple nationwide flood-risk season. It is more likely to be a **spatially uneven compound-risk period**, where northern regions face flash flood, GLOF and landslide threats, while plains face heat, water stress, urban flooding, crop stress and public health risks. The principal concern is the coexistence of **below-normal seasonal rainfall in many areas** with **localized extreme rainfall events** capable of producing high-impact disasters.

9. **Final Assessment**

Category	Assessment
Overall Risk Level	High
Peak Risk Month	August
Primary Trigger	Localized extreme rainfall during above-normal temperature conditions
Secondary Trigger	Glacier and snowmelt interacting with rainfall

Most Vulnerable Systems	Water, agriculture, health, energy urban drainage
Most Exposed Populations	Mountain communities, low-income urban households, farmers, outdoor workers and floodplain settlements
Priority Hazards	GLOFs, flash floods, landslides, urban flooding, heatwave, dengue and crop moisture stress

GLOBAL CLIMATE PICTURE

1. The climate outlook for July-August-September (JAS) 2026 is developed from the large-scale ocean atmospheric interactions and climatic parameters that influence the regional weather patterns over Pakistan.

a. **Mascarene High**. During the Northern Hemisphere summer, the Indian subcontinent and the Tibetan Plateau heat up rapidly, creating an intense low-pressure system. Meanwhile, the Southern Hemisphere experiences winter, causing high pressure to build over the Mascarene High. The natural movement of air from high pressure to low pressure creates a massive pressure gradient forcing air to rush northward from the Mascarene High toward the Indian subcontinent. As these winds cross the equator, the Earth's rotation (Coriolis force) deflects them to the right, creating a powerful, moisture-heavy low-level jet stream (the Somali Jet) that slams into the Western Ghats, bringing heavy rainfall to India. The Mascarene High is likely to be less effective in strengthening cross-equatorial monsoon flow during JAS 2026. Historically, a strong Mascarene High supports stronger southwesterly winds and deeper Arabian Sea moisture transport toward the subcontinent. In 2026, weaker monsoon forcing may reduce this support, contributing to limited moisture penetration into Pakistan, prolonged dry intervals, and weaker rainfall organization across the plains.

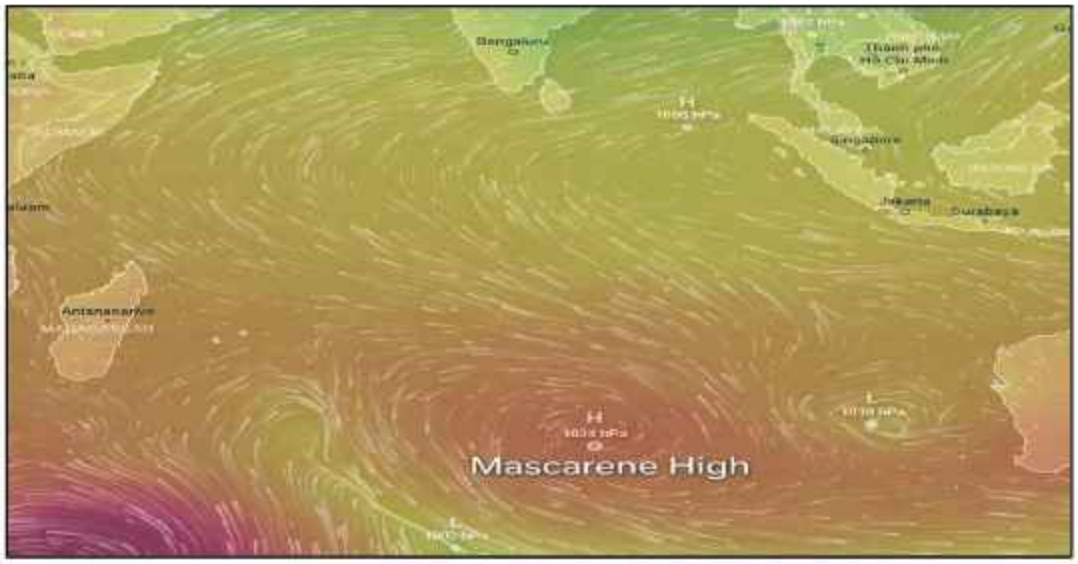


Figure 8 Mascarene High

b. **Somali Jet**. The Somali Jet, a strong low-level cross-equatorial wind current over the western Indian Ocean and Arabian Sea, is expected to be weaker than normal during the JAS 2026 monsoon season due to the anticipated development of El Niño conditions and a likely reduction in the monsoon land–sea pressure gradient, standing in stark contrast to the 2025 season which was characterized by a much stronger and structurally robust jet circulation that enhanced moisture transport. As the primary low-level moisture transport pathway from the Arabian Sea into the Indian subcontinent and Pakistan, this weaker 2026 Somali Jet pattern could limit sustained moisture advection and reduce the frequency of widespread monsoonal rainfall events.

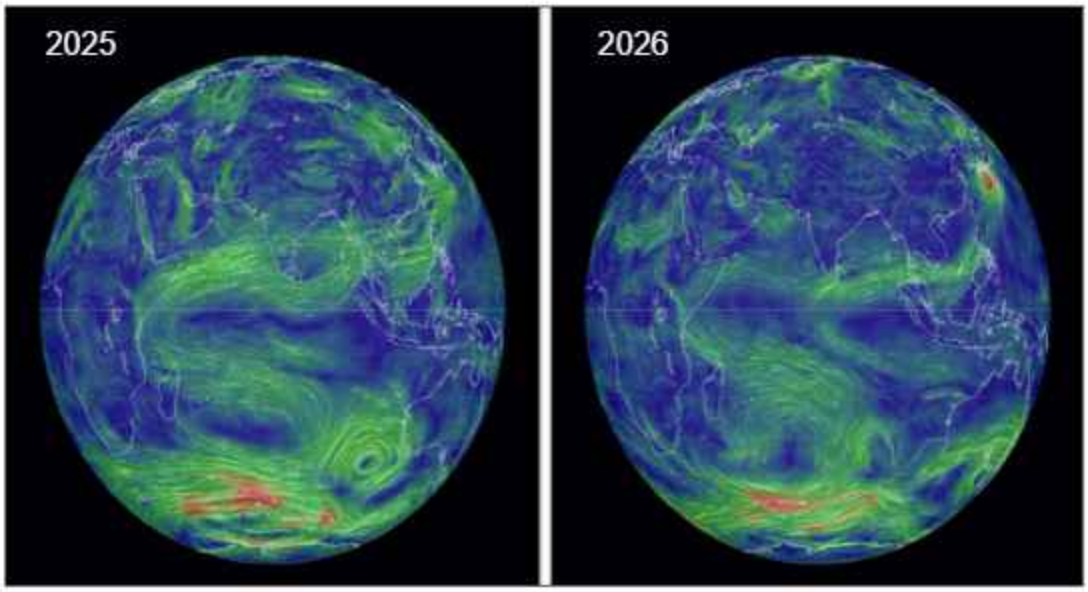


Figure 9 Somali Jet Comparison 2025 to 2026

c. **Bay of Bengal Easterlies / Monsoon Lows**. Bay of Bengal easterlies and monsoon low-pressure systems are expected to remain weaker and less frequent during JAS 2026 due to the strong El Niño influence. These systems normally help push monsoon rainfall westward into Punjab, KP, and northern Pakistan. Their reduced strength may lead to weaker inland monsoon penetration, below-normal rainfall over central and southern Pakistan, and more dependence on isolated local convection or terrain-driven rainfall in northern regions.

d. **Tibetan Plateau Heating**. The Tibetan Plateau acts as a massive elevated heat source that powers the Asian monsoon systems. As the plateau heats up it acts as a colossal thermal pump due to which warm air rises into the upper troposphere creating a low-pressure zone at the surface. The Tibetan Plateau Heat Pump is likely to remain thermally active due to above-normal regional temperatures, which can support atmospheric instability and upper-level monsoon circulation. However, in JAS 2026, its positive influence may be limited by weak moisture transport and strong El Nino suppression. As a result, it may help generate localized rainfall over northern Pakistan, GB, AJK, and upper KP, but is unlikely to produce widespread monsoon strengthening across the country.

e. **Northern Hemisphere / Eurasian Snow Cover**. Reduced snow persistence over Eurasian and Himalayan regions generally favors stronger land heating and can support the seasonal thermal gradient needed for monsoon development. In 2026, this may enhance surface heating over South Asia, but the benefit may be converted more into heat stress than rainfall because large-scale moisture transport remains weak. For Pakistan, this points toward elevated temperatures, higher evapotranspiration, and limited rainfall recovery despite strong land heating.

f. **Western Disturbances (WDs)**. Western Disturbances may occasionally interact with available monsoon moisture during JAS 2026, especially over northern Pakistan. Such interactions can produce short-duration rainfall over upper KP, GB, AJK, Pothohar, and northern Punjab. However, because the broader monsoon system is expected to remain weak, these events are likely to be localized and episodic, providing temporary rainfall but not enough for widespread seasonal hydrological recovery.

g. **Outgoing Longwave Radiation (OLR)**. OLR conditions are expected to indicate weaker large-scale convection over much of Pakistan during JAS 2026, especially across Sindh, Punjab, Balochistan, and southern KP. Higher OLR usually reflects reduced cloud cover, suppressed convection, and drier atmospheric conditions. This supports the outlook of below-normal rainfall, prolonged sunny and hot periods, higher heat stress, and only isolated convective bursts during active monsoon windows.

h. **Land–Ocean Thermal Contrast**. Land–ocean thermal contrast is expected to remain strong due to above-normal land temperatures over Pakistan and South Asia. Normally, stronger heating helps attract moist monsoon winds inland, but in 2026 the circulation response may remain weak because of El Niño-driven suppression and limited moisture transport. Therefore, the stronger thermal contrast may intensify heatwaves, soil moisture loss, and irrigation demand rather than producing a strong rainfall response.

i. **ITCZ Position**. The Intertropical Convergence Zone may remain less favorably positioned for sustained monsoon moisture transport into Pakistan during JAS 2026. A weaker or southward-displaced monsoon convergence zone can restrict organized rainfall movement toward northwestern South Asia. For Pakistan, this would favor spatially uneven rainfall, weaker monsoon penetration into Sindh and Punjab, and greater rainfall concentration over localized northern or orographic regions.

j. **Kelvin Waves**. Kelvin Waves have likely supported the development and intensification of the projected strong El Niño event by transferring warm subsurface Pacific waters eastward. Their influence on Pakistan is indirect, through strengthening El Niño and weakening the broader Walker circulation and monsoon system. For JAS 2026, this reinforces the expectation of a weaker, hotter, and drier monsoon pattern, with reduced rainfall reliability and increased drought-heat stress risk across much of Pakistan.

k. **El Niño Southern Oscillation (ENSO)**. The projected strong-to-historic El Niño event in 2026 (forecast near +3.3°C Niño 3.4 anomaly) is likely to play a major role in weakening Pakistan's July–September monsoon. Historically, strong El Niño years have been associated with suppressed monsoon rainfall, warmer temperatures, and prolonged dry spells across Pakistan, and the 2026 signal appears consistent with this pattern. During July to September 2026, monsoon circulation is expected to remain relatively weak, with below-normal rainfall, reduced moisture inflow from the Arabian Sea and Bay of Bengal, and above-normal temperatures across much of the country, particularly over Punjab, Sindh, and Balochistan. While northern regions may still receive episodic rainfall due to topographic effects, the season overall is likely to be characterized by spatially uneven precipitation,

extended dry periods, elevated heat stress, and increasing agricultural and water resource pressure, marking a shift toward a heat- and drought-dominant monsoon regime.

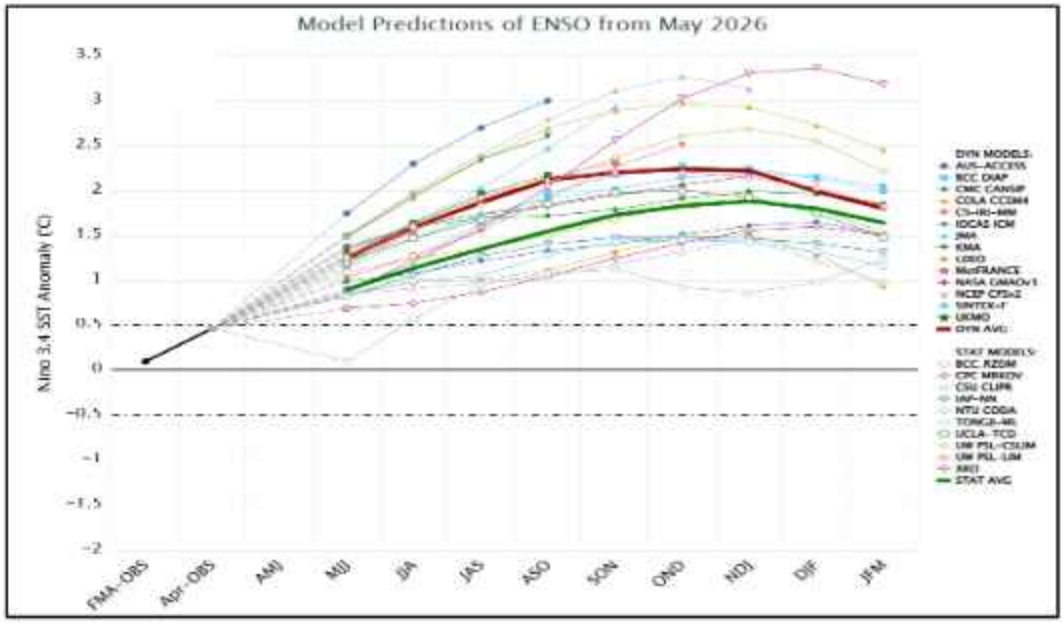


Figure 11 Model Predictions of ENSO for 2026

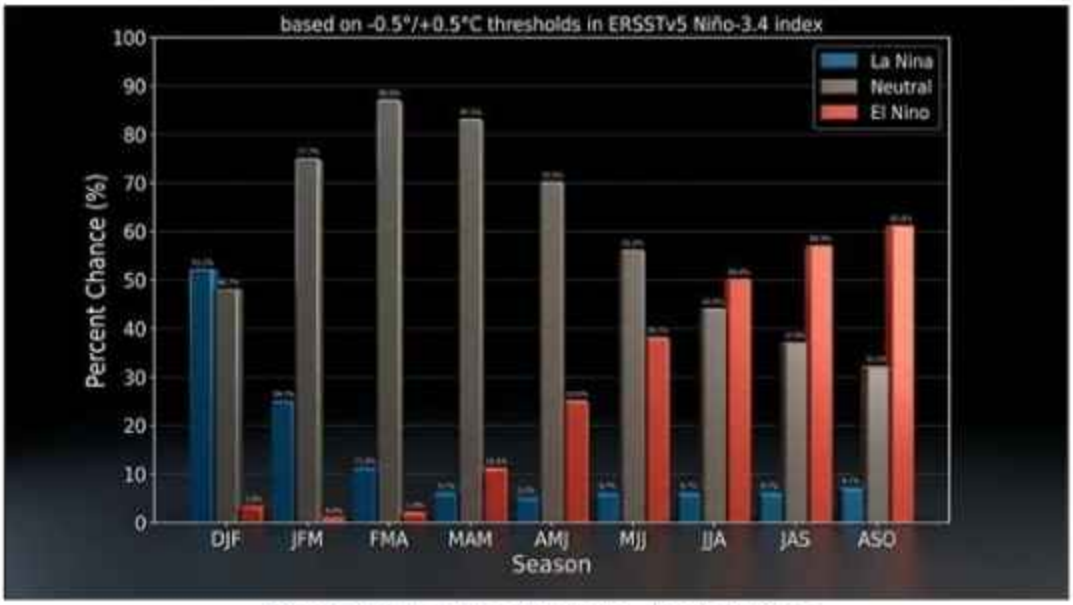


Figure 10 La Nina/ El Nino Probabilities

I. **Indian Ocean Dipole**. Based on the forecast data, Indian Ocean Dipole (IOD) index is projected to hover near-neutral to weakly positive during the core monsoon period of July–September 2026. The index forecast shows peaking just above +0.5 °C in July, dipping slightly through August to around +0.45 °C by September, and subsequently strengthening toward +0.7 °C by November. The overall forecast mean sits only marginally above the positive IOD threshold +0.4 °C, indicating a weak positive tendency rather than a strong, well-sustained positive event. For Pakistan's monsoon season, this suggests that the IOD will offer limited moisture support into Arabian Sea monsoon currents. While this weak positive signal may help sustain localized, episodic rainfall over southern Pakistan, Sindh, southern Punjab, and eastern Balochistan during July and August, it will ultimately be insufficient to counteract broader suppressing climate drivers, resulting in a spatially inconsistent and weaker-than-normal monsoon across most of the country.

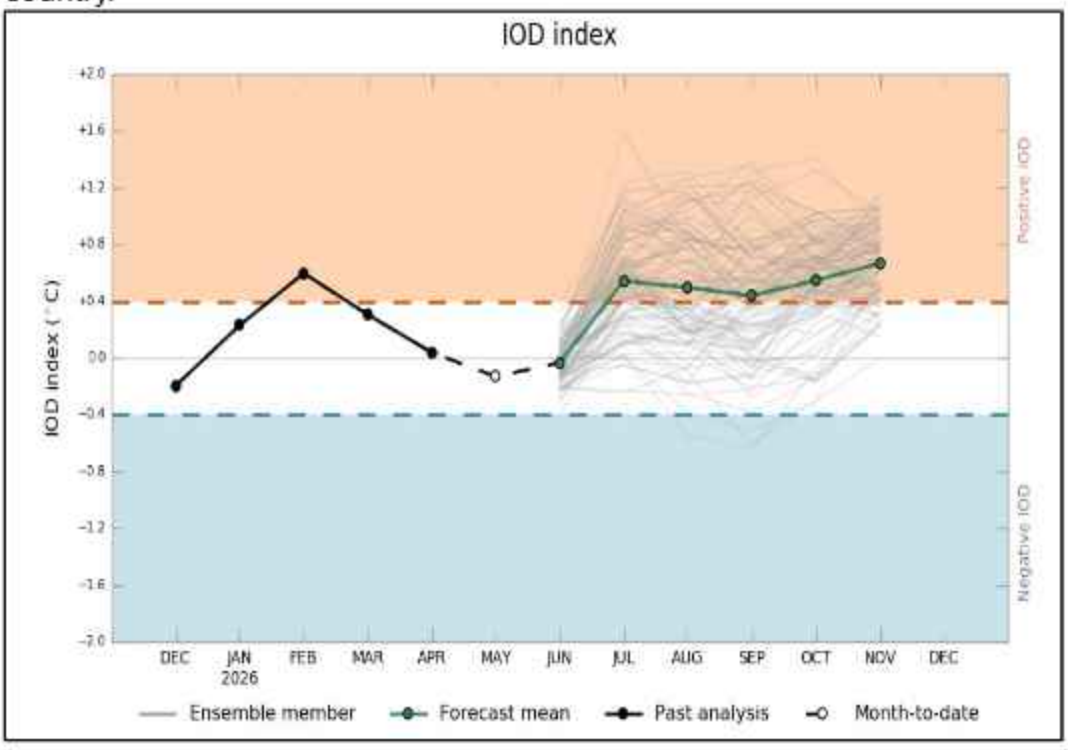


Figure 12 IOD Index

NATIONAL METEOROLOGICAL OUTLOOK

1. From 2020 to 2025, Pakistan's monsoon exhibited pronounced interannual variability, oscillating between rainfall deficit conditions (2021, parts of 2023), catastrophic excess and widespread flooding (2022), and regionally uneven but comparatively wetter conditions (2024–2025), highlighting the strong sensitivity of the monsoon system to large-scale climate drivers such as ENSO, the Indian Ocean Dipole (IOD), monsoon circulation dynamics, and regional atmospheric variability. These years repeatedly produced hydrological extremes, agricultural disruption, infrastructure stress, flash and riverine flooding, uneven rainfall distribution, and episodic groundwater and reservoir recharge, underscoring the increasing volatility of Pakistan's monsoon system.

2. In contrast, the 2026 monsoon appears likely to transition toward a warmer and comparatively drier regime, though not a complete monsoon collapse. Seasonal guidance indicates a structurally weaker and spatially inconsistent monsoon, characterized by reduced moisture transport, prolonged dry intervals, elevated temperatures, and generally below-normal rainfall across much of the country, particularly over Punjab, Sindh, southern Khyber Pakhtunkhwa, and eastern Balochistan, while northern mountainous regions including upper KP, Gilgit-Baltistan (GB), and parts of Azad Jammu & Kashmir (AJK) may continue to receive localized and terrain-driven rainfall episodes.

3. The 2026 monsoon outlook for Pakistan, therefore, indicates a transition toward a heat- and moisture-stress-dominant season, with below-normal rainfall across many regions and persistently above-normal temperatures likely to increase soil moisture depletion, evapotranspiration, irrigation demand, and pressure on water resources and agriculture. Unlike strongly flood-dominated years, 2026 is more likely to be characterized by prolonged dry spells and uneven rainfall distribution, although episodic high-intensity rainfall events may still occur during active monsoon incursions, creating risks of localized urban flooding and flash flooding without substantial seasonal hydrological recovery. Overall, 2026 calls for a recalibration of climate-risk priorities, shifting emphasis from primarily riverine flood preparedness toward heat-health action plans, drought monitoring, anticipatory water-resource management, agricultural adaptation, and preparedness for localized extreme rainfall events.

a. **<u>July 2026 - Historical July Precipitation Pattern</u>**. Historical July rainfall patterns (2020–2025), Pakistan has remained concentrated over northern and northeastern regions, particularly upper Punjab, KP, GB, and AJK, while Sindh, southern Punjab, and Balochistan experience lower and more variable rainfall with occasional localized heavy events. This spatial unevenness has generally supported seasonal water availability in the north while maintaining intermittent dry spells in southern regions. In contrast, July 2026 is anticipated to shift toward a weaker and spatially inconsistent monsoon pattern, with below-normal rainfall across much of southern and central Pakistan, elevated heat stress, prolonged dry intervals, and increasing pressure on soil moisture and irrigation demand, although northern catchments may still receive above-normal localized rainfall activity.

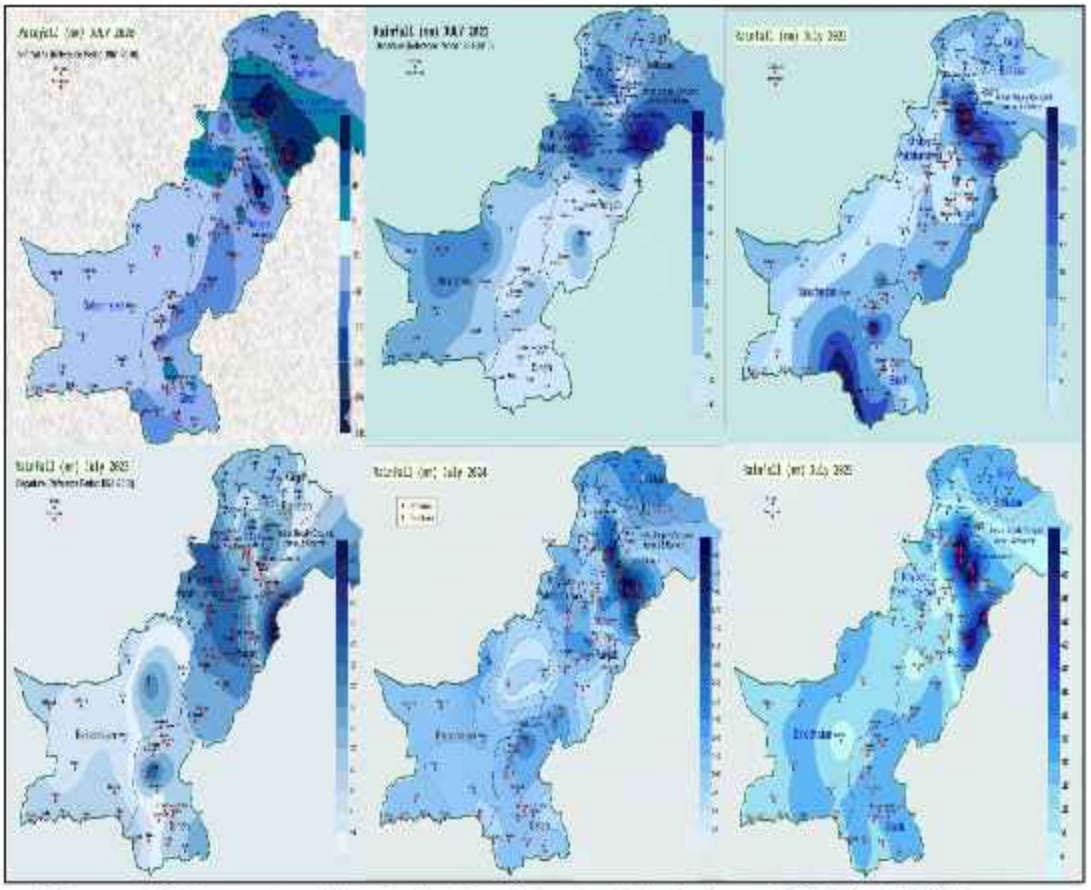


Figure 13 Year vise Precipitation Trend of July from 2020 to 2025

Year-wise Precipitation Trend of July from 2020 to 2025

Year	Rainfall Anomaly (%)	Spatial Character	Onset	Impacts
2021	+4% (near normal)	Wet north, drier Sindh	5 July	Balanced hydrology, localized northern flood pulses
2022	+181% (extreme)	Nationwide excess	30 June	Major flooding, early soil saturation and river swelling
2023	+70% (wet)	Widespread heavy rain	3 July	Urban flooding, crop waterlogging, and reservoir recharge
2024	−8% (slightly dry)	Mixed distribution	29 June	Limited flooding, mild moisture stress
2025	+22.8% (above normal)	Broadly wet	26 June	Flood events, strong agricultural support
2026	Generally, below normal (locally stronger deficits in some regions	Deficits in Sindh, Punjab (central/south & NE), southern KP, eastern Balochistan; near-normal to slightly above-normal in upper KP, GB, northern catchments.	Late June – Early July	Heat stress, soil moisture loss, prolonged dryness, higher irrigation demand, reduced recharge, and isolated intense storms causing localized urban/flash flooding.

4. **July 2026 Precipitation Outlook – Pakistan.** In July 2026, monsoon rainfall across Pakistan is expected to remain spatially uneven and generally weaker than normal, reflecting a structurally suppressed monsoon pattern under the influence of broader climate drivers. Sindh, particularly the southern and central districts, is likely to experience below-normal rainfall, with longer dry intervals and only episodic rainfall spells during active monsoon phases.

   a. **Punjab**. projected to remain below normal overall, especially across central, southern, and northeastern districts, although localized rainfall activity may still occur over the Pothohar region and upper Punjab during short-lived monsoon incursions

b. **Balochistan**. particularly eastern and southeastern districts, is expected to remain drier than normal, while coastal and southwestern areas may observe comparatively better but still limited rainfall activity. Khyber Pakhtunkhwa (KP) is likely to experience mixed conditions, with southern and central districts remaining below normal, whereas upper KP and northern mountainous areas, including Swat, Chitral, Dir, and Hazara, may receive near-normal to slightly above-normal rainfall due to terrain-driven uplift and localized monsoon penetration.

c. **Gilgit-Baltistan (GB)**. is expected to remain near normal to slightly above normal in localized catchments, particularly over western and northwestern mountainous regions including Ghizer, Ishkoman, Hunza, and adjoining upper valleys, where topographic influence may enhance localized moisture concentration. However, parts of Gilgit, Skardu, Diamer, and central valleys may remain closer to near-normal conditions, resulting in a spatially variable and elevation-dependent rainfall pattern.

d. **Azad Jammu & Kashmir (AJK)**. is likely to experience near-normal to slightly below-normal rainfall, with localized variability across Muzaffarabad, Bagh, Neelum Valley, and adjoining mountainous districts. While episodic rainfall spells may still occur during active monsoon incursions, persistent widespread monsoon activity appears less likely, favoring intermittent rainfall rather than sustained wet conditions.

5. Overall, July 2026 is expected to be characterized by a weak and spatially inconsistent monsoon, with episodic rainfall spells rather than prolonged wet periods, increasing the likelihood of prolonged dry intervals, localized heat stress, and uneven moisture distribution across the country, while isolated short-duration heavy rainfall events may still occur during active monsoon surges.

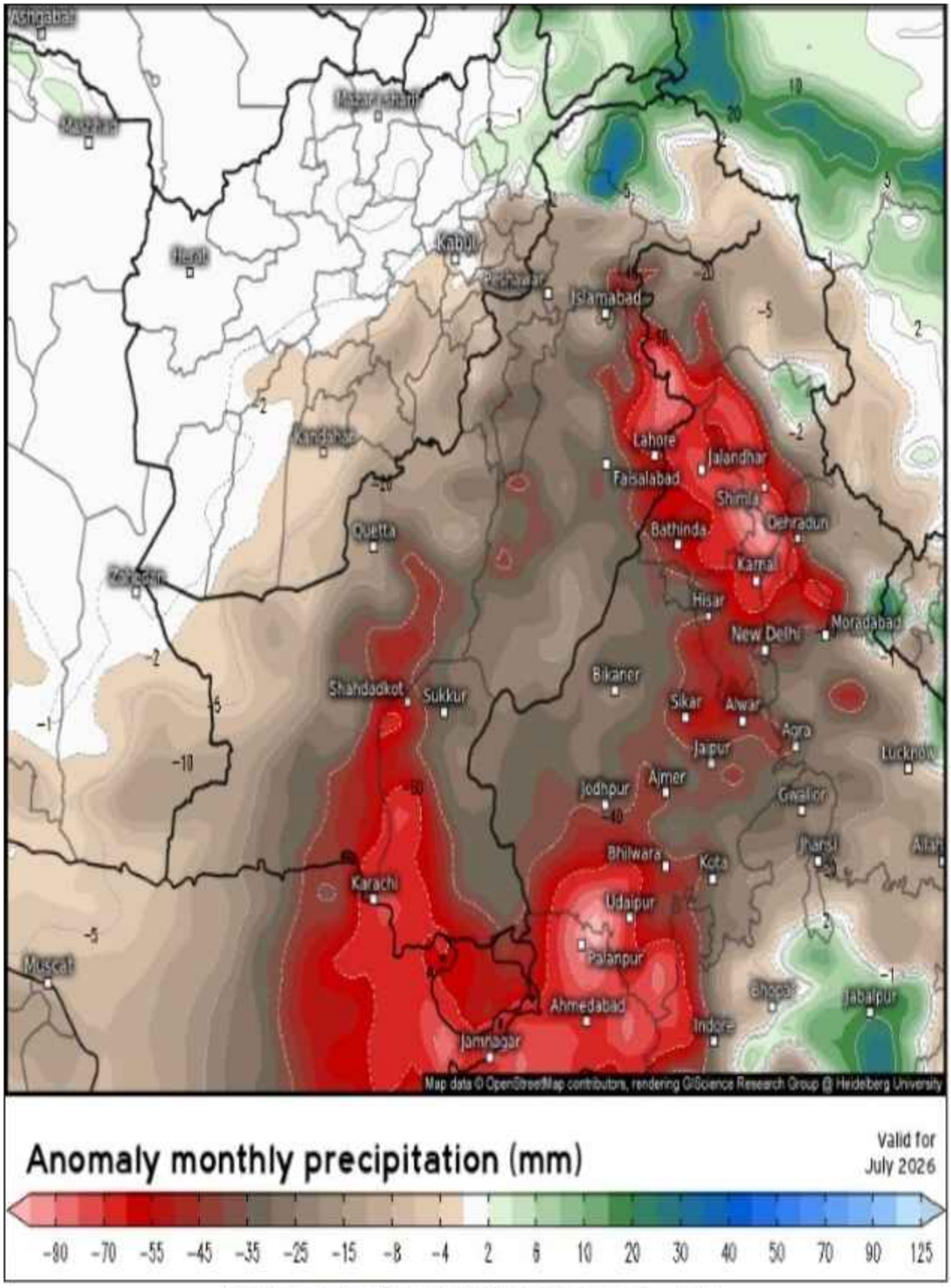


Figure 14 Monthly Precipitation Anomaly – July

6. **Historical July Temperature Pattern.** Historical July temperature patterns (2020–2025) across Pakistan indicate a persistent north–south thermal gradient, with southern Pakistan, including Sindh, southern Punjab, and much of Balochistan consistently experiencing above-normal and comparatively hotter conditions, while upper Khyber Pakhtunkhwa (KP), Gilgit-Baltistan (GB), and northern mountainous regions generally remain cooler and closer to normal due to elevation and periodic monsoon cloud cover. Central regions, including parts of Punjab and lower KP, typically experience warm to above-normal conditions, although monsoon activity occasionally moderates daytime heating.

7. Overall, historical July temperature patterns suggest persistent heat concentration over southern and central Pakistan, partially moderated by monsoon influence over northern and northeastern regions. In contrast, July 2026 is projected to be warmer than historical norms across much of Pakistan, with above-normal temperatures expected over Punjab, Sindh, Balochistan, southern KP, and central regions, reflecting weaker monsoon moderation and prolonged dry intervals. Northern regions, including GB and upper KP, are also likely to remain warmer than normal, although high-altitude areas may experience comparatively moderated warming because of elevation and localized cloud cover. Overall, elevated heat stress, increased evapotranspiration, enhanced soil moisture loss, and greater pressure on water and agricultural systems are likely under weaker monsoon conditions.

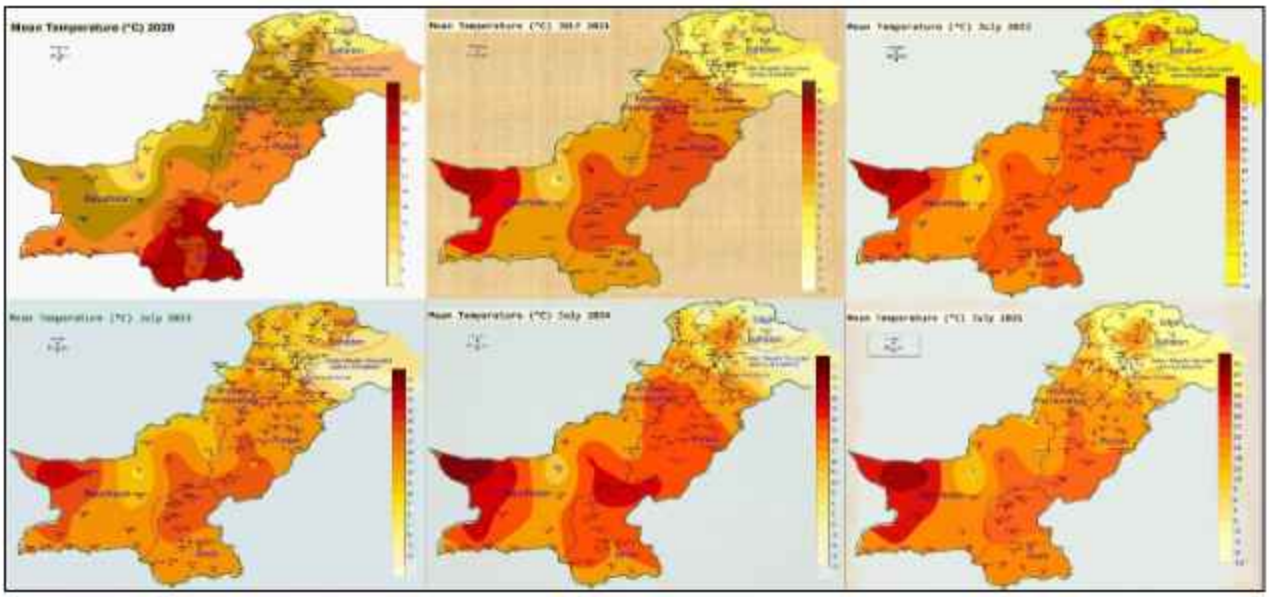


Figure 15 Year vise Temperature Trend of July from 2020 to 2025

Year vise Temperature Trend of July from 2020 to 2025

Year	Temperature Anomaly	Spatial Character	Thermal Pattern	Impacts
2021	Near Normal	Warmer south, cooler north	Stable July temperatures	Moderate heat stress; balanced thermal conditions
2022	+1°C to +2°C *(above normal)*	Widespread warming	Humid monsoon-driven heat	Elevated humidity; reduced nighttime cooling
2023	Near Normal to Slightly Warm	Mixed regional pattern	Moderated by stronger monsoon cloud cover	Reduced heat intensity in northern/central regions
2024	+0.5°C to +1.5°C	Strong south–north gradient	Persistent heat over Sindh & Balochistan	Mild-to-moderate heat stress; increased water demand
2025	Slightly Above Normal	Broadly warm	High temperatures moderated by rainfall activity	Stable but warm July conditions
2026	Above normal	Strong warming across Punjab, Sindh, Balochistan & central Pakistan; milder warming in upper KP, GB & AJK.	Warmer-than-normal July under weaker monsoon influence	Elevated heat stress, higher evapotranspiration, accelerated soil moisture loss, rising irrigation demand, prolonged warm spells

8. **July 2026 Temperature Outlook – Pakistan.** In July 2026, temperatures across Pakistan are projected to remain predominantly above normal, reflecting a warmer-than-usual monsoon onset under relatively weaker rainfall conditions.

a. **Punjab**. likely to experience above-normal temperatures, particularly across central and southern districts, while northern Punjab may observe comparatively less intense but still warmer-than-normal conditions.

b. **Sindh**. Expected to remain above normal throughout the province, with persistent warmth across upper, central, and coastal districts, although

coastal influence may slightly moderate daytime heating near Karachi and adjoining areas

c. **Balochistan**. Likely to experience above-normal temperatures, especially across eastern, southeastern, and southern districts, while western and higher-elevation areas may observe a comparatively weaker warming signal but still remain warmer than historical norms. Khyber Pakhtunkhwa (KP) is projected to remain above normal, with the strongest warming expected over southern and central districts, while upper KP and mountainous areas may experience relatively milder but still warmer-than-normal conditions.

d. **Gilgit-Baltistan (GB)**. Expected to remain slightly above normal, with Gilgit, Diamer, Astore, Skardu, and lower valleys experiencing a noticeable warming tendency under weaker monsoon moderation. Higher-altitude regions, including Hunza, Ghizer, and glacier-fed catchments, may experience comparatively moderated but still warmer-than-normal conditions due to elevation and localized cloud cover.

e. **Azad Jammu & Kashmir (AJK)**. Projected to remain slightly near normal, with Muzaffarabad, Bagh, Rawalakot, Neelum Valley, and adjoining valleys likely to experience warmer-than-usual conditions despite periodic cloud cover and localized rainfall activity. Higher-elevation terrain may experience comparatively moderated warming, though temperatures are still expected to remain above seasonal norms overall.

9. Overall, July 2026 is likely to be warmer than normal across most of Pakistan, increasing the likelihood of heat stress, higher evapotranspiration, soil moisture decline, and rising irrigation demand, particularly in rain-fed and agricultural regions under weaker monsoon influence.

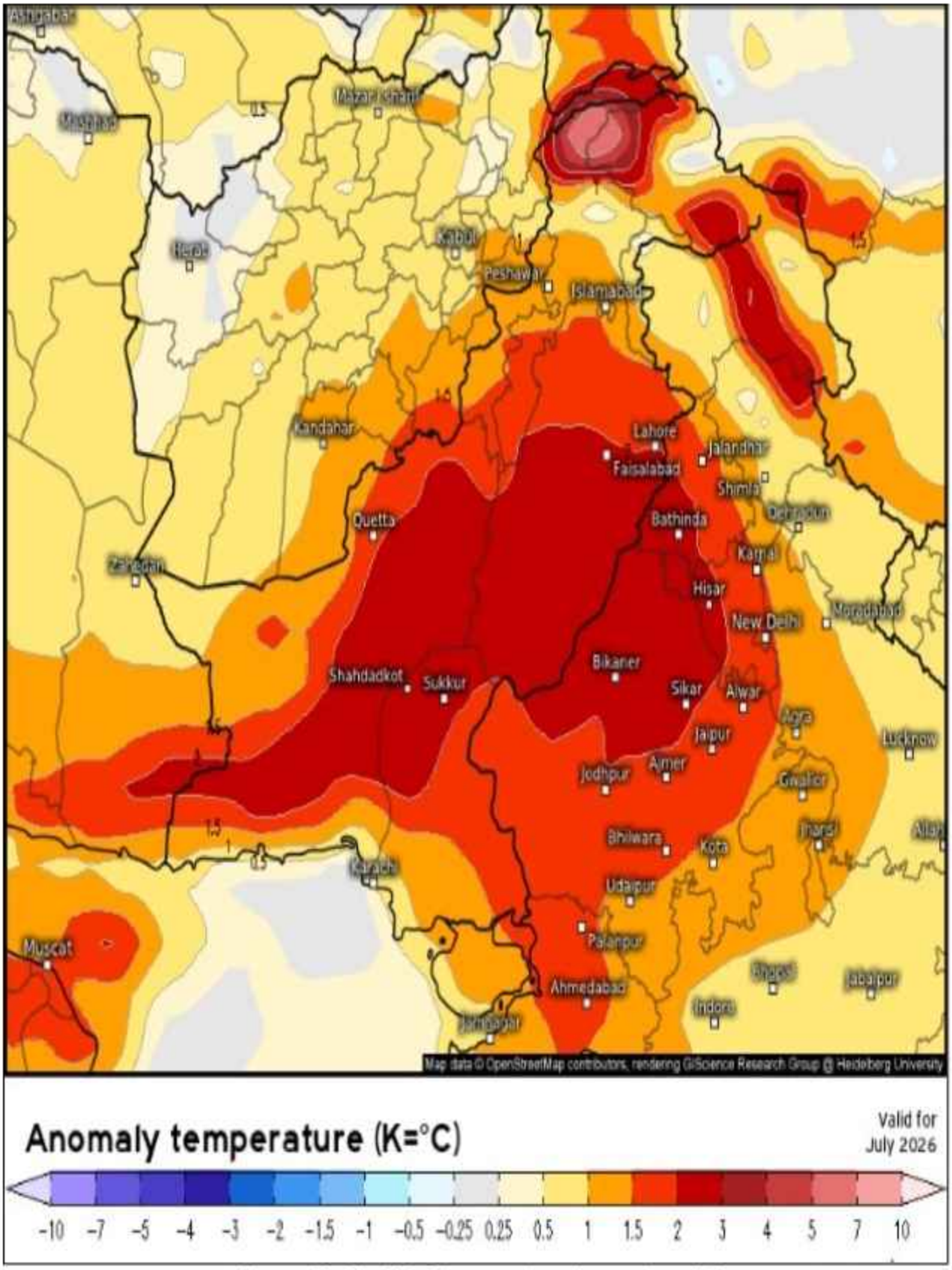


Figure 16 Monthly Temperature Anomaly - July

10. **August 2026 - Historical Precipitation Pattern**. Historical August rainfall patterns (2020–2025), Pakistan's monsoon rainfall generally shows a strong concentration over northern and northeastern regions, particularly upper Punjab, KP, GB, and AJK, where August frequently records moderate to heavy rainfall activity. Compared to July, August has historically exhibited broader monsoon coverage and greater rainfall intensity, especially during 2022 and 2023, when widespread rainfall supported enhanced soil moisture, reservoir recharge, and favorable agricultural conditions. In contrast, Sindh, southern Punjab, and Balochistan typically experience lighter and more variable rainfall, although occasional localized heavy rainfall has been observed over lower Sindh and southeastern Pakistan in some years.

11. Overall, historical August rainfall in Pakistan remains spatially uneven but generally wetter than July, often acting as the peak monsoon month with widespread rainfall distribution across northern and central regions. In contrast, August 2026 is anticipated to diverge from this historical pattern, with forecast signals indicating a comparatively weaker and spatially inconsistent monsoon phase, characterized by below-normal rainfall across much of Punjab, Sindh, and adjoining regions, while northern catchments may continue to receive localized rainfall activity but at lower intensity than observed in wetter historical years.

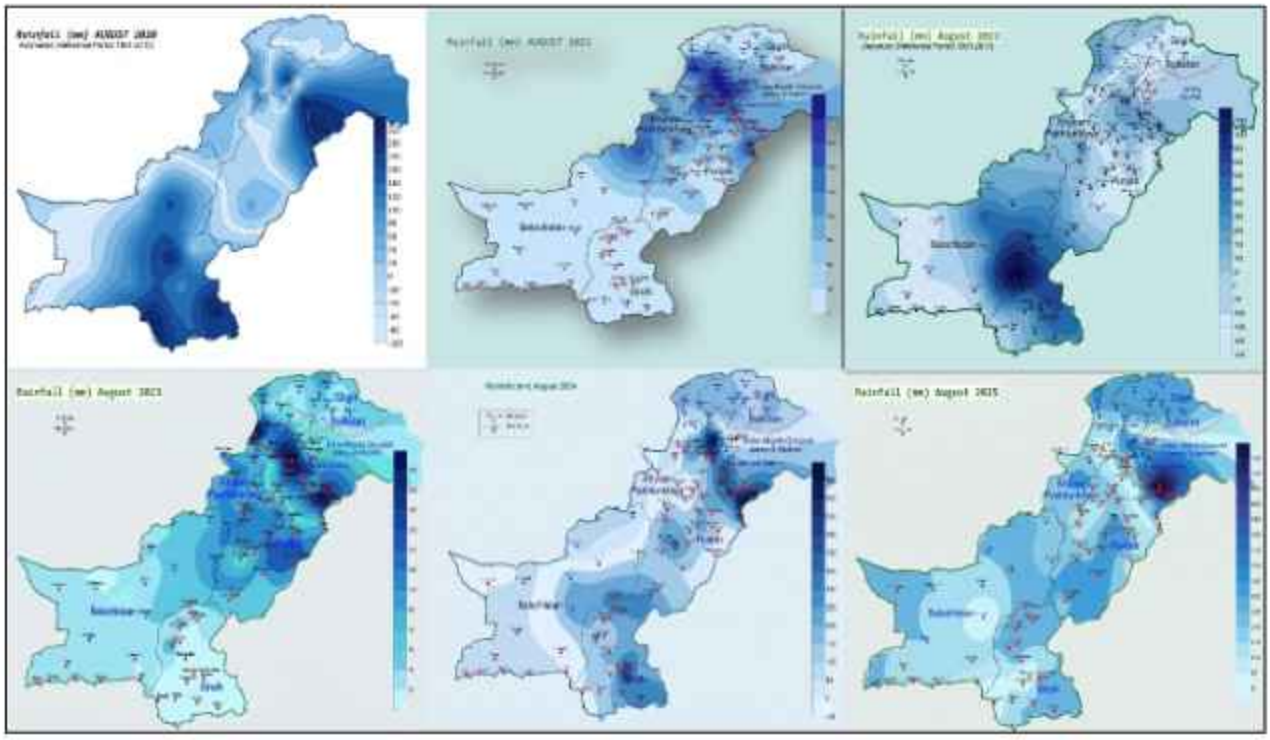


Figure 17 Year vise Precipitation Trend of August from 2020 to 2025

Year vise Precipitation Trend of August from 2020 to 2025

Year	Rainfall Anomaly (%)	Spatial Character	Impacts
2021	−55% (severe deficit)	Widespread dry	Agricultural stress, low reservoir inflows
2022	+243% (historic extreme)	Sindh/Balochistan epicenter	Catastrophic flooding, infrastructure collapse
2023	−66% (extreme dry)	Nationwide deficit	Crop stress, drought signals
2024	+147% (very wet)	Strong south + Punjab	Urban flooding, casualties, and infrastructure damage
2025	+11% (moderate wet)	Balanced	Flood events
2026	Below normal	Deficits across Punjab, Sindh & eastern Balochistan; near-normal conditions in upper KP, GB & AJK.	Elevated heat stress, soil moisture decline, irrigation pressure, prolonged dry interval

12. **August 2026 Precipitation Outlook – Pakistan.** In August 2026, monsoon rainfall across Pakistan is expected to remain predominantly below normal and spatially uneven, despite August typically being the climatological peak monsoon month.

a. **Punjab**. likely to experience below-normal rainfall, particularly across central, eastern, and northeastern districts, where monsoon activity may remain weaker and less sustained, while southern Punjab is also expected to remain relatively dry with prolonged intervals between rainfall events.

b. **Sindh**. Projected to experience below-normal precipitation across much of the province, with the strongest rainfall suppression likely over lower and southeastern districts, including Karachi, Hyderabad, Thatta, Badin, and adjoining regions. Upper Sindh may continue to receive episodic rainfall activity, though overall monsoon penetration is expected to remain weaker than usual.

c. **Balochistan**. Expected to remain below normal, particularly across eastern and southeastern districts where monsoon incursions are typically more influential. Central and western Balochistan may experience only isolated and inconsistent rainfall activity, while coastal districts are likely to remain relatively dry overall.

d. **Khyber Pakhtunkhwa (KP)**. May observe near-normal to slightly below-normal rainfall, particularly across upper and mountainous districts where terrain-driven rainfall may still occur intermittently, although southern and central KP are likely to remain comparatively drier with longer dry intervals.

e. **Gilgit-Baltistan (GB)** Likely to continue to receive localized rainfall activity, particularly over higher mountainous catchments and western valleys, although overall precipitation is expected to remain near normal to slightly below normal across much of the region. Gilgit, Skardu, Diamer, Ghanche, and adjoining central valleys are likely to experience a weaker and spatially inconsistent monsoon signal, lacking the comparatively wetter conditions often observed during stronger monsoon years.

f. **Azad Jammu & Kashmir (AJK)**. Expected to experience predominantly below-normal rainfall, with Muzaffarabad, Bagh, Rawalakot, Neelum Valley, and adjoining districts likely to observe weaker monsoon persistence and longer dry intervals between rainfall spells. Although localized rainfall activity may still occur during episodic monsoon incursions, the region is unlikely to experience the stronger and more sustained wet signal typically associated with wetter August monsoon years.

13. Overall, August 2026 is likely to be characterized by a weaker and spatially inconsistent monsoon, favoring prolonged dry spells, rising soil moisture stress, increased irrigation demand, and elevated heat stress, although isolated short-duration heavy rainfall events and localized urban flooding may still occur during active monsoon incursions.

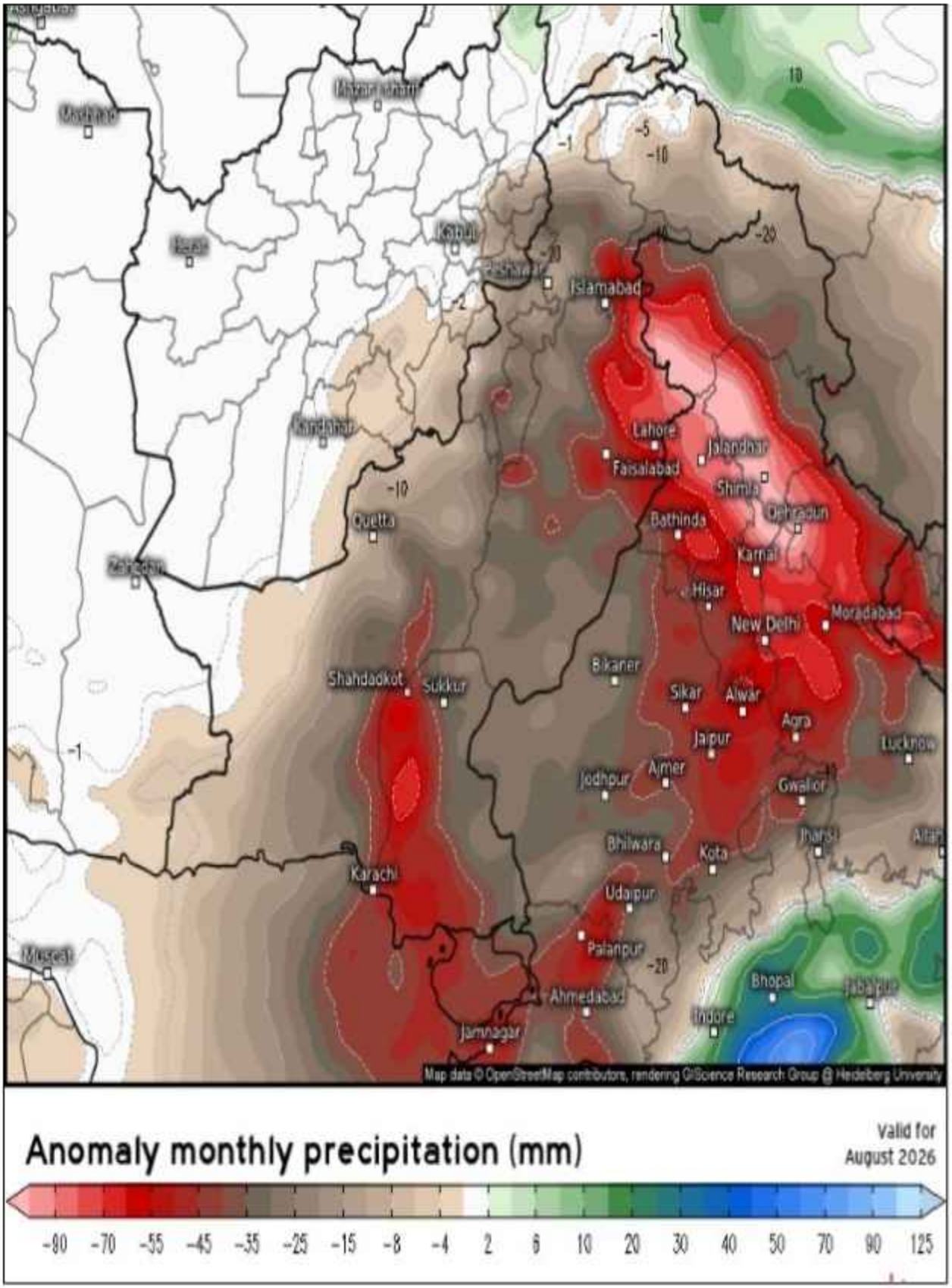


Figure 18 Monthly Precipitation Anomaly - August

14. **Historical Temperature Pattern (August)**. Historical August temperature patterns (2020–2025), Pakistan's temperature distribution generally reflects continued seasonal heat over southern and central regions, although August typically experiences slight moderation compared to peak summer months due to stronger monsoon influence. Sindh, southern Punjab, and Balochistan consistently record the highest temperatures, while upper Punjab, KP, GB, and AJK remain relatively cooler under enhanced cloud cover and rainfall activity. Historical August temperatures indicate a stable thermal pattern with persistent warmth across southern Pakistan and comparatively milder conditions over northern regions, reflecting the influence of the climatological peak monsoon period. In contrast, August 2026 is anticipated to diverge from this historical pattern, with forecast signals indicating significantly above-normal temperatures across much of Pakistan, especially over Punjab, Sindh, and adjoining plains, potentially intensifying heat stress, soil moisture depletion, and agricultural water demand during the climatological peak monsoon month.

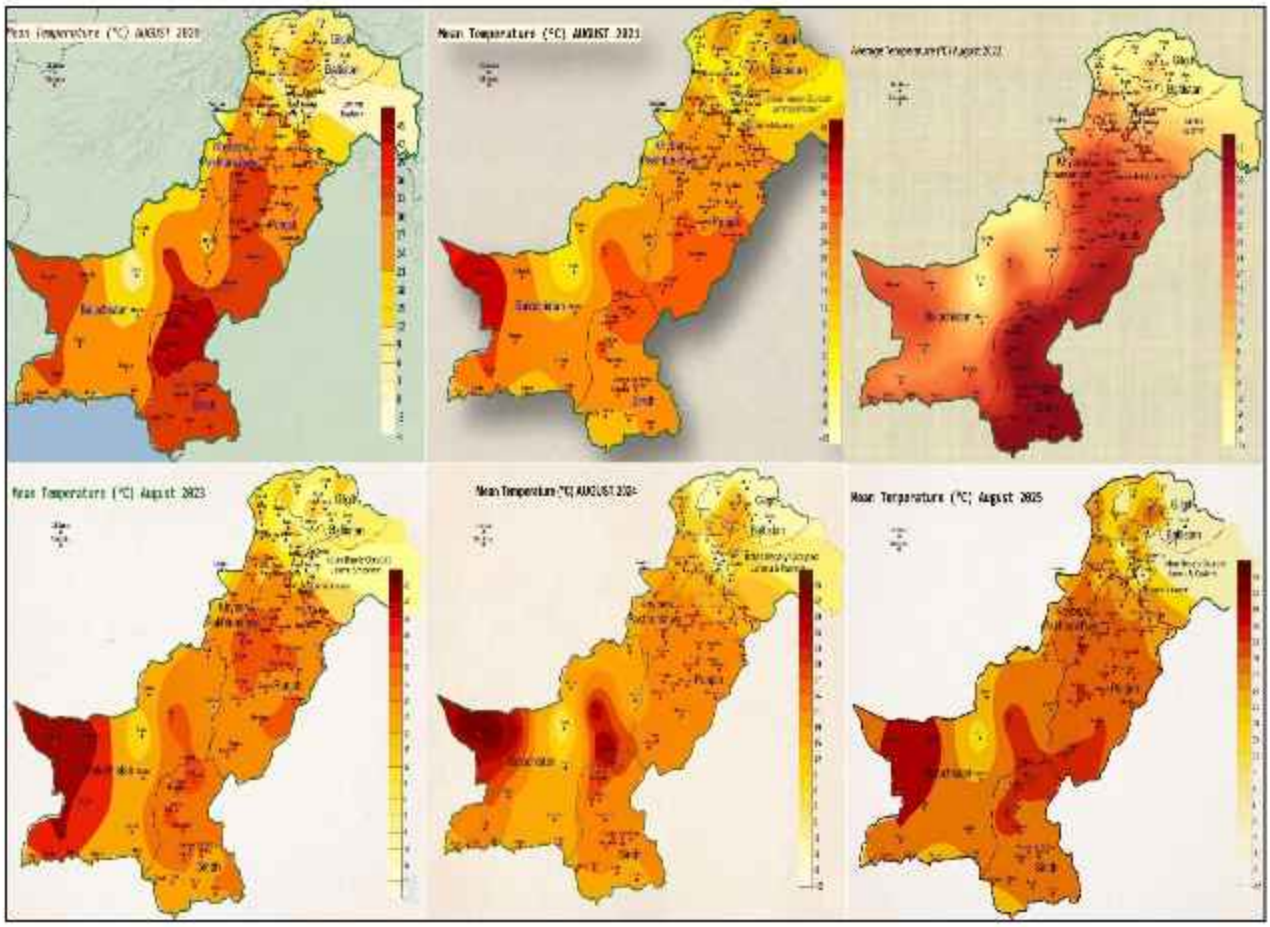


Figure 19 Year vise Temperature Trend of August from 2020 to 2025

Year vise Temperature Trend of August from 2020 to 2025

Year	Temperature Anomaly	Spatial Character	Thermal Pattern	Impacts
2021	Near Normal to Slightly Cool	Cooler north, warmer south	Moderated by monsoon activity	Reduced heat stress; favorable thermal conditions
2022	+0.5°C to +1.5°C *(above normal)*	Warm nationwide	Humid monsoon-driven warmth	Elevated humidity; reduced nighttime cooling
2023	Near Normal	Strong south–north contrast	Monsoon moderation over north & central regions	Stable temperatures with localized humid spells
2024	+1°C to +2°C *(above normal)*	Strong warming over southern Pakistan	Persistent warmth despite rainfall activity	Moderate heat stress; higher evapotranspiration
2025	Slightly Above Normal	Broadly warm	Warm but moderated by August monsoon	Stable thermal conditions; moderate agricultural stress
2026	Above normal	Strong warming in Punjab, Sindh & adjoining plains; comparatively milder above-normal in upper KP, GB & AJK.	Significantly warmer-than-normal August despite climatological peak monsoon	Intensified heat stress, accelerated soil moisture depletion, higher irrigation demand, increased agricultural water stress

15. **August 2026 Temperature Outlook - Pakistan.** In August 2026, temperatures across Pakistan are expected to remain predominantly above normal, despite August being the climatological peak monsoon month.

a. **Punjab**. likely to experience above-normal temperatures, particularly across central and southern districts, while northeastern Punjab may remain comparatively less warm but still above historical norms.

b. **Sindh**.Projected to remain persistently above normal, with the strongest warming signal expected over upper and central districts, while coastal

areas may experience slightly moderated but still warmer-than-normal conditions.

c. **Balochistan**. Expected to experience above-normal temperatures, especially across eastern, southeastern, and southern districts, whereas western and higher-elevation areas may observe a comparatively weaker warming signal. Khyber Pakhtunkhwa (KP) is likely to remain above normal, with stronger warming across southern and central districts, while upper KP and mountainous areas may experience relatively milder but still warmer-than-normal conditions.

d. **Gilgit-Baltistan (GB)**. Expected to remain near normal to slightly above normal, with Gilgit, Skardu, Diamer, and adjoining valleys experiencing mild warming under weaker monsoon moderation. Higher-altitude regions, including Hunza, Ghizer, and glacier-fed catchments, are likely to remain closer to near-normal conditions, as elevation and localized cloud cover help moderate daytime temperatures

e. **Azad Jammu & Kashmir (AJK).** Projected to remain slightly above normal to near normal, with Muzaffarabad, Bagh, Rawalakot, and Neelum Valley likely to experience modest warming rather than strong heat anomalies. Mountainous terrain and intermittent monsoon cloud cover may continue to moderate daytime heating, preventing the stronger warming observed across Punjab and central Pakistan.

16. Overall, August 2026 is likely to remain warmer than normal across most of Pakistan, increasing the likelihood of persistent heat stress, higher evapotranspiration, soil moisture depletion, rising irrigation demand, and prolonged warm spells, particularly under weaker monsoon moderation and below-normal rainfall conditions.

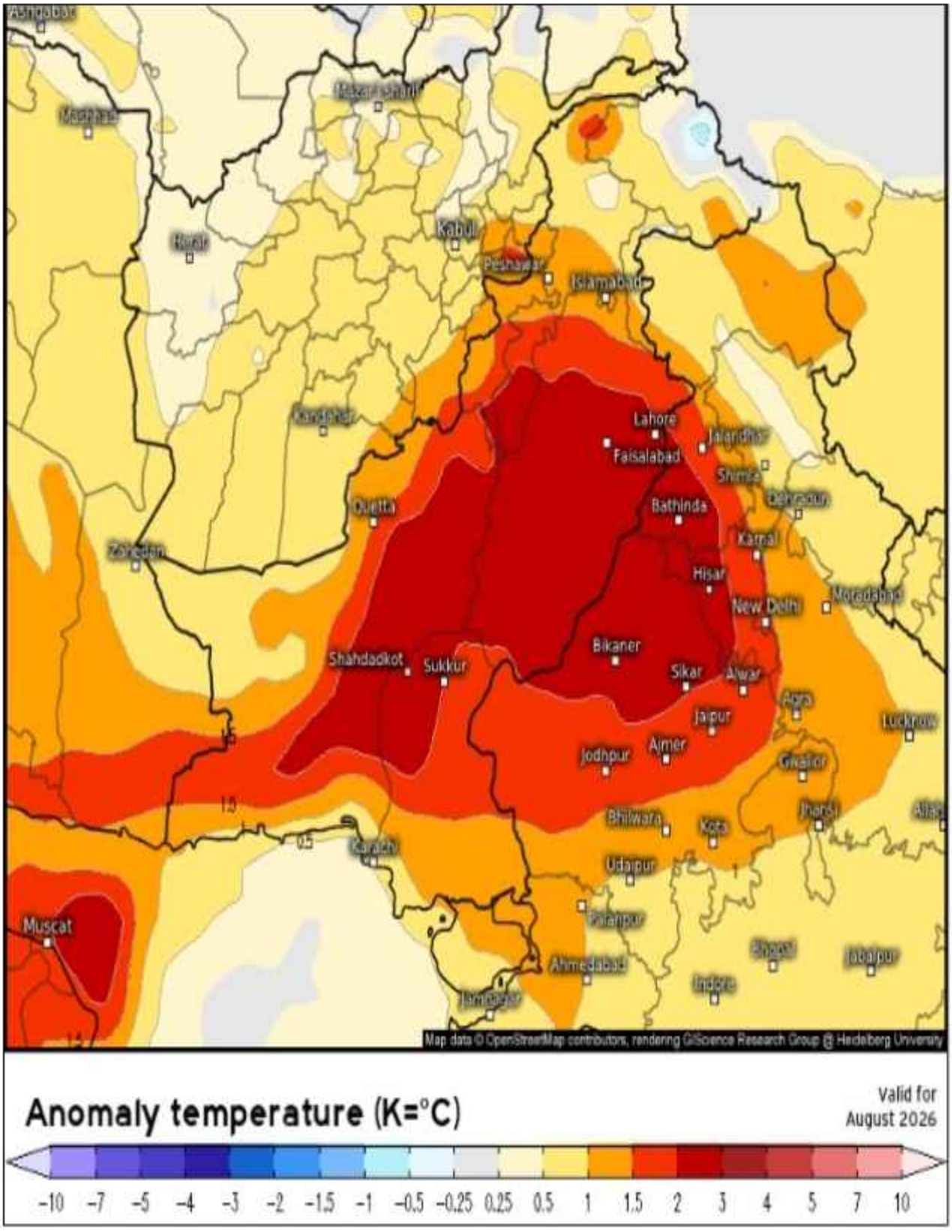


Figure 20 Monthly Temperature Anomaly – August

17. **<u>September 2026 - Historical September Precipitation Pattern.</u>** Historical September rainfall patterns (2020–2025), Pakistan's monsoon rainfall generally shows a gradual north-to-south retreat, with upper Punjab, KP, GB, and AJK continuing to receive moderate rainfall activity, while Sindh, southern Punjab, and Balochistan experience comparatively lower and more localized precipitation as the monsoon weakens seasonally. Historical September rainfall indicates a more spatially concentrated pattern compared to July and August, with rainfall increasingly confined to northern catchments and northeastern Punjab, while southern regions often transition toward drier post-monsoon conditions. Despite this retreat, localized rainfall activity has intermittently persisted over southern Sindh and southeastern Pakistan, maintaining moderate hydrological support during some years. In contrast, September 2026 is anticipated to diverge from this historical pattern, with forecast signals indicating a comparatively drier and earlier monsoon withdrawal phase, characterized by below-normal rainfall across much of Punjab, Sindh, and eastern Balochistan, while northern catchments may retain only localized rainfall activity.

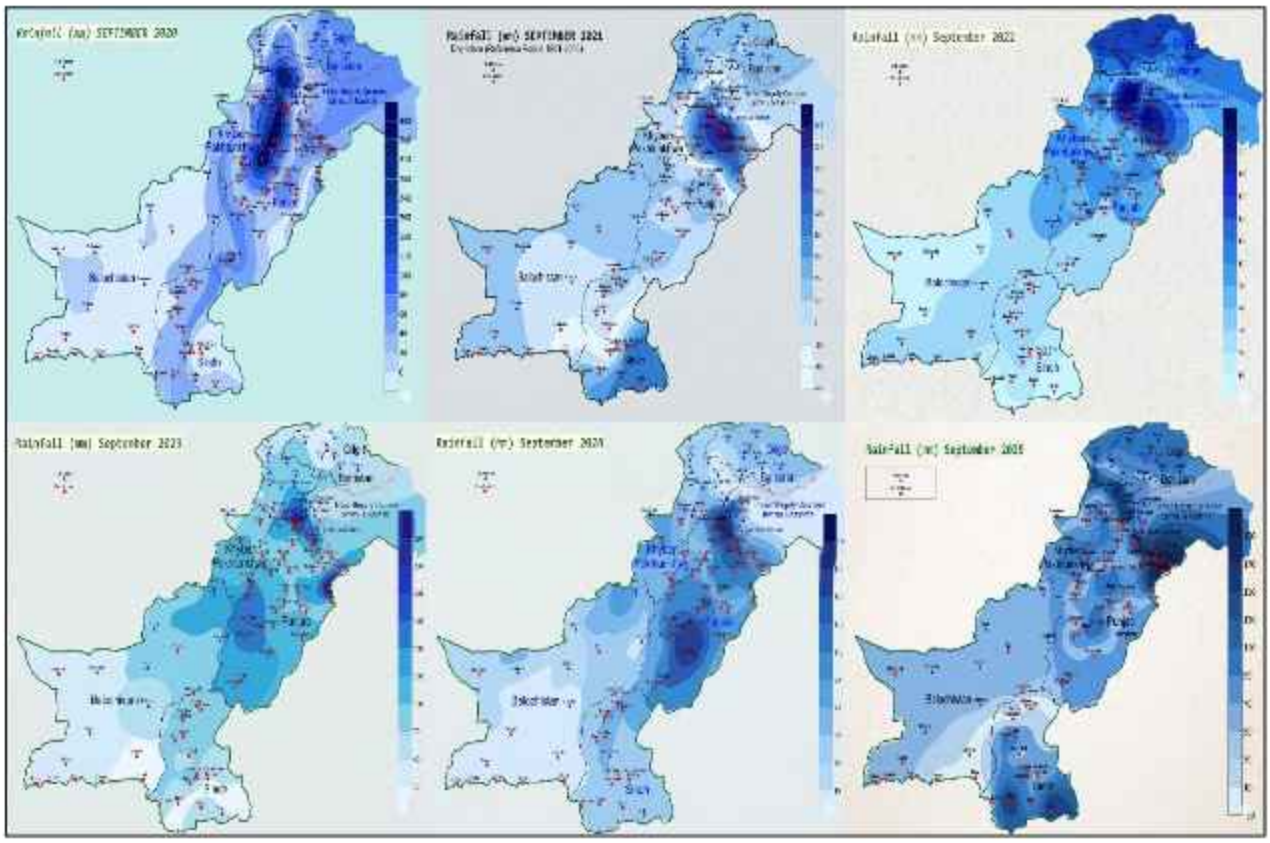


Figure 21 Year vise Precipitation Trend of September from 2020 to 2025

Year vise Precipitation Trend of September from 2020 to 2025

Year	Rainfall Anomaly (%)	Spatial Character	Impacts
2021	+60% (wet)	Broad surplus	Flood relief in some areas, crop benefit
2022	−21% (dry)	Post-flood decline	Floodwaters persisted despite reduced rain
2023	−7% (near normal)	Balanced	Stable transition, limited hazard
2024	−30% (dry)	Widespread deficit	Reduced late-season recharge
2025	+52% (wet)	Strong south focus	Flooding in Sindh, infrastructure damage
2026	Below normal	Deficits in eastern Punjab, Sindh & adjoining plains; near-normal in upper KP, GB & AJK	Reduced soil moisture recharge, prolonged dry intervals, rising irrigation demand, localized moisture stress

18. **September 2026 Precipitation Outlook – Pakistan.** In September 2026, monsoon rainfall across Pakistan is expected to remain predominantly below normal, reflecting a gradual but earlier monsoon withdrawal and weaker moisture availability.

a. **Punjab**. is likely to experience below-normal rainfall, particularly across central, eastern, and northeastern districts, while southern Punjab may remain relatively drier with prolonged dry intervals and limited rainfall continuity.

b. **Sindh**. Projected to remain below normal, although rainfall deficits may become comparatively less intense than in August as monsoon activity weakens further. Upper and central Sindh are likely to observe limited rainfall activity, while lower and coastal districts may continue to experience isolated but inconsistent rainfall spells.

c. **Balochistan**. Expected to remain below normal, especially across eastern and southeastern districts where residual monsoon influence may persist

weakly, while western and southwestern areas are likely to remain largely dry under an earlier seasonal transition.

d. **Khyber Pakhtunkhwa (KP)**. May observe near-normal to slightly below-normal rainfall over upper districts due to localized terrain-driven activity, though central and southern KP are expected to remain comparatively drier with reduced rainfall frequency.

e. **Gilgit-Baltistan (GB)**. May continue to receive isolated localized precipitation, particularly over higher mountain catchments and glacier-fed valleys, although overall rainfall is expected to remain near normal to slightly below normal across much of the region. Gilgit, Skardu, Diamer, Ghanche, and adjoining valleys are likely to experience reduced rainfall continuity and longer dry intervals, as monsoon influence weakens toward seasonal retreat.

f. **Azad Jammu & Kashmir (AJK)**. Likely to experience slightly below-normal rainfall, with Muzaffarabad, Bagh, Rawalakot, and Neelum Valley expected to observe weaker monsoon persistence and declining rainfall activity. While localized rainfall episodes may still occur, overall monsoon influence is expected to weaken, favoring longer dry intervals and an earlier seasonal drying tendency.

19. Overall, September 2026 is likely to be characterized by a weaker and retreating monsoon pattern, favoring prolonged dry intervals, declining soil moisture recharge, increasing moisture stress, and reduced seasonal rainfall continuity, particularly across Punjab, Sindh, and eastern Balochistan.

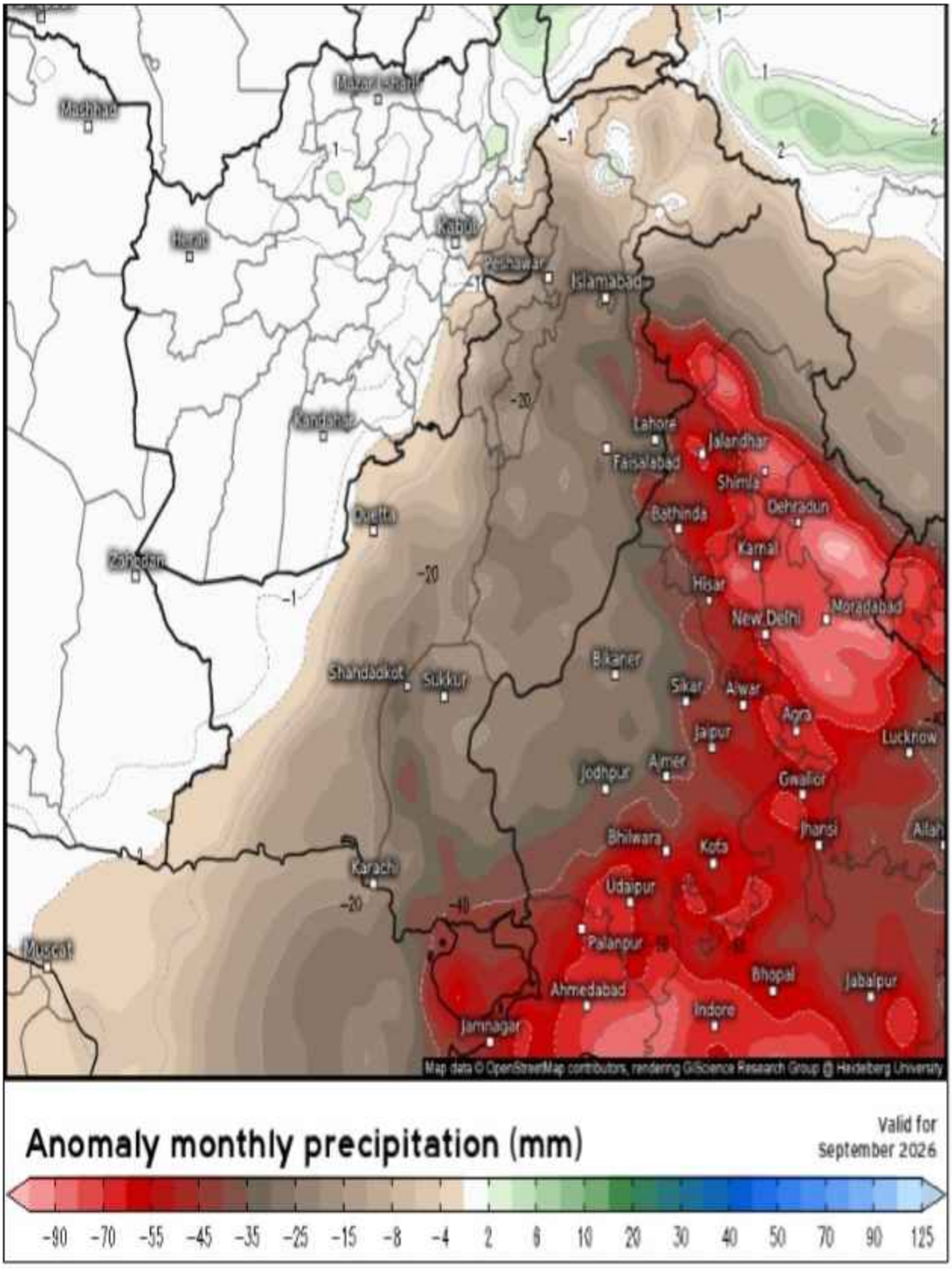


Figure 22 Monthly Precipitation Anomaly – September

20. **Historical September Temperature Pattern.** Historical September temperature patterns (2020–2025), Pakistan's temperature distribution generally reflects a gradual transition from peak summer toward post-monsoon moderation, although southern and central regions continue to experience persistent seasonal warmth. Sindh, southern Punjab, and Balochistan consistently record the highest temperatures, while upper Punjab, KP, GB, and AJK remain comparatively cooler due to higher elevation and lingering monsoon influence. Historical September temperatures indicate a stable thermal pattern, with warm conditions persisting over southern Pakistan and relatively milder temperatures across northern regions as seasonal cooling gradually begins. In contrast, September 2026 is anticipated to diverge from this historical pattern, with forecast signals indicating warmer-than-normal conditions across much of Pakistan, especially over Punjab, Sindh, and adjoining plains, while northern regions may remain comparatively less anomalous but still above seasonal norms.

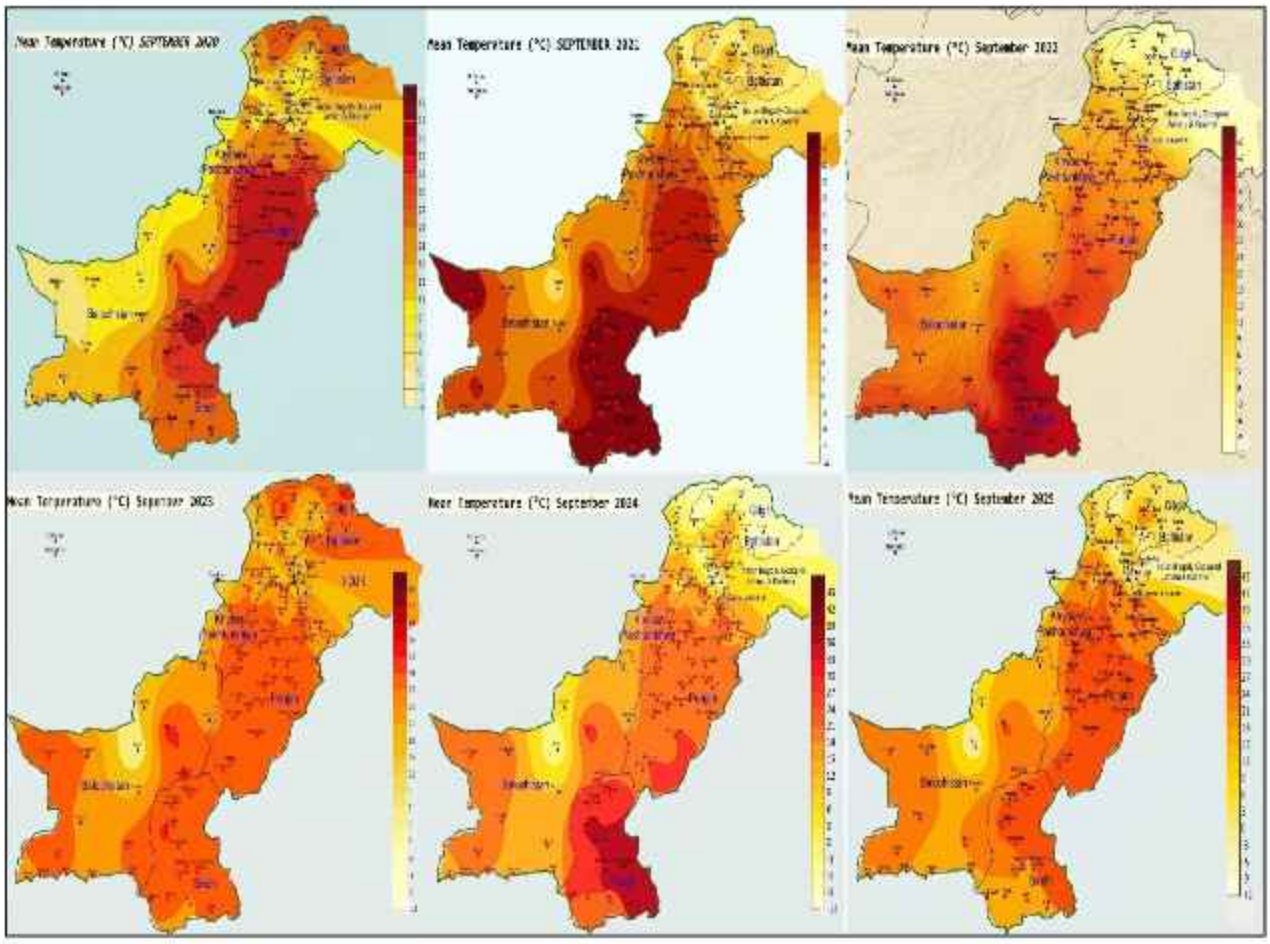


Figure 23 Year vise Temperature Trend of September from 2020 to 2025

Year vise Temperature Trend of September from 2020 to 2025

Year	Temperature Anomaly	Spatial Character	Thermal Pattern	Impacts
2021	Near Normal	Warm south, cooler north	Stable post-monsoon transition	Moderate heat stress; balanced seasonal cooling
2022	+0.5°C to +1.5°C *(above normal)*	Broad nationwide warmth	Warm and humid late monsoon conditions	Elevated humidity; slower seasonal cooling
2023	Slightly Above Normal	Persistent south–north gradient	Warm September with mild northern moderation	Extended warmth across plains
2024	Near Normal to Slightly Warm	Mixed regional warming	Moderated temperatures under monsoon influence	Stable thermal conditions
2025	Slightly Above Normal	Broadly warm	Persistent warmth with gradual cooling	Mild heat stress; stable transition
2026	Above normal	Strong warming in Punjab, Sindh & central Pakistan; milder above-normal in upper KP, GB & AJK.	Warmer-than-normal September with delayed cooling	Elevated heat stress, higher evapotranspiration, continued soil moisture decline, delayed seasonal cooling

21. **September 2026 Temperature Outlook – Pakistan.** In September 2026, temperatures across Pakistan are expected to remain predominantly above normal, extending warmer-than-usual conditions into the late monsoon and early post-monsoon transition period.

a. **Sindh**. Projected to remain above normal, with stronger warming likely over upper and central districts, while coastal areas may experience slightly moderated but still warm conditions.

b. **Punjab**. Likely to experience above-normal temperatures, particularly across central and southern districts, while northeastern Punjab may remain comparatively less intense but still warmer than historical norms.

c. **Balochistan.** Expected to remain above normal, particularly across eastern and southeastern districts, whereas western and higher-elevation regions may experience a comparatively weaker warming signal. Khyber Pakhtunkhwa (KP) is likely to remain above normal, with southern and central districts experiencing stronger warming, while upper KP and mountainous areas may observe comparatively milder but still warmer-than-normal conditions.

d. **Gilgit-Baltistan (GB)**. Expected to remain near normal to slightly above normal, with Gilgit, Skardu, Diamer, Ghanche, and adjoining valleys experiencing modest warming as seasonal cooling begins. Higher-altitude and glacier-fed regions, including Hunza and Ghizer, may remain closer to near-normal conditions, although warmer-than-usual temperatures are still likely overall under delayed seasonal cooling.

e. **Azad Jammu & Kashmir (AJK)**. Projected to remain slightly above normal, with Muzaffarabad, Bagh, Rawalakot, and Neelum Valley likely to experience continued warmer-than-usual conditions despite a gradual monsoon retreat. While mountainous terrain may moderate daytime heating in elevated areas, seasonal cooling is expected to remain delayed, favoring persistent warmth into the post-monsoon transition period.

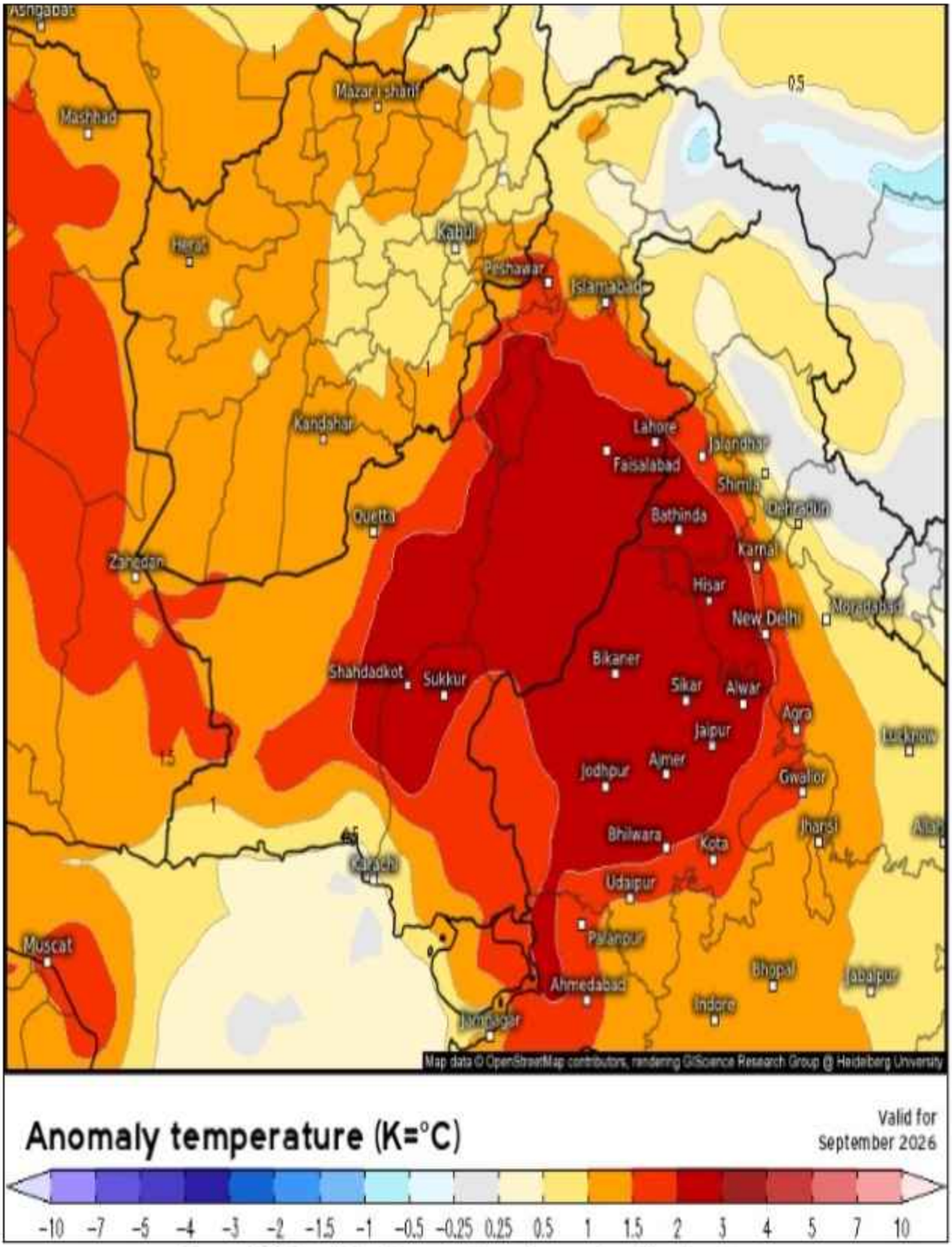


Figure 24 Monthly Temperature Anomaly – September

PROVINCE-WISE METEOROLOGICAL OUTLOOK

22. **Punjab – Temperature Outlook.** The seasonal outlook (July–August–September 2026) suggests that Punjab is likely to experience persistently above-normal temperatures throughout the monsoon season and post-monsoon transition period, with warming expected to become more widespread and pronounced from July into September under weaker rainfall conditions. During July, much of Punjab is projected to experience above-normal temperatures, with comparatively stronger warming over southern and western districts including Multan, Bahawalpur, Dera Ghazi Khan, Bhakkar, Layyah, and Rahim Yar Khan, where daytime heating is likely to remain elevated. Northern districts including Rawalpindi, Islamabad, Jhelum, Gujrat, and adjoining Pothohar region, may experience comparatively moderated warming due to occasional cloud cover and localized rainfall activity, though temperatures are still expected to remain warmer than seasonal norms overall.

a. During August, warming is expected to become more spatially widespread and persistent across Punjab, particularly over central and southern districts, including Lahore, Faisalabad, Sargodha, Multan, Bahawalpur, Muzaffargarh, and adjoining plains, where temperatures are likely to remain well above normal under weaker monsoon moderation. Northern and northeastern districts, including Rawalpindi Division, Gujrat, Sialkot, and adjoining upper Punjab, may continue to experience comparatively weaker warming due to localized rainfall activity, although temperatures are still projected to remain above normal overall. Urban centers and densely populated agricultural zones may experience warmer and more humid conditions, increasing thermal discomfort.

b. By September, temperatures are projected to remain above normal across much of Punjab, with central and southern districts retaining the strongest warming signal, while northern districts may experience comparatively weaker warming but delayed seasonal cooling. Southern agricultural districts and rain-fed regions are likely to continue experiencing warmer-than-normal conditions under reduced rainfall influence and earlier monsoon withdrawal tendencies.

23. Overall, the outlook indicates a persistent warming trend across Punjab through JAS (July–September) 2026, with likely implications including elevated heat stress, higher evapotranspiration, increased irrigation demand, delayed seasonal cooling, and continued soil moisture depletion, particularly across rain-fed areas, central agricultural belts, and southern Punjab.

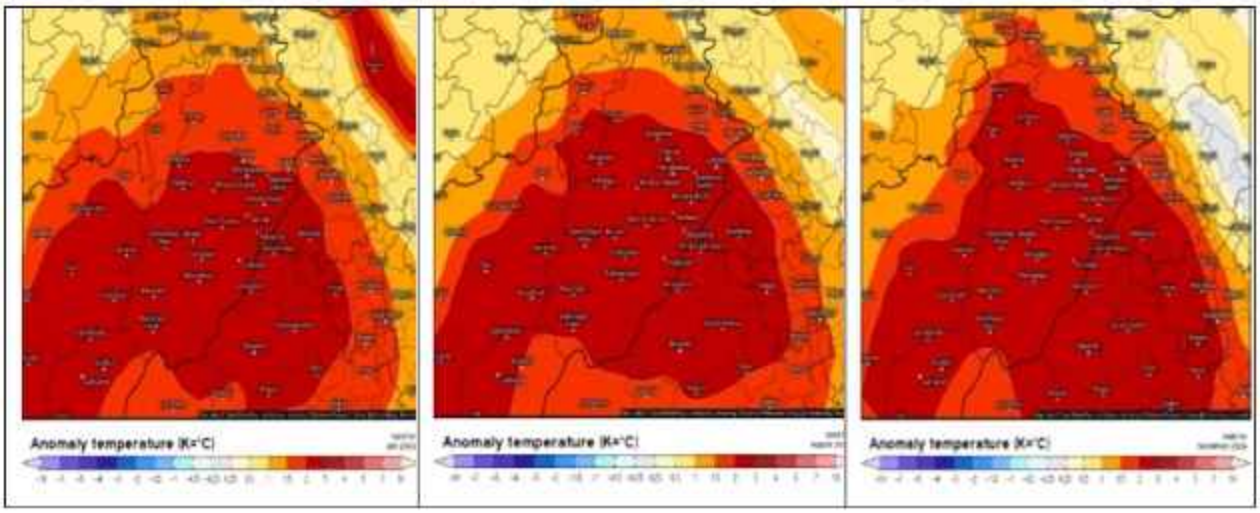


Figure 25 Punjab Monthly Temperature Anomaly JAS 2026

24. **Punjab – Precipitation Outlook.** The seasonal outlook (July–August–September 2026) suggests that Punjab is likely to experience predominantly below-normal precipitation throughout the monsoon season, with rainfall deficits expected to become more widespread and pronounced from July into September, reflecting a weaker and spatially inconsistent monsoon signal.

a. During July, much of Punjab is projected to experience below-normal rainfall, with comparatively stronger rainfall suppression over northeastern districts, including Rawalpindi, Islamabad, Jhelum, Gujrat, Sialkot, Narowal, and the adjoining Pothohar region, where monsoon incursions are expected to remain inconsistent.

b. Central Punjab, including Lahore, Faisalabad, Sargodha, Hafizabad, and adjoining districts, is also likely to experience reduced rainfall activity, although rainfall may continue through short-duration and episodic monsoon spells rather than sustained wet conditions.

c. Southern Punjab, including Multan, Bahawalpur, Dera Ghazi Khan, Muzaffargarh, and Rahim Yar Khan, is expected to remain relatively drier than normal, with prolonged dry intervals becoming increasingly common.

d. During August, despite being the climatological peak monsoon month, precipitation is expected to remain below normal across much of Punjab, particularly over northeastern and eastern districts including Rawalpindi Division, Gujrat, Sialkot, Narowal, Lahore, Kasur, and adjoining areas, where rainfall activity may remain weaker than climatological expectations. Central and southern Punjab are also likely to experience persistent below-normal rainfall, although episodic monsoon incursions and localized rainfall spells may still occur, particularly over districts adjoining eastern Punjab and the Pothohar region. However, sustained widespread monsoon activity appears unlikely across the province.

e. By September, precipitation is projected to remain below normal across much of Punjab, although rainfall deficits may weaken slightly as the monsoon gradually retreats. Northern and northeastern districts may continue to experience localized rainfall activity, while central and southern Punjab are likely to observe longer dry intervals, weaker rainfall persistence, and reduced soil moisture replenishment under an earlier seasonal withdrawal tendency.

25. Overall, the outlook indicates a persistently drier-than-normal JAS (July–September) period across Punjab, with likely implications including reduced soil moisture recharge, elevated irrigation demand, moisture stress in rain-fed areas, and increasing dependence on episodic rainfall events rather than sustained monsoon activity, particularly across Pothohar, northeastern Punjab, and southern agricultural districts.

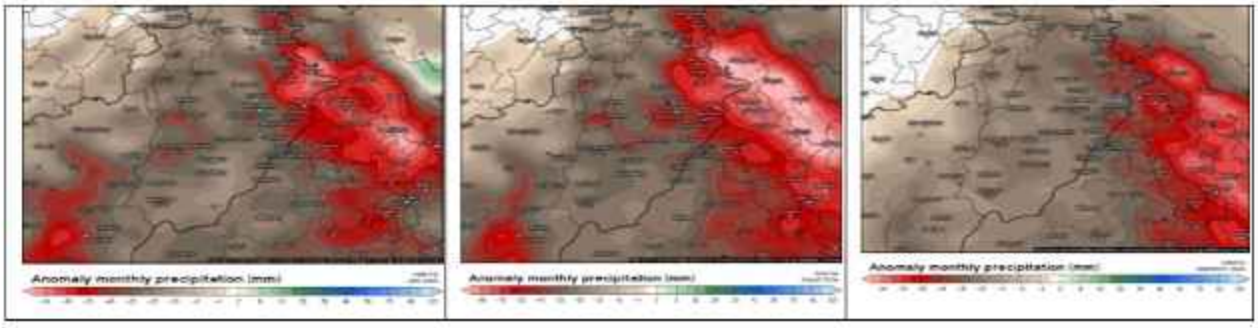


Figure 26 Punjab Monthly Precipitation Anomaly JAS 2026

26. **Sindh - Temperature Outlook.** The seasonal outlook (July–August–September 2026) suggests that Sindh is likely to experience persistently above-normal temperatures throughout the monsoon season, with strong and sustained warming signals across much of the province, particularly over upper and central Sindh, while coastal districts may experience comparatively moderated conditions due to maritime influence. During July, temperatures across much of Sindh are projected to remain above normal, with the strongest warming expected over upper Sindh districts including Jacobabad, Shikarpur, Larkana, Sukkur, Kashmore, and adjoining areas, where daytime heat is likely to remain elevated. Southern coastal districts such as Karachi, Thatta, Badin, and coastal belts may experience comparatively weaker warming because of sea-breeze moderation, though temperatures are still expected to remain warmer than normal overall. Central Sindh, including Hyderabad, Mirpurkhas, and Shaheed Benazirabad, is also likely to remain above seasonal norms, contributing to warmer and more humid conditions.

a. During August, warming is expected to become more spatially widespread and persistent across Sindh, with upper and northwestern districts, particularly Jacobabad, Larkana, Khairpur, Sukkur, and adjoining areas, continuing to experience the strongest warm signal. Central and southeastern Sindh, including Hyderabad, Mirpurkhas, Umerkot, and adjoining districts, are also expected to remain well above normal, although Karachi and coastal districts may experience comparatively moderated temperatures because of maritime influence. The combination of weaker monsoon moderation and elevated humidity is likely to enhance thermal discomfort and heat stress across urban and agricultural regions.

b. By September, temperatures are projected to remain above normal across most of Sindh, with upper and central districts retaining the strongest warming signal, while Karachi, Thatta, Badin, and coastal areas may observe comparatively weaker warming but delayed seasonal cooling. Northern Sindh, particularly the Jacobabad–Larkana–Sukkur belt, is expected to continue experiencing the strongest warming, whereas southern Sindh is likely to remain warm and humid under lingering post-monsoon conditions.

27. Overall, the outlook indicates a persistent warming trend across Sindh through JAS (July–September) 2026, with likely implications including elevated heat stress, increased

evapotranspiration, higher water demand, delayed cooling, and continued thermal pressure on agriculture and urban populations, particularly across upper and central Sindh.

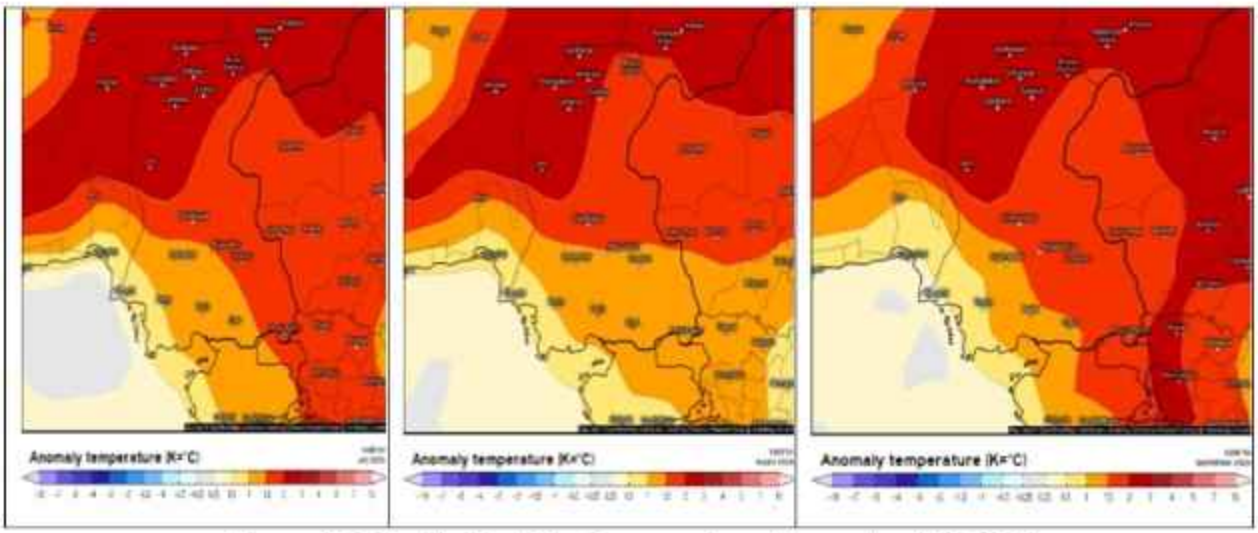


Figure 27 Sindh Monthly Temperature Anomaly JAS 2026

28. **Sindh - Precipitation Outlook.** The seasonal outlook (July–August–September 2026) suggests that Sindh is likely to experience predominantly below-normal precipitation throughout the monsoon season, with rainfall deficits expected to remain spatially uneven and become more pronounced during August before easing slightly into September. During July, much of Sindh is projected to experience below-normal rainfall, with comparatively drier conditions concentrated over upper and western Sindh, including Jacobabad, Shikarpur, Larkana, Sukkur, Kashmore, and adjoining districts, where monsoon penetration is expected to remain weak and inconsistent. Karachi, Hyderabad, Thatta, Badin, and southeastern coastal districts may experience comparatively better but still slightly below-normal rainfall conditions, with rainfall likely to occur through localized and episodic monsoon spells rather than sustained wet periods.

a. During August, despite being the climatological peak monsoon month, precipitation is expected to remain below normal across much of Sindh, particularly over southern and coastal districts including Karachi, Thatta, Badin, Hyderabad, Mirpurkhas, and lower Sindh, where weaker monsoon influence may result in reduced rainfall frequency and longer dry intervals. Upper Sindh, including the Jacobabad–Larkana–Sukkur belt, is also likely to remain drier than normal, although localized rainfall activity may still occur

during episodic monsoon incursions, particularly in eastern districts adjoining India.

b. By September, precipitation is projected to remain slightly below normal to below normal across much of Sindh, although rainfall deficits may ease somewhat as the monsoon gradually retreats. Coastal and southeastern districts, including Karachi, Thatta, Badin, and Tharparkar, may continue to receive isolated rainfall activity, though overall monsoon rainfall is expected to remain weaker than historical September conditions, particularly across central and upper Sindh, where longer dry intervals are likely to persist.

29. Overall, the outlook indicates a predominantly drier-than-normal JAS (July–September) period across Sindh, with likely implications including reduced soil moisture recharge, increasing irrigation demand, prolonged dry intervals, and greater dependence on short-duration rainfall episodes rather than sustained monsoon activity, particularly across agricultural and water-stressed regions of upper and central Sindh.

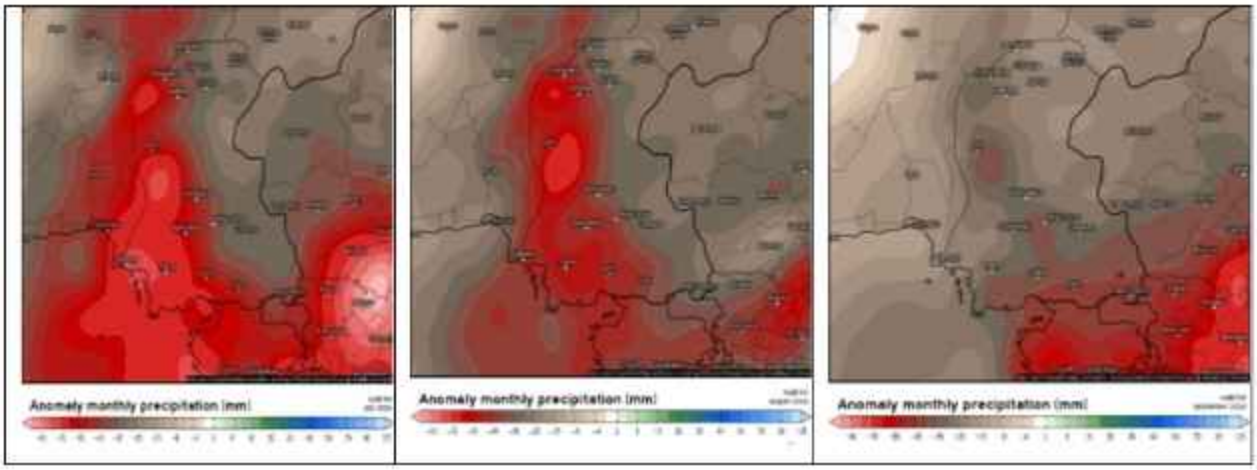


Figure 28 Sindh Monthly Precipitation Anomaly JAS 2026

30. **Khyber Pakhtunkhwa (KPK) - Temperature Outlook.** The seasonal outlook (July–August–September 2026) suggests that Khyber Pakhtunkhwa (KP) is likely to experience above-normal temperatures throughout the monsoon season, although the warming signal is expected to remain spatially uneven between northern mountainous districts and southern plains. During July, temperatures across much of KP are projected to remain above normal, with comparatively stronger warming over southern districts including Dera Ismail Khan, Tank, Bannu, Lakki Marwat, and adjoining plains, where daytime heating is likely to remain elevated. Upper KP, including Swat, Chitral, Dir,

Abbottabad, Mansehra, and Hazara Division, may experience comparatively weaker warming due to elevation and localized cloud cover, though temperatures are still expected to remain slightly above seasonal norms overall. Peshawar Valley, Kohat, and Mardan divisions are also likely to remain warmer than normal, particularly during daytime hours.

a. During August, warming is expected to become more widespread and persistent across KP, particularly over southern and central districts including Dera Ismail Khan, Tank, Bannu, Kohat, Karak, Lakki Marwat, and adjoining lower valleys, where temperatures are likely to remain well above normal. Northern mountainous districts, including Chitral, Swat, Dir, Abbottabad, Mansehra, and upper Hazara, may continue to experience comparatively moderated conditions because of elevation and intermittent cloud cover, though temperatures are still projected to remain above normal overall. Peshawar, Nowshera, Mardan, and Charsadda divisions may experience persistently warm and humid conditions under weaker monsoon moderation.

b. By September, temperatures are projected to remain above normal across much of KP, with southern and central districts retaining the strongest warming signal, while northern mountainous districts may experience comparatively weaker warming but delayed seasonal cooling. Upper KP may gradually begin transitioning toward more seasonal conditions, though southern plains and central valleys are likely to continue experiencing warmer-than-normal conditions under reduced rainfall influence and earlier monsoon withdrawal tendencies.

31. Overall, the outlook indicates a persistent warming trend across KP through JAS (July–September) 2026, with likely implications including elevated heat stress, increased evapotranspiration, higher water demand, delayed seasonal cooling, and increasing pressure on agriculture and water resources, particularly across southern KP and lower valley regions.

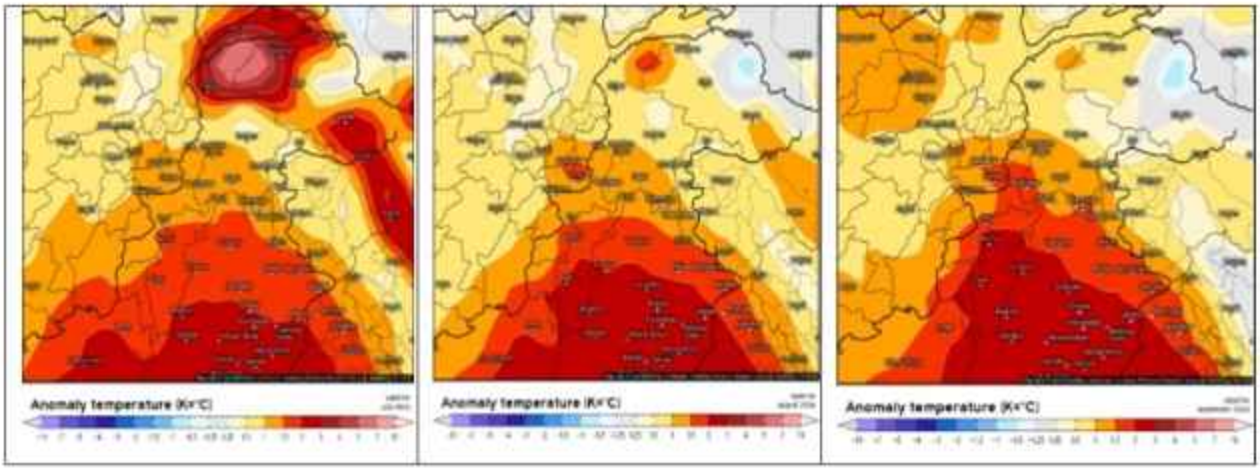


Figure 29 KPK Monthly Temperature Anomaly JAS 2026

32. **Khyber Pakhtunkhwa (KPK) - Precipitation Outlook**. The seasonal outlook (July–August–September 2026) suggests that Khyber Pakhtunkhwa (KP) is likely to experience predominantly below-normal precipitation throughout much of the monsoon season, although rainfall conditions are expected to remain spatially uneven between northern mountainous districts and southern plains. During July, much of KP is projected to experience slightly below-normal to near-normal rainfall, with southern districts including Dera Ismail Khan, Tank, Bannu, Lakki Marwat, and adjoining plains expected to remain comparatively drier under weaker monsoon penetration. However, upper and northern districts including Swat, Chitral, Upper and Lower Dir, Abbottabad, Mansehra, and parts of Hazara Division may continue to receive localized near-normal rainfall activity due to terrain-induced uplift and localized monsoon incursions. Peshawar Valley and central districts, including Peshawar, Mardan, Nowshera, and Kohat, may experience episodic rainfall spells, though rainfall is likely to remain inconsistent and interrupted by dry intervals.

a. During August, despite being the climatological peak monsoon month, precipitation is expected to remain below normal across much of KP, particularly over southern and central districts including Dera Ismail Khan, Tank, Bannu, Kohat, Karak, Lakki Marwat, and adjoining lower valleys, where prolonged dry intervals are likely to persist. Northern and upper KP, including Swat, Chitral, Dir, Kohistan, Abbottabad, and Mansehra, may continue to receive localized rainfall activity, although rainfall is expected to remain weaker and more spatially inconsistent than wetter historical

monsoon years. Peshawar, Mardan, Charsadda, Nowshera, and Kohat divisions may observe intermittent rainfall events, but sustained widespread monsoon activity appears unlikely.

b. By September, precipitation is projected to remain below normal across much of KP, although rainfall deficits may weaken slightly as the monsoon gradually retreats. Northern mountainous districts may continue to receive isolated rainfall activity, while southern and central districts, particularly Dera Ismail Khan, Tank, Bannu, Lakki Marwat, and adjoining regions, are likely to experience reduced rainfall and earlier seasonal drying. Lower valleys and central KP may remain comparatively drier under a weaker late-season monsoon signal.

33. Overall, the outlook indicates a generally drier-than-normal JAS (July–September) period across KP, with likely implications including reduced soil moisture recharge, prolonged dry intervals, increasing irrigation and water demand in southern districts, and greater dependence on localized rainfall events rather than sustained monsoon activity, particularly across southern and lower valley regions.

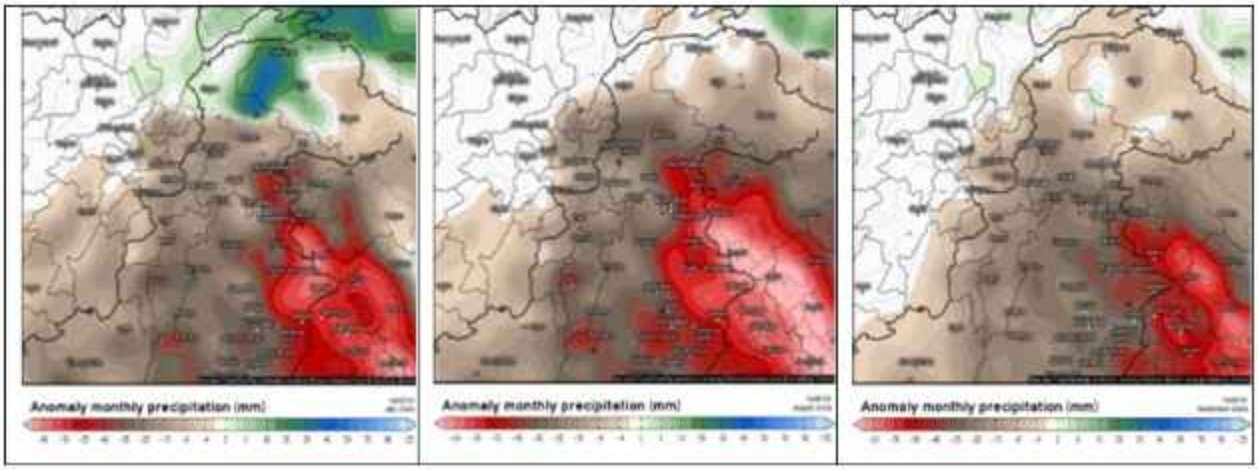


Figure 30 KPK Monthly Precipitation Anomaly JAS 2026

34. **Balochistan - Temperature Outlook.** The seasonal outlook (July–August–September 2026) suggests that Balochistan is likely to experience above-normal temperatures throughout the monsoon season, with warming expected to remain stronger over eastern, southeastern, and southern districts, while western and northwestern highlands may observe comparatively weaker warming. During July, temperatures across much of the province are projected to remain above normal, particularly over eastern districts including Zhob, Barkhan, Musakhel, Sibi, Dera Bugti, and adjoining areas, where

daytime heating is likely to remain elevated. Central districts including Khuzdar, Kalat, and surrounding highlands are also expected to remain warmer than normal, while southern coastal districts such as Gwadar, Pasni, Ormara, Turbat, and coastal Makran may experience comparatively weaker warming because of maritime influence and occasional sea breeze moderation.

a. During August, warming is projected to become more spatially widespread and persistent across Balochistan, particularly over eastern and southeastern districts including Sibi, Zhob, Barkhan, Khuzdar, Lasbela, and adjoining plains, where above-normal temperatures are likely to intensify further. Southern Makran division (Turbat, Panjgur, Gwadar) is also expected to remain warmer than normal, although coastal areas may continue to experience relatively moderated conditions compared with inland districts. Quetta Valley and northern highlands may observe comparatively weaker warming due to elevation and intermittent cloud cover but are still likely to remain above seasonal norms overall.

b. By September, temperatures are projected to remain above normal across most of Balochistan, with persistent warming over eastern, southeastern, and southern districts, while western and central highland regions may experience comparatively weaker but still noticeable warming under delayed seasonal cooling. The Sibi–Zhob belt and districts adjoining Punjab and Sindh are likely to retain the strongest warm signal, whereas coastal areas may gradually transition toward more seasonally moderated conditions.

35. Overall, the outlook indicates a persistent warming trend across Balochistan through JAS (July–September) 2026, with likely implications including elevated heat stress, increased evapotranspiration, higher water demand, accelerated soil moisture loss, and growing pressure on agriculture and water resources, particularly across eastern and southeastern Balochistan.

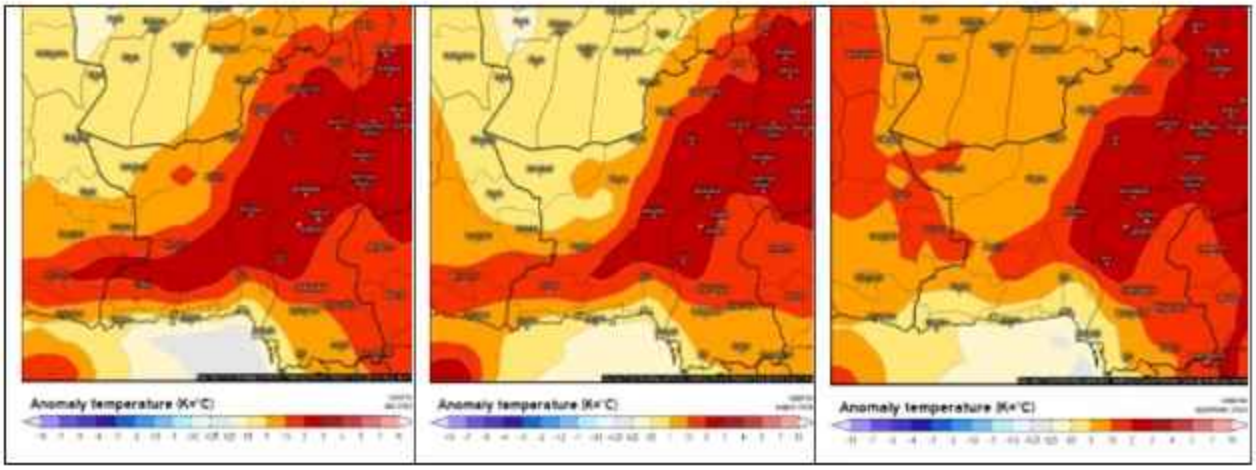


Figure 31 Balochistan Monthly Temperature Anomaly JAS 2026

36. **Balochistan - Precipitation Outlook.** The seasonal outlook (July–August–September 2026) suggests that Balochistan is likely to experience predominantly below-normal precipitation throughout the monsoon season, although rainfall conditions are expected to remain spatially uneven between eastern districts, central highlands, and coastal regions. During July, much of the province is projected to remain below normal, particularly across eastern and southeastern districts including Sibi, Zhob, Barkhan, Musakhel, Khuzdar, and adjoining areas, where monsoon penetration is expected to remain weak and inconsistent. Central Balochistan including Quetta Valley and surrounding highlands is also likely to experience slightly below-normal rainfall, while coastal and southwestern districts including Gwadar, Pasni, Ormara, Turbat, and parts of Makran may remain closer to near-normal conditions, though still with limited rainfall activity.

a. During August, despite being the climatological peak monsoon period, precipitation is expected to remain below normal across much of Balochistan, particularly over eastern and southeastern districts, including Sibi, Zhob, Barkhan, Khuzdar, Lasbela, and adjoining belts, where dry conditions are likely to persist. Central and western Balochistan may continue to receive limited and fragmented rainfall, while coastal Makran districts could experience isolated rainfall episodes, though overall monsoon activity is expected to remain weak and spatially inconsistent.

b. By September, precipitation is projected to remain below normal across most of Balochistan, although rainfall deficits may weaken slightly as the

monsoon gradually retreats. Eastern districts adjoining Punjab and Sindh are still likely to experience reduced rainfall activity and longer dry intervals, while western and southwestern regions may remain comparatively drier with minimal seasonal recovery. Coastal districts could still receive occasional rainfall episodes, but overall precipitation is expected to stay below historical September conditions.

37. Overall, the outlook indicates a predominantly drier-than-normal JAS (July–September) period across Balochistan, with likely implications including reduced soil moisture recharge, increasing water stress, prolonged dry intervals, greater dependence on groundwater resources, and continued pressure on rain-fed agriculture, particularly across eastern and southeastern districts.

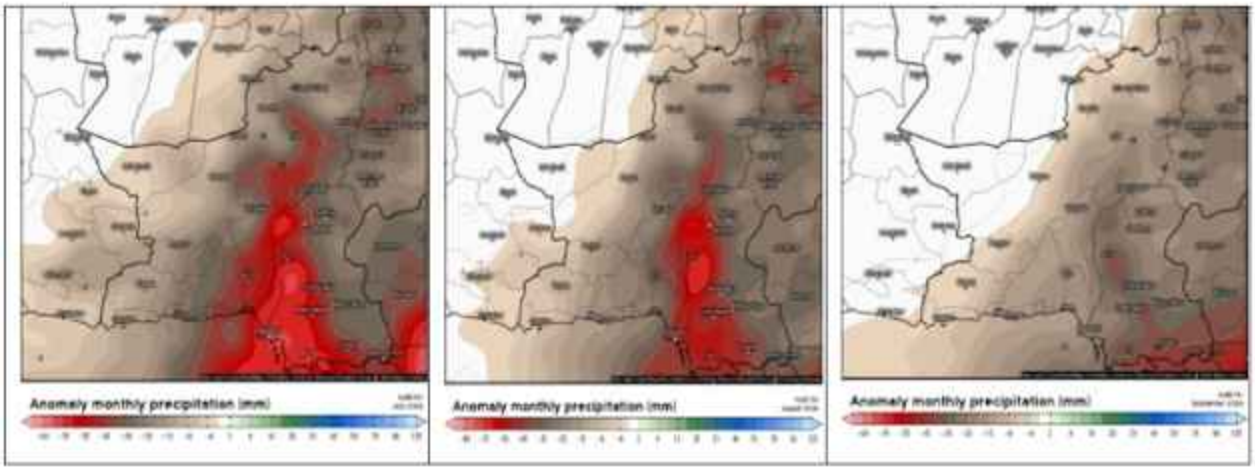


Figure 32 Balochistan Monthly Precipitation Anomaly JAS 2026

38. **Gilgit-Baltistan (GB) - Temperature Outlook.** The seasonal outlook (July–August–September 2026) suggests that Gilgit-Baltistan (GB) is likely to experience above-normal temperatures through most of the season, with the strongest warming developing in September. During July, temperatures across much of GB are projected to remain near-normal to slightly above normal, particularly around Gilgit, Skardu, Khaplu, Chilas, and Gorkot, while some high-elevation eastern and northeastern areas may remain closer to normal because of altitude and localized cloud cover. Overall, July shows only modest warming across GB, with no widespread extreme temperature signal.

a. During August, temperatures are expected to become more clearly above normal across GB, especially over western and central districts including Ghizer, Hunza, Gilgit, Chilas, Skardu, and Khaplu. Some higher-elevation

areas may still remain relatively moderated, but the broader GB signal indicates warmer-than-normal daytime conditions and reduced seasonal cooling compared to climatology. Overall, August shows a stronger warming pattern than July, though still spatially variable across valleys and mountain zones.

b. By September, temperatures are projected to become significantly above normal across much of GB, with the strongest warming over Ghizer, Hunza, Gilgit, Chilas, Skardu, Khaplu, and adjoining glacier-fed valleys. High-altitude regions and upper mountain belts also show a clear warm signal, suggesting delayed seasonal cooling during the post-monsoon transition. Overall, the outlook indicates progressive warming across GB from July to September, with likely impacts including enhanced glacier and snowmelt, increased runoff variability, delayed autumn cooling, and added pressure on fragile mountain ecosystems and water resources.

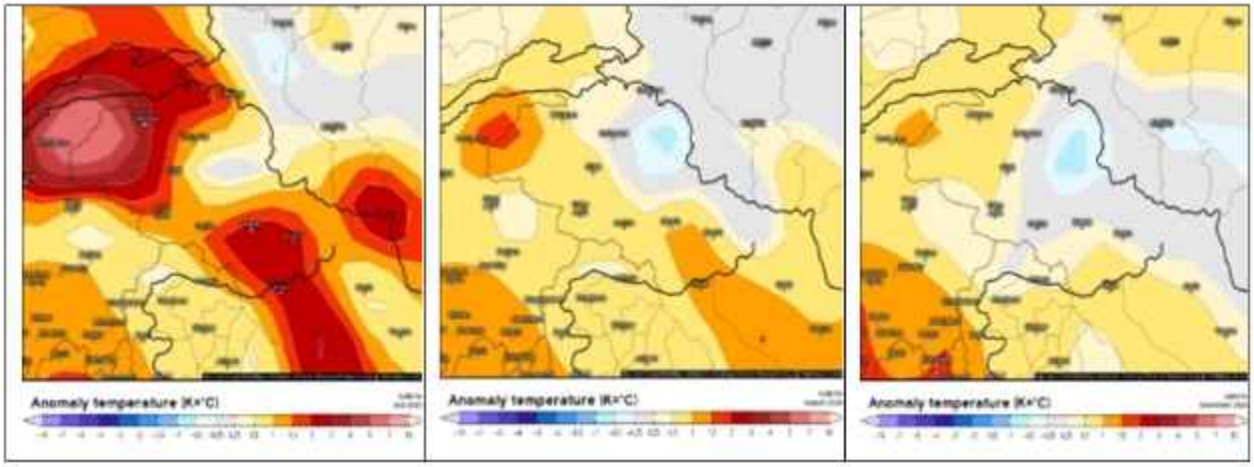


Figure 33 GB Monthly Temperature Anomaly JAS 2026

39. **Gilgit-Baltistan (GB) - Precipitation Outlook.** The seasonal outlook (July–August–September 2026) suggests that Gilgit-Baltistan (GB) is likely to experience spatially variable precipitation conditions, with July emerging as the most favorable moisture month, followed by comparatively drier and more uneven conditions during August and September. During July, much of GB is projected to experience near-normal to slightly above-normal precipitation, particularly across Ghizer, Ishkoman, Hunza, upper Gilgit, and surrounding high-altitude catchments, where terrain-induced uplift and episodic monsoon incursions may enhance rainfall activity. Gilgit, Skardu, Gorkot, and adjoining

glacier-fed basins are also likely to receive near-normal to modestly improved rainfall conditions, supporting streamflow and catchment recharge. However, localized valleys around Diamer–Chilas may remain closer to normal or slightly drier due to topographic rain-shadow influences. Overall, July is expected to be comparatively wetter and hydrologically favorable for GB, with improved moisture availability and episodic mountain rainfall activity.

a. During August, precipitation is projected to become more mixed and spatially inconsistent across GB, with near-normal to slightly below-normal conditions dominating much of Gilgit, Diamer, Chilas, upper Indus valleys, and parts of Skardu, reflecting weaker monsoon penetration into the northern mountains. However, isolated western and northwestern mountainous areas, particularly around Ishkoman and Ghizer, may continue to observe localized near-normal rainfall activity, supported by short-duration convective events and orographic uplift. While widespread rainfall is not strongly favored, episodic localized rainfall spells may still occur over elevated terrain, particularly across glacier-fed catchments.

b. By September, precipitation is expected to remain slightly below normal to near normal across much of GB as monsoon influence gradually retreats and moisture transport weakens further. Gilgit, Diamer, Chilas, Skardu, Khaplu, and adjoining glacier-fed valleys are likely to experience reduced rainfall activity and longer dry intervals, although isolated mountainous pockets, particularly in western GB, may occasionally receive localized rainfall due to terrain effects.

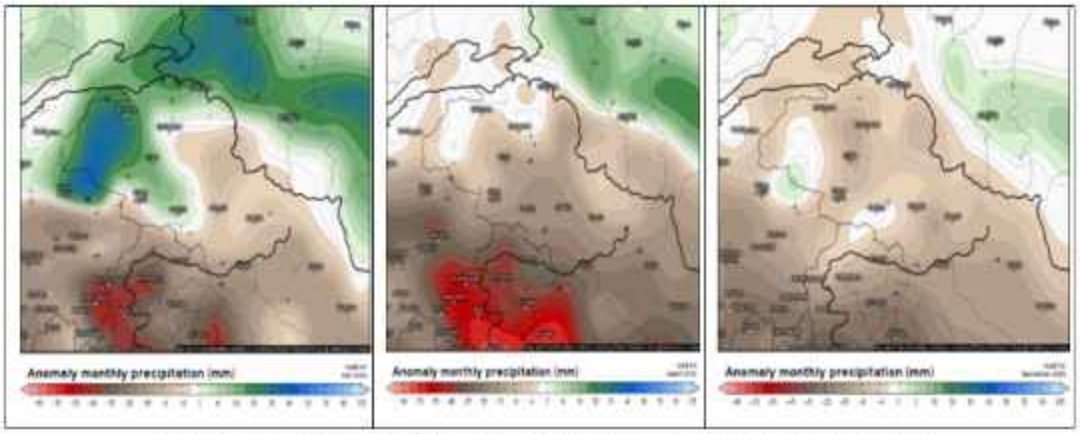


Figure 34 GB Monthly Precipitation Anomaly JAS 2026

40. Overall, the outlook indicates a hydrologically favorable July followed by progressively drier and more spatially variable conditions during August and September, suggesting reduced late-season moisture availability across much of Gilgit-Baltistan.

41. **Azad Jammu & Kashmir (AJK) - Temperature Outlook.** The seasonal outlook (July–August–September 2026) suggests that Azad Jammu & Kashmir (AJK) is likely to experience generally above-normal temperature conditions throughout the season, with August emerging as the warmest month and persistent warmth continuing into September. During July, much of AJK is projected to experience above-normal temperatures, particularly across Muzaffarabad, Bagh, Rawalakot, Kotli, Mirpur, Bhimber, and adjoining valleys, reflecting broader regional warming under weaker monsoon conditions. Higher-elevation areas, including Neelum Valley and elevated mountainous terrain, are expected to remain comparatively milder but still warmer than climatological normal. Overall, July indicates warmer-than-normal conditions across most of AJK, though mountainous terrain may slightly moderate daytime heat.

a. During August, temperatures are projected to become more elevated across AJK, with above-normal to significantly above-normal warmth dominating much of the region, particularly across Muzaffarabad, Bagh, Rawalakot, Kotli, Mirpur, Bhimber, and surrounding valleys. The persistence of weaker monsoon activity and reduced cloud cover may enhance daytime heating, while higher elevations may remain comparatively cooler but still warmer than normal. Overall, August is expected to be the warmest month of the season, with elevated heat stress and warmer daytime conditions across lower valleys and populated areas.

b. By September, temperatures are expected to remain slightly above normal to above normal across much of AJK, although some moderation compared to August may occur as seasonal transition begins. Muzaffarabad, Bagh, Rawalakot, Kotli, and Mirpur are likely to continue experiencing warmer-than-normal conditions, while elevated mountainous terrain may observe relatively milder temperatures.

42. Overall, the outlook indicates a consistently warm JAS (July–September) temperature pattern across AJK, with August likely to show the strongest warming, followed by persistent but slightly moderated warmth into September, reflecting weaker monsoon moderation and prolonged seasonal heat.

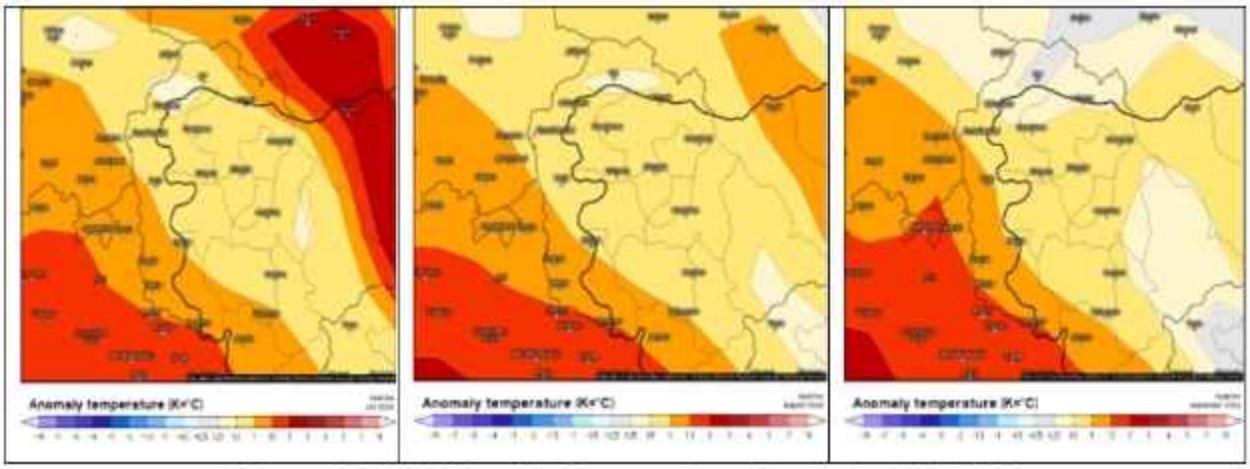


Figure 35 AJK Monthly Temperature Anomaly JAS 2026

43. **Azad Jammu & Kashmir (AJK) – Precipitation Outlook.** The seasonal outlook (July-August-September 2026) suggests that Azad Jammu & Kashmir (AJK) is likely to experience generally below-normal precipitation conditions throughout the monsoon season, with rainfall remaining spatially variable across mountainous terrain and August emerging as the comparatively driest month. During July, much of AJK is projected to experience slightly below-normal precipitation, particularly across Muzaffarabad, Bagh, Neelum Valley, Rawalakot, Kotli, and adjoining mountainous catchments, reflecting weaker monsoon penetration into the region. Southern districts including Mirpur and Bhimber may experience comparatively drier conditions, although isolated elevated terrain may still receive episodic rainfall activity due to topographic uplift. Overall, July is expected to remain weaker than climatological normal, though short-duration rainfall spells may still occur over higher elevations.

a. During August, precipitation is projected to become more suppressed across much of AJK, with below-normal conditions dominating the region, particularly across Bagh, Rawalakot, Muzaffarabad, Kotli, Mirpur, Bhimber, and adjoining valleys, indicating a comparatively weaker monsoon signal during the climatological peak rainfall month. Although isolated mountainous areas may occasionally observe localized rainfall enhancement, the broader regional signal favors reduced rainfall frequency, longer dry intervals, and

weaker sustained monsoon activity, particularly over southern and central AJK.

b. By September, precipitation is expected to remain slightly below normal to below normal across much of AJK as monsoon influence gradually retreats and moisture transport weakens further. Muzaffarabad, Bagh, Neelum Valley, Rawalakot, Kotli, and Mirpur are likely to experience continued reduced rainfall activity and longer dry intervals, although localized topographic rainfall may still occur over elevated terrain.

44. Overall, the outlook indicates a consistently weaker-than-normal JAS (July–September) precipitation pattern across AJK, with August likely to show the strongest suppression, followed by persistent but slightly moderated dryness into September, reflecting reduced monsoon persistence and increasingly uneven rainfall distribution across the region.

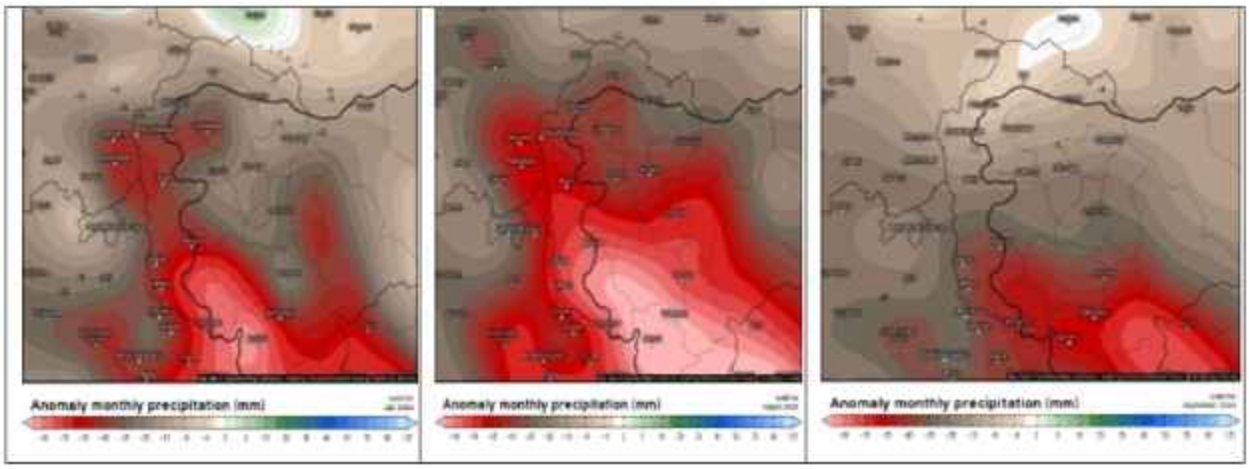


Figure 36 AJK Monthly Precipitation Anomaly JAS 2026

FLOODS

1. **Historical context of Flooding in Pakistan.** Historical flood events demonstrate that July to September is the most critical flood period in Pakistan. The catastrophic floods of 2010 primarily affected Khyber Pakhtunkhwa (KP), Punjab, Sindh, Balochistan, Gilgit-Baltistan (GB), and Azad Jammu & Kashmir (AJK) through widespread riverine flooding across the Indus Basin. Similarly, the 2022 floods severely impacted Sindh, Balochistan, southern Punjab, KP, GB, and AJK due to persistent monsoon rainfall and flash flooding. During 2024, heavy monsoon rains triggered flash floods and localized flooding in KP, GB, Balochistan, and Sindh, while the 2025 monsoon season produced significant flood impacts across Punjab, KP, GB, AJK, Sindh, and Balochistan, including riverine floods, flash floods, urban flooding, and GLOF-related events. These historical events highlight the recurring vulnerability of the Indus River System, northern mountainous catchments, hill torrent regions, and major urban centers during the peak monsoon months of July, August, and September.

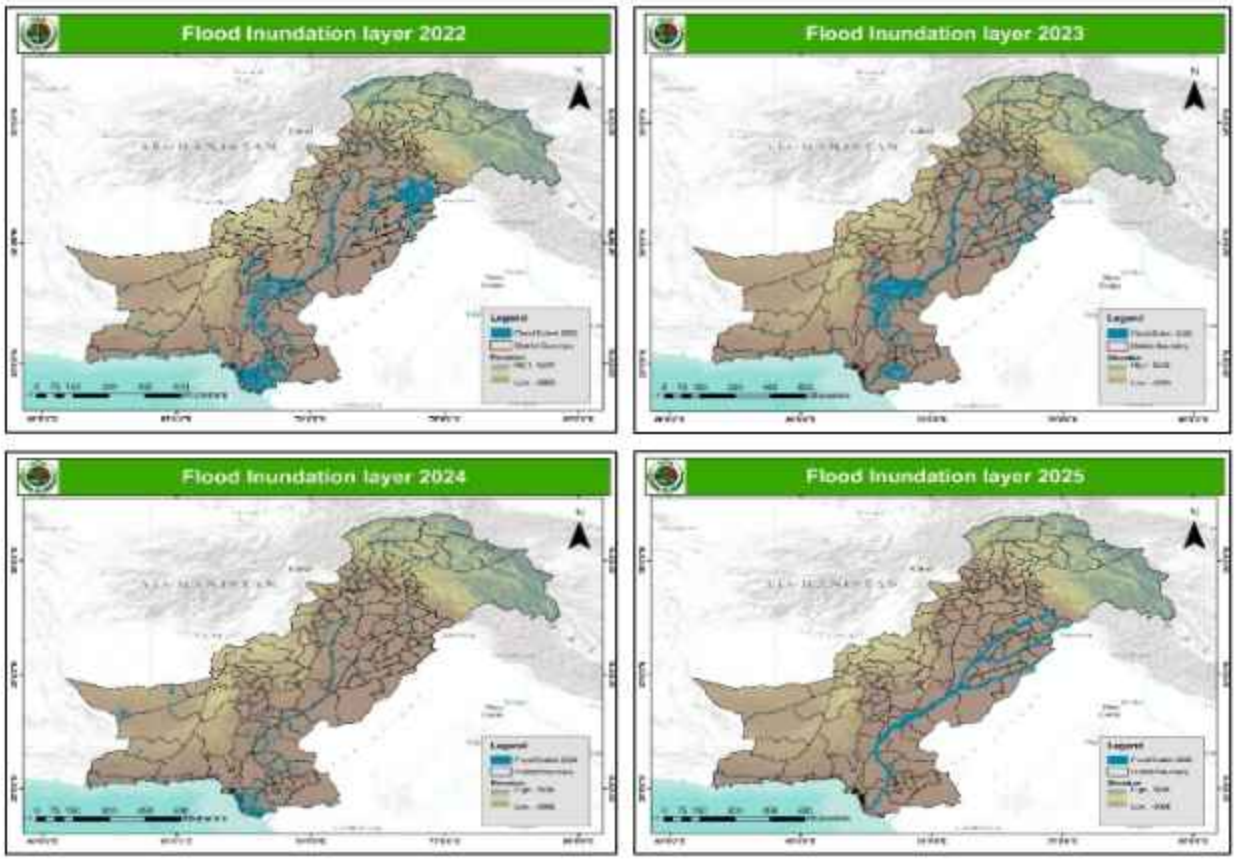


Figure 37 Historical Flooding Extents of Pakistan for 2022, 2023, 2024 & 2025

a. **July 2026.** The hydrological outlook for July 2026 indicates a moderate to high flood hazard potential across northern and western river catchments, with localized very high risk in steep catchments where monsoon rainfall, snowmelt, glacier melt, and reservoir releases may combine. Although the precipitation anomaly map suggests suppressed or below-normal rainfall over large parts of southern, central, and western Pakistan, the monsoon signal remains more active over the northern and upper catchment zones. This matches the broader seasonal outlook, where rainfall is expected to stay uneven but focused over northern Pakistan and adjoining upper catchments, while plains and southern areas remain hotter and comparatively drier.

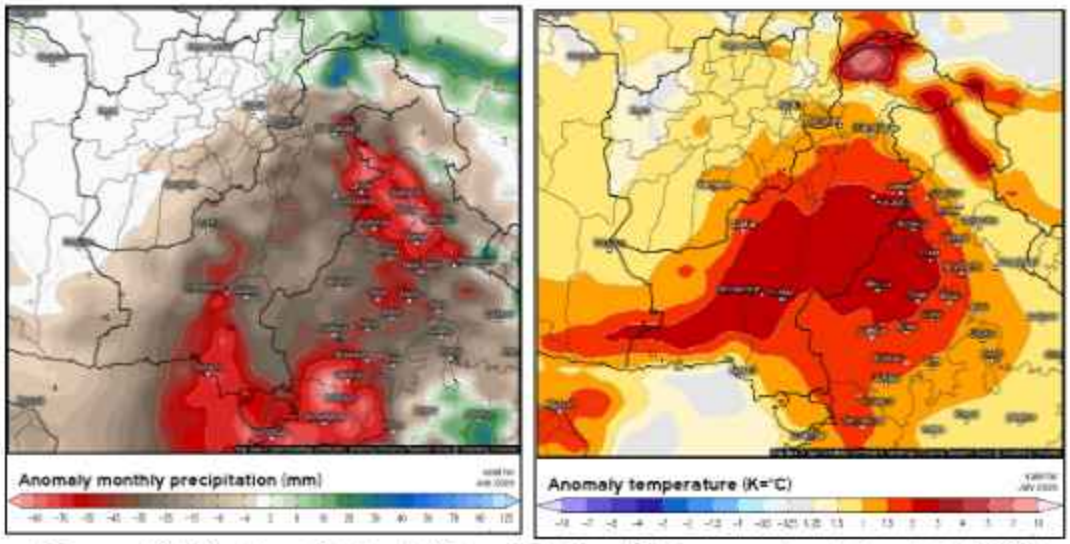


Figure 38 Weather Outlook (Precipitation & Temperature) for July 2026

2. **Hydrological Risk in Northern Pakistan.** The highest compound hydrological risk is expected across GB, Upper KP, AJK, and Upper Indus catchments, where rainfall bursts may overlap with high temperatures, glacial melt, unstable slopes, and saturated mountain terrain. Priority watch areas include Gilgit, Hunza, Gupis-Yasin, Nagar, Astore, Skardu, Ghanche, Shigar, Chitral, Swat, Kohistan, Buner, Bajaur, Dir, Neelum Basin, Jhelum Basin, and Kunhar Basin. These zones remain vulnerable to flash floods, GLOFs, debris flows, landslides, and sudden streamflow surges, especially in narrow valleys and along mountain road corridors.

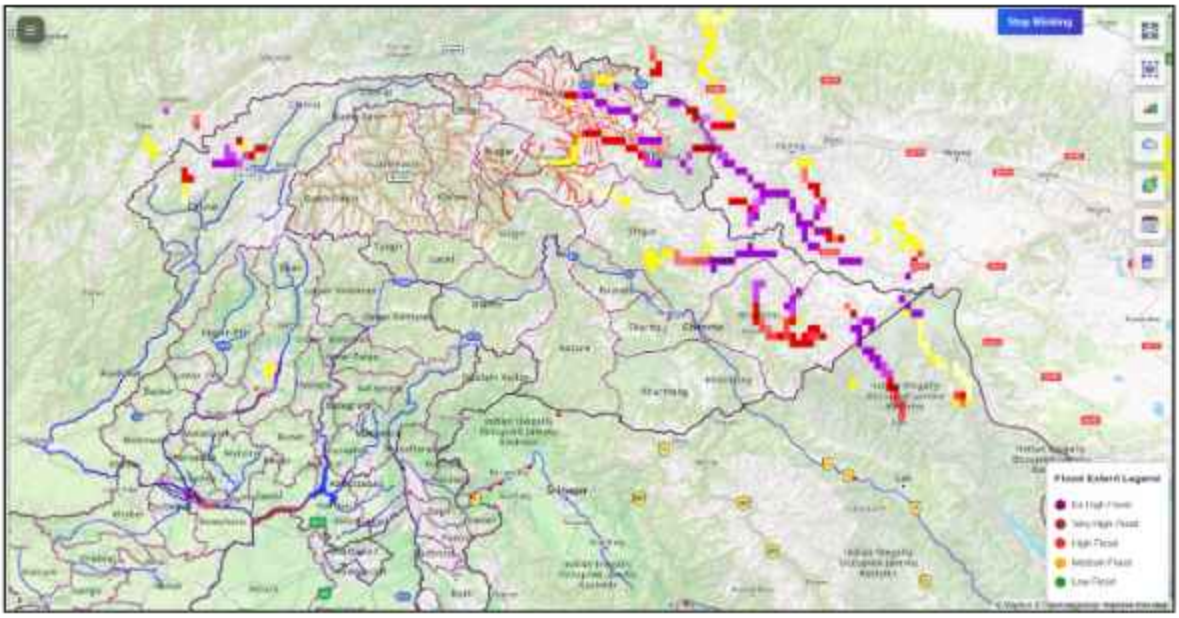


Figure 39 Vulnerable Districts of GB & KP for Flashfloods/Debris Flow

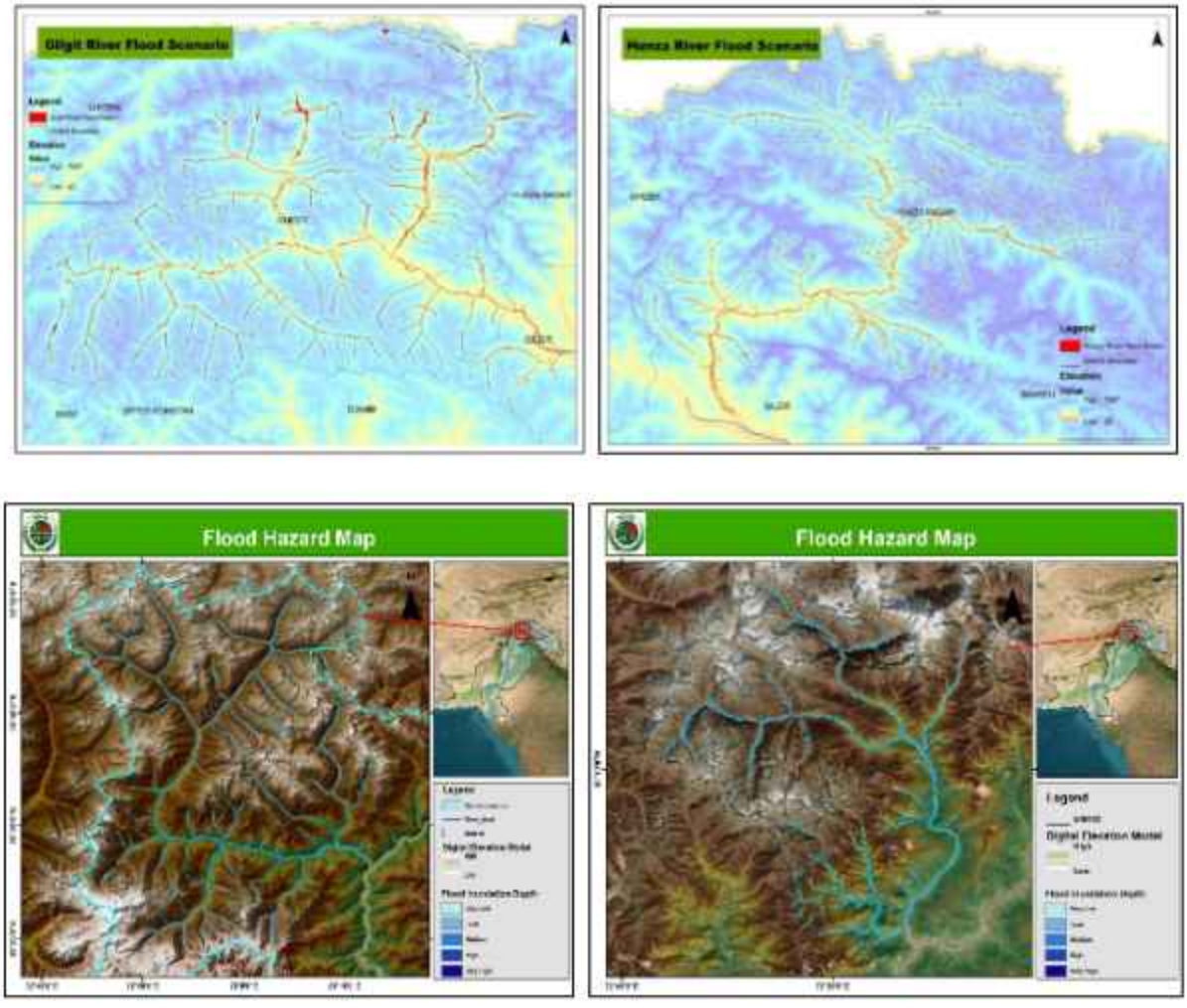
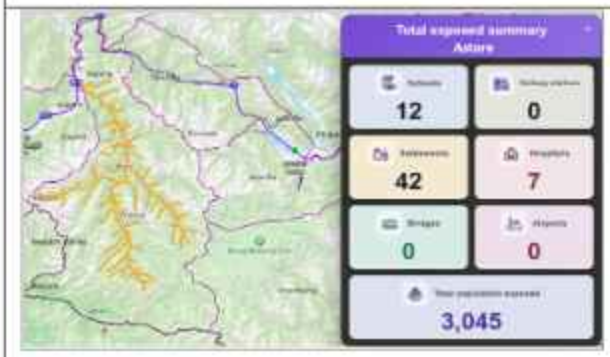


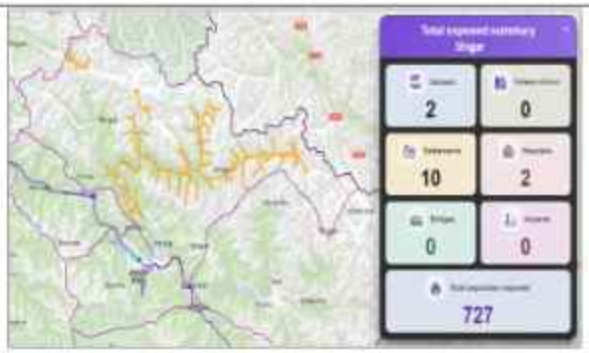
Figure 40 Flood Hazard Map for Gilgit (top left) & Hunza River (top Right) and Upper & Lower Kohistan

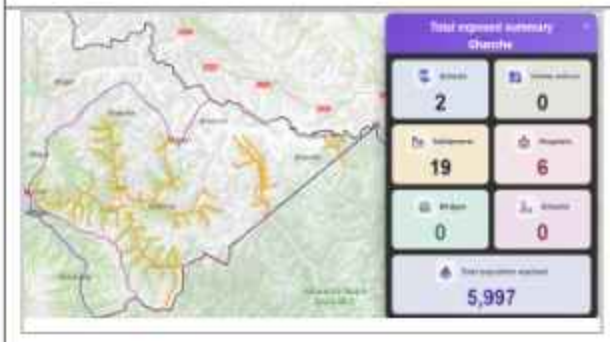
Exposure maps of Vulnerable areas against flashfloods/debris flow

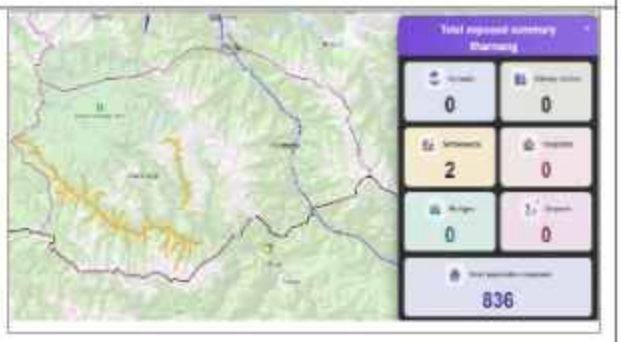
Gilgit River with Tributaries

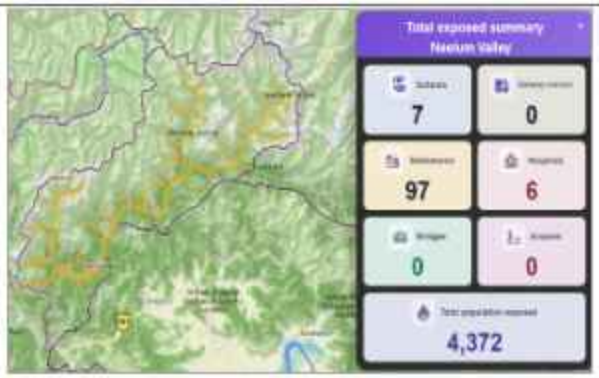
Hunza River with Tributaries

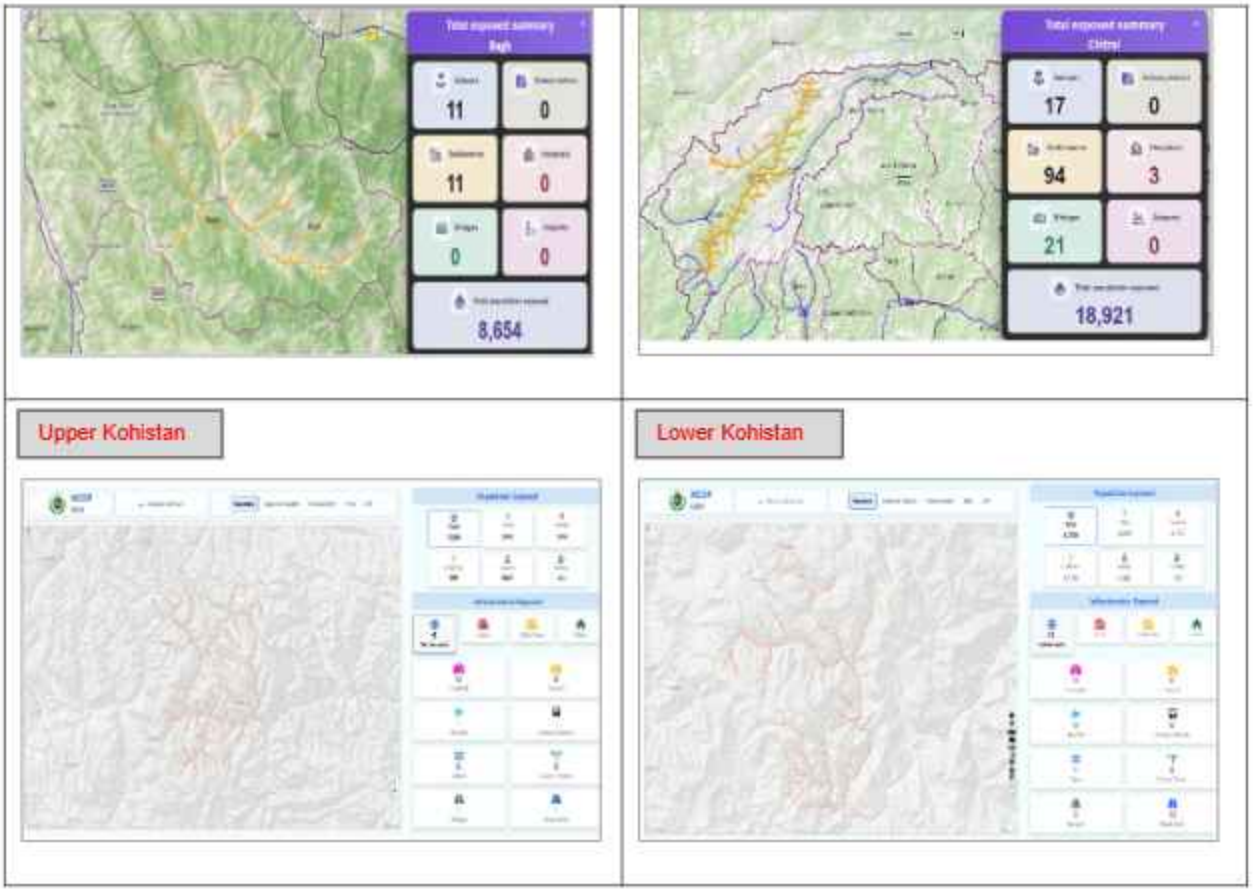












3. **Riverine Flooding.** In July, western rivers are the main hydrological concern, especially the Swat, Panjkora, Kabul River system, and downstream Tarbela reaches. High flows are expected in these basins due to a combination of localized monsoon bursts over northern KP and adjoining Afghan catchments, rapid runoff from steep terrain, and added meltwater contribution from elevated temperatures. Short-duration intense rainfall over these catchments may quickly translate into river surges, flash floods, sediment-

Figure 41 Riverine Flooding Hazard Map for Swat & Panjkora rivers and Kabul River along with Vulnerable Districts

laden flows, and pressure on bridges, roads, and low-lying settlements along river corridors.

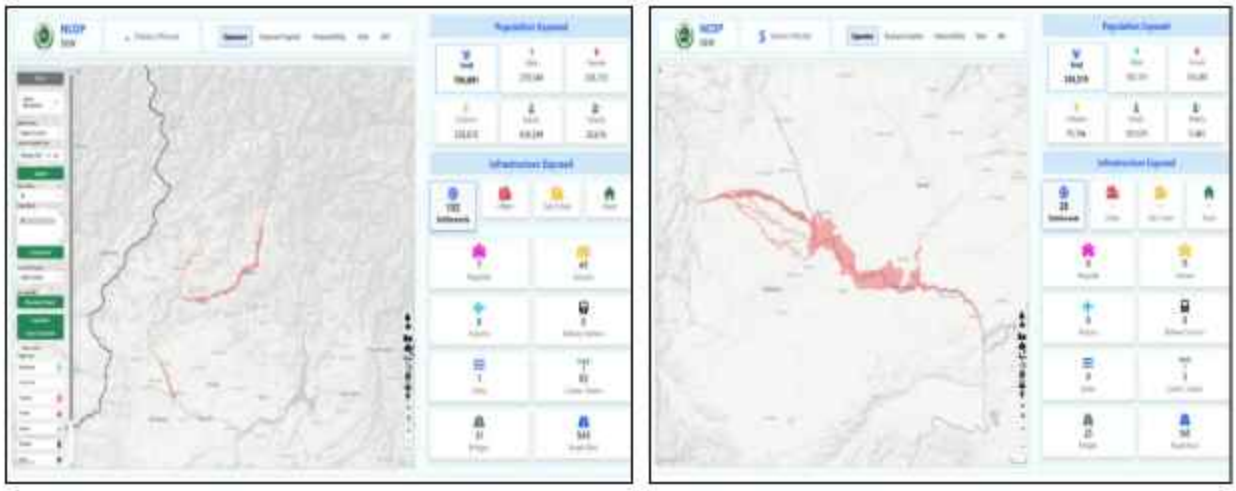


Figure 43 Exposure Maps of Riverine Flooding for Swat and Kabul River

Figure 42 Vulnerable Districts of Hill Torrents areas of D.I Khan and DG khan & Rajanpur

4. The River Indus system is likely to experience medium to high flows during July, particularly downstream of Tarbela Dam. This risk is supported by above-normal temperature anomalies over the glaciated and snow-fed regions of the Upper Indus Basin, which may accelerate snow, ice, and glacier melt. As a result, even if rainfall remains spatially uneven, melt-enhanced baseflow and regulated reservoir outflows can increase discharge variability along the Indus belt. Close monitoring of Tarbela inflows, reservoir levels, spillway/outflow operations, and downstream flow response will therefore be critical during peak July conditions.

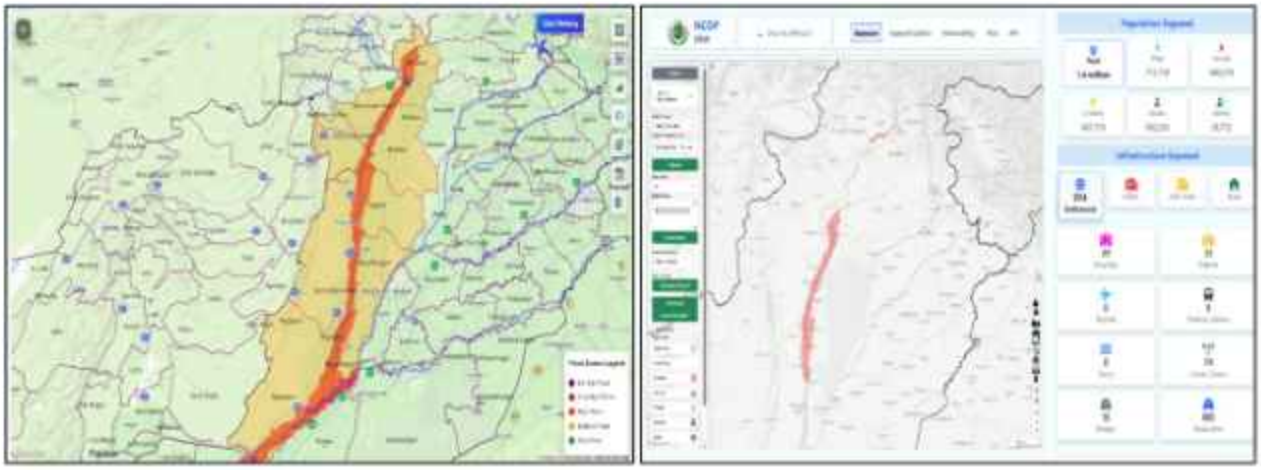


Figure 44 Vulnerable districts of Upper Indus River for Riverine Flooding along with Exposure

5. **Flash Floods & Hill Torrents.** Across Punjab, hydrological risk is expected to be more localized. The Indus belt and D.G. Khan & Rajanpur hill torrents may experience rapid runoff during isolated convective rainfall events, especially where intense cells develop over the Sulaiman Range and adjoining catchments. Urban flooding may also occur in major cities during short-duration heavy downpours, but widespread riverine flooding across the plains appears less likely unless upstream flows, dam releases, or localized cloudbursts.

   a. **Southern** KP may experience hotter and drier spells, but localized convection over hill torrents can still create sudden flows in vulnerable nullahs and seasonal streams.

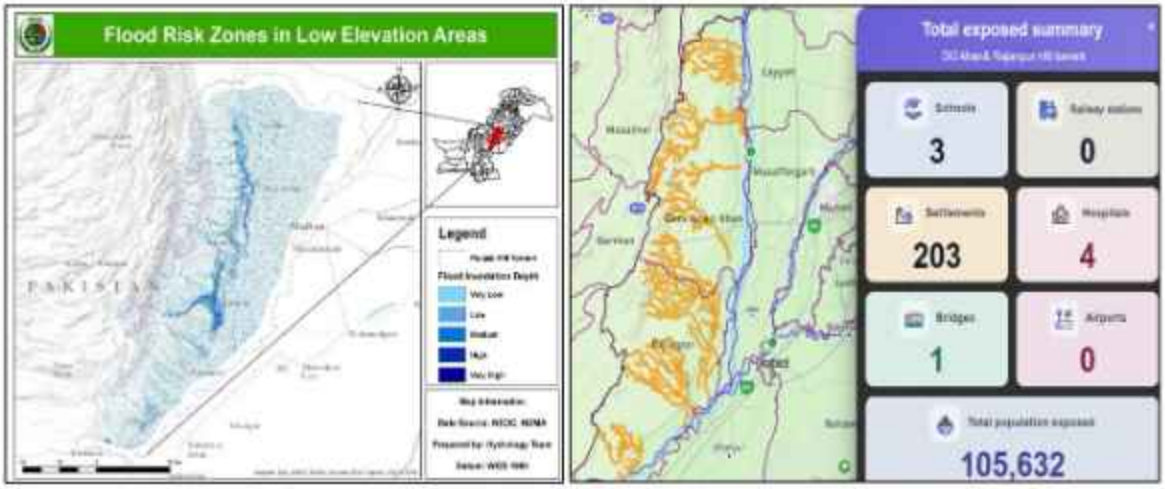


Figure 45 Hill Torrents in the southern parts of Punjab Province (Sulaiman Range)

Figure 46 Floods and Hill Torrents Hazard map and vulnerable districts for Bajaur, D.I.Khan & Chakwal

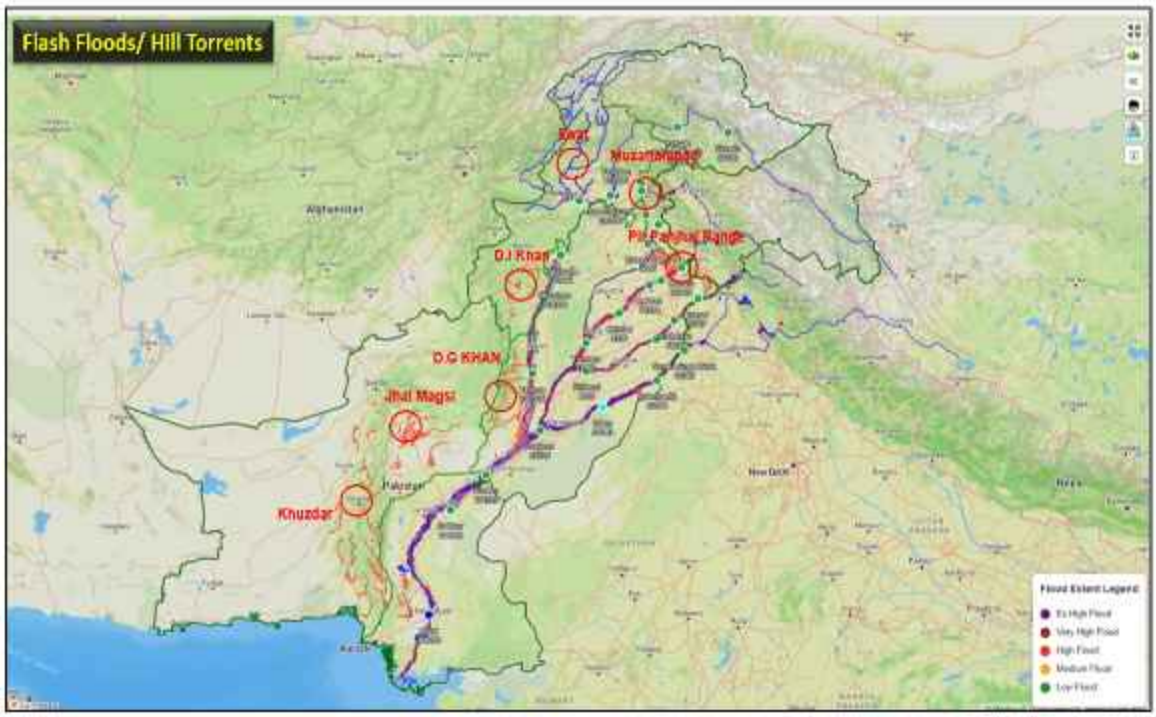


Figure 47 Hotspot of Flash Foods & Hill Torrents across Pakistan

6. **Urban Flooding.** Despite the overall suppressed rainfall signal anticipated during the latter half of the 2026 monsoon season, the risk of urban flooding cannot be ruled out. Elevated surface temperatures across large parts of the country may contribute to the development of localized low-pressure systems and convective activity, capable of producing short-duration but high-intensity rainfall events. Such localized downpours can generate significant runoff over densely populated urban areas where drainage capacity is limited or already under stress.

7. Metropolitan cities and rapidly expanding urban centers remain particularly vulnerable to localized inundation due to the high proportion of impervious surfaces, encroachment upon natural drainage channels, inadequate stormwater infrastructure, and concentration of population and critical facilities. Even in seasons characterized by below-normal rainfall, isolated convective storms can overwhelm urban drainage systems within a short period, resulting in water accumulation in low-lying areas, disruption of transportation networks, damage to infrastructure, and interruption of essential services.

8. The areas requiring continued monitoring include major urban centers of central Khyber Pakhtunkhwa, Punjab, and Sindh, where localized rainfall episodes may trigger temporary flooding of roads, underpasses, residential areas, and commercial districts. Accordingly, municipal authorities and disaster management agencies should maintain preparedness measures throughout the monsoon withdrawal period, including stormwater drain clearance, pumping station readiness, real-time rainfall monitoring, urban flood forecasting, public advisories, and emergency response planning.

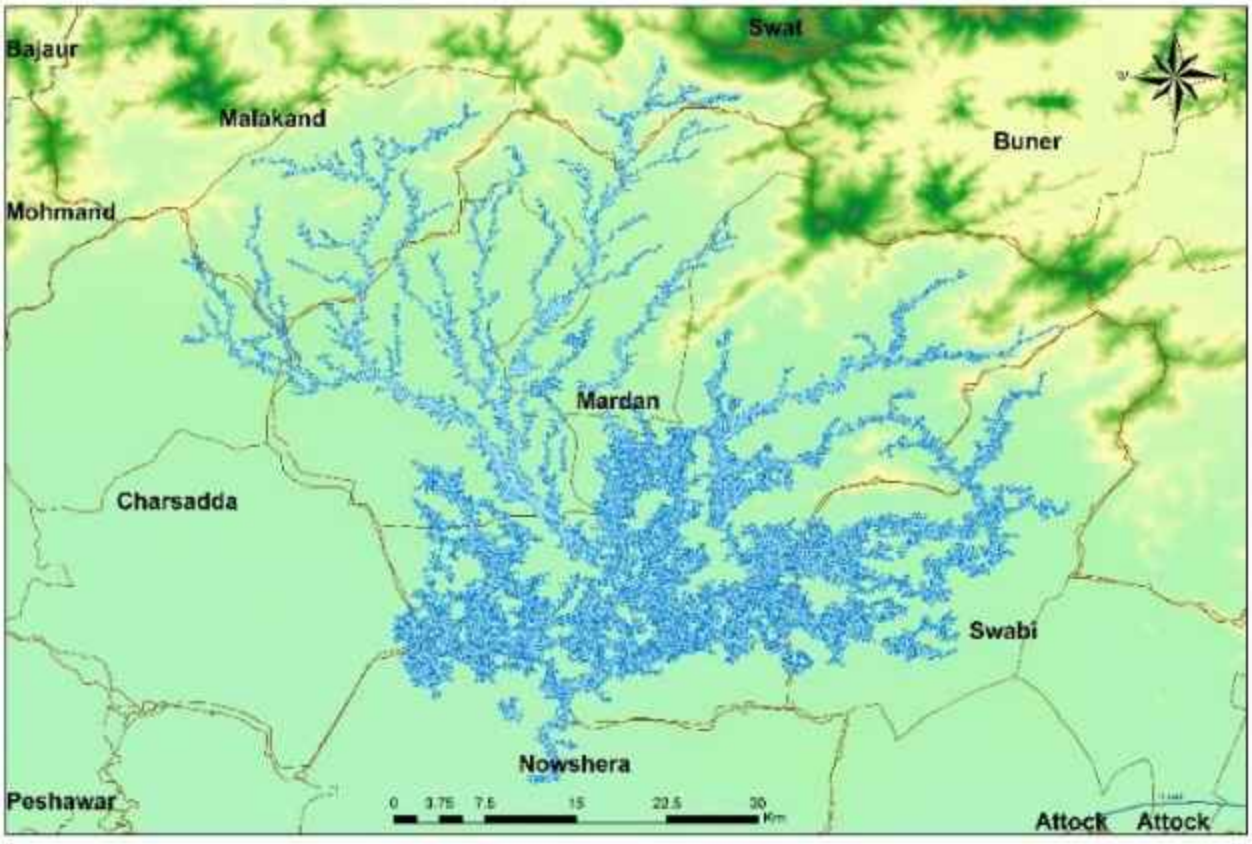


Figure 48 Urban Flood Hazard Prone Areas of Mardan

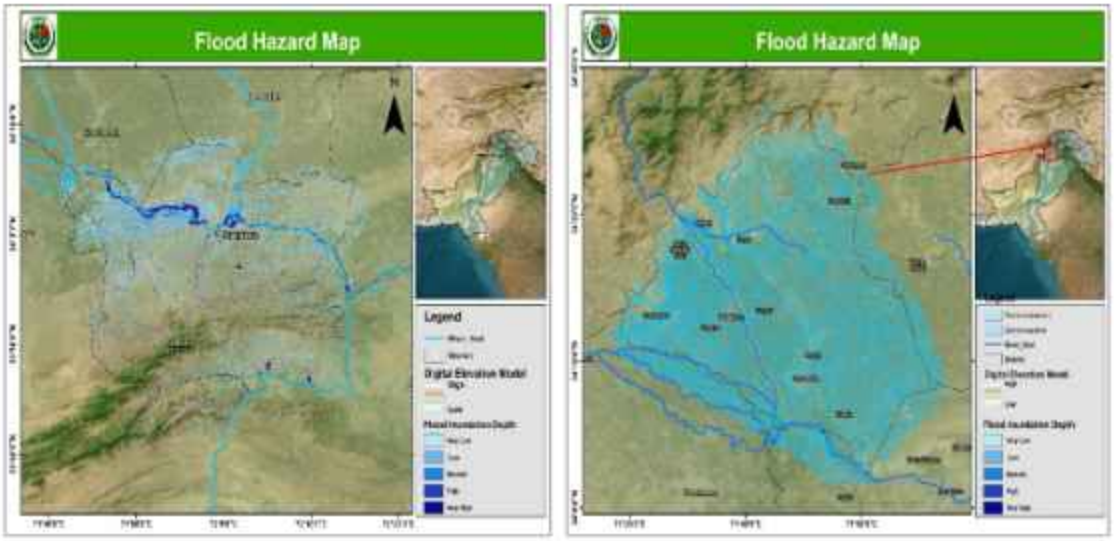


Figure 49 Urban Flood Hazard Prone Areas of Nowshera and Charsadda

a. **August 2026.** The hydrological outlook for August 2026 indicates a moderate flood hazard potential at the national scale, with localized high to very high risk in northern, glaciated, and transboundary river catchments. The main concern during the month will be catchment response, river flows, reservoir behavior, GLOF potential, landslides, and downstream flood routing, rather than widespread countrywide flooding.

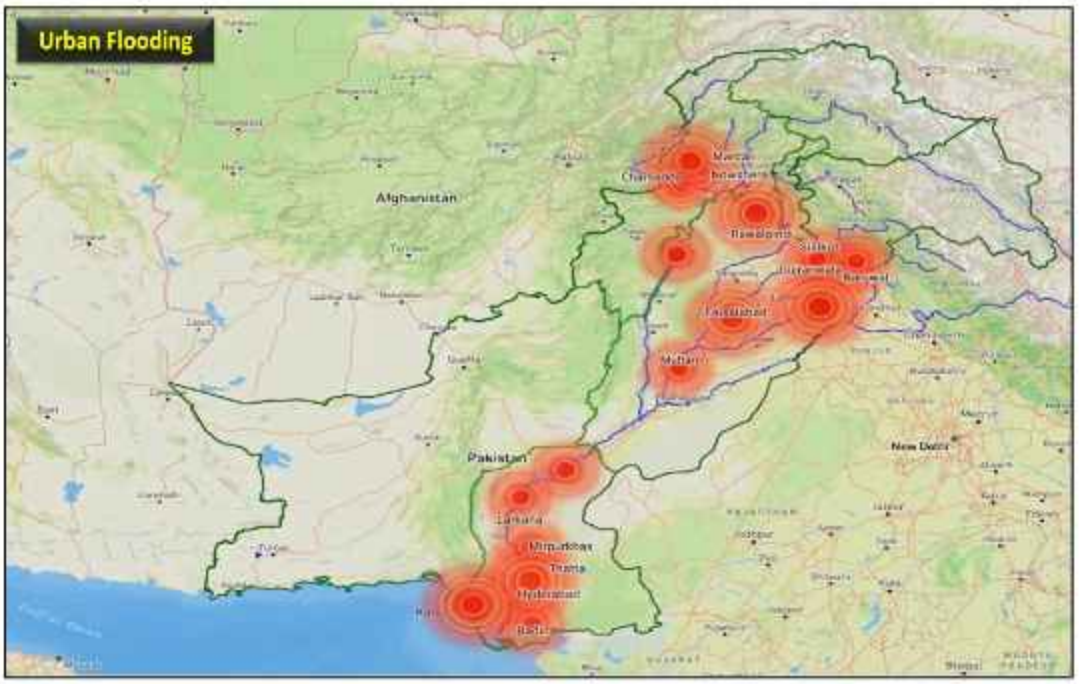


Figure 50 Urban Flooding Hotspot Areas across Pakistan for Monsoon 2026

9. In the Upper Indus Basin, medium to locally high flows are likely to continue due to sustained meltwater contribution from snow, ice, and glaciers. This may maintain elevated

baseflows in the Indus River system, particularly upstream and downstream of Tarbela Dam as hazard map and exposure is already shown above in July 2026. Any short-duration rainfall over steep catchments can quickly combine with existing melt-driven flows and produce sharp rises in tributaries and main river channels. Continuous monitoring of Tarbela inflows, reservoir level, outflows, and downstream discharge response will remain important throughout August.

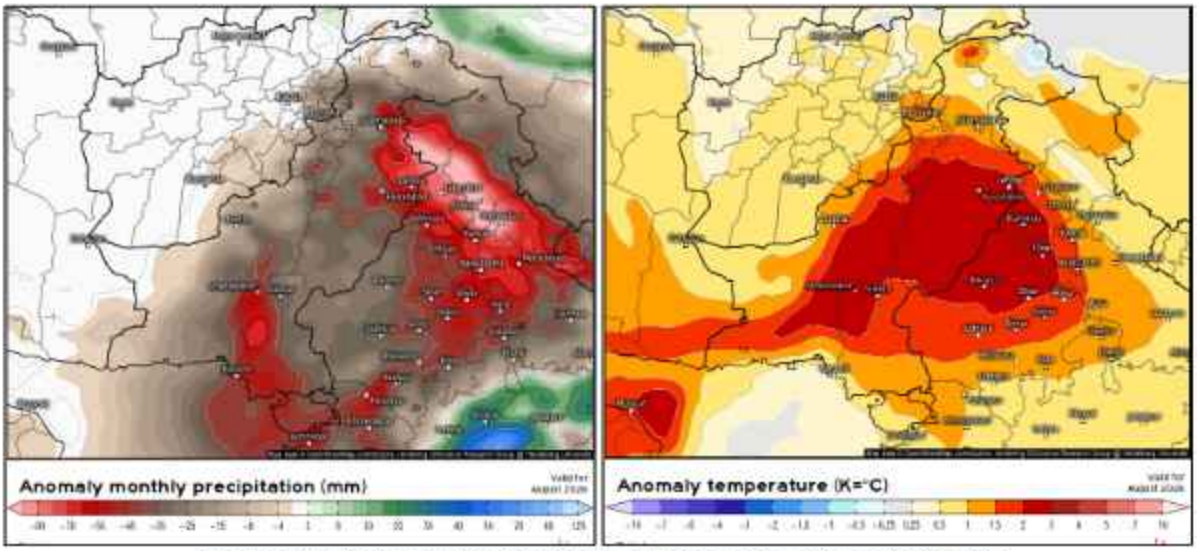


Figure 51 August Precipitation and Temperature Anomaly

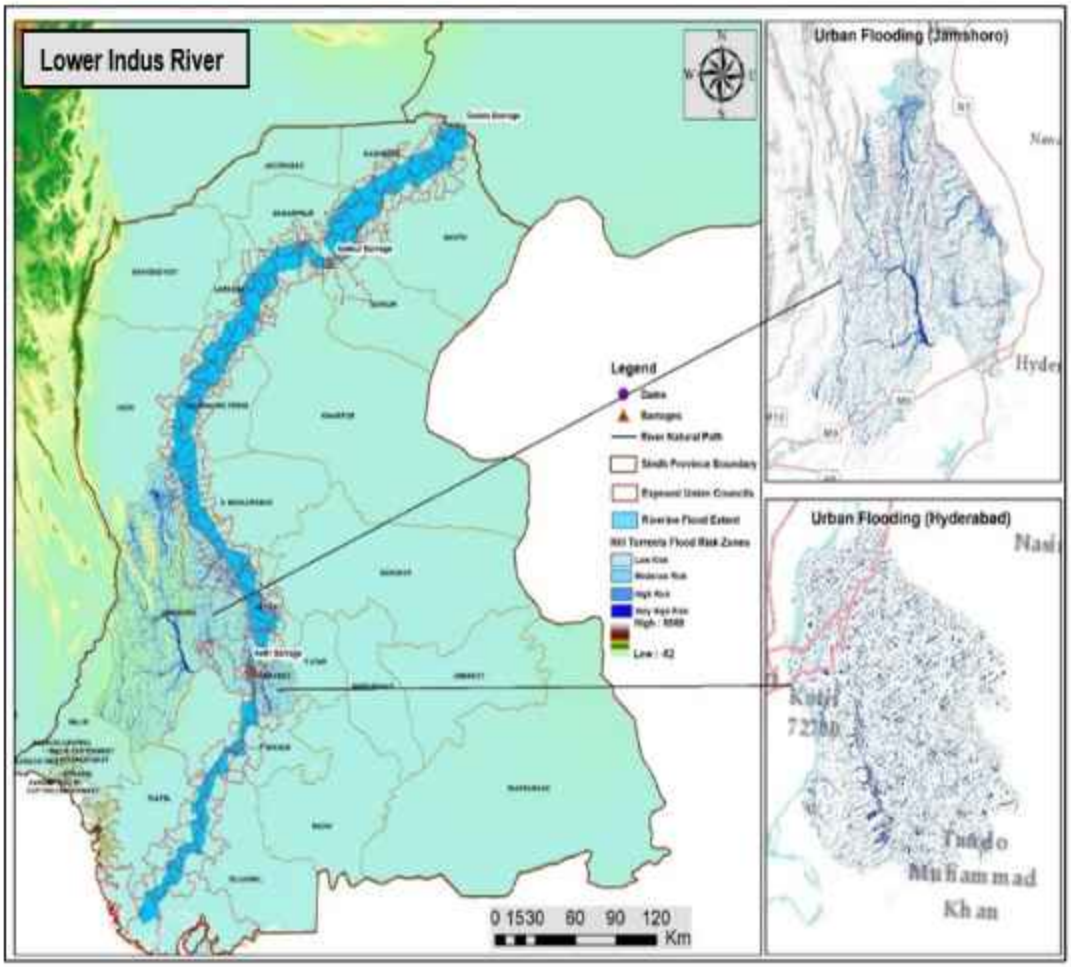
10. The highest compound hydrological risk is expected across GB, upper KP, AJK, and upper Indus tributary basins. Priority areas include Chitral, Hunza, Gilgit, Nagar, Rondu, Shigar, Astore, Neelum Valley, Jhelum Valley, Buner, Swat. These zones remain exposed to GLOF, flash/debris flows, slope failures, landslides, and sudden streamflow surges, especially in narrow valleys, glacier-fed streams, and road corridors. The broader monsoon outlook also identifies northern catchments as priority areas for compound flood and GLOF risk during August.

a. The Swat, Panjkora, Kabul, and upper Indus tributaries should remain under close watch. These rivers can respond rapidly to short-duration runoff from steep terrain, producing flash floods, sediment-laden flows, bank erosion, and bridge or road exposure. Downstream areas near the Kabul-Indus confluence and downstream Tarbela reaches may experience flow variability depending on the timing of upstream inflows and reservoir operations.

b. Across Sindh, local flood potential is comparatively lower, but the Indus River belt should remain under observation because downstream flows may be

influenced by upstream Indus inflows, Tarbela releases, and cumulative catchment response from northern Pakistan. The Kirthar Range torrent corridors may also generate localized runoff where isolated catchment response occurs.

Figure 52 River Indus along Punjab and Sindh Districts



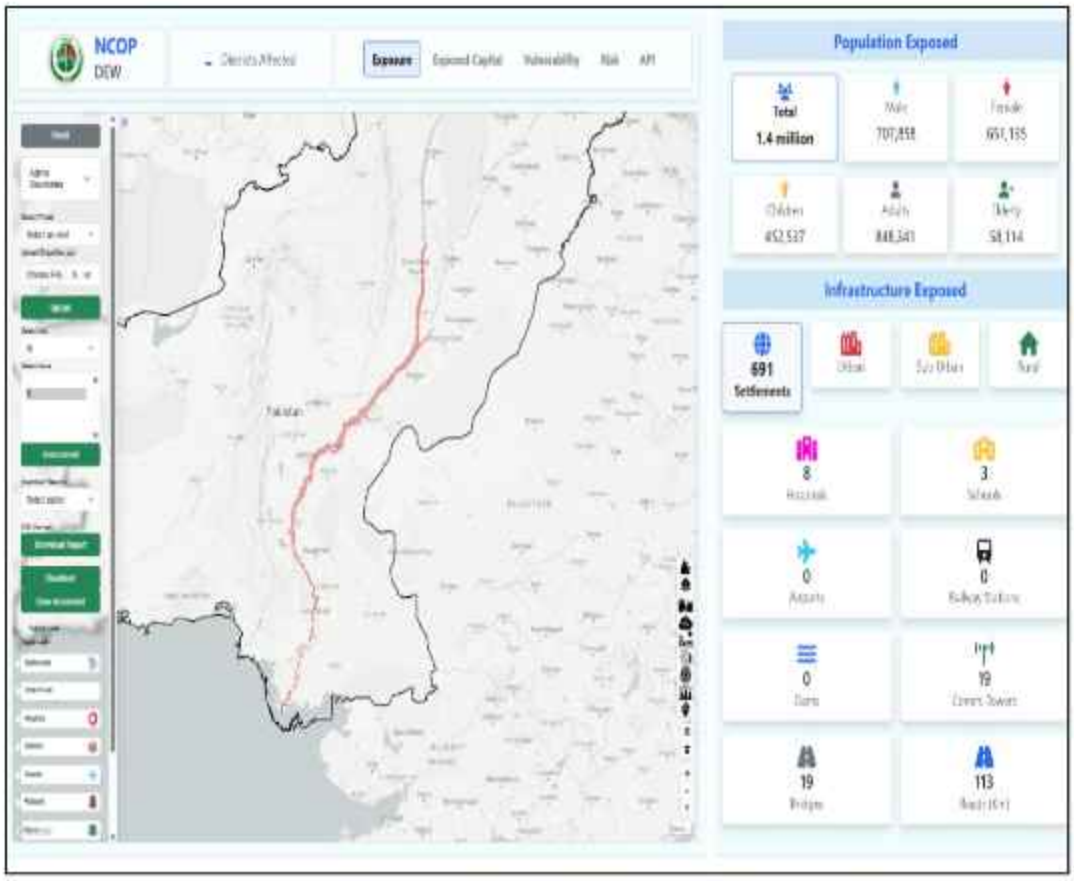


Figure 53 Lower River Indus Medium to High Flows Exposure

11. In Balochistan, the flood risk is expected to remain mostly localized and associated with hill torrent catchments. Northern and north-eastern belts may produce short-lived runoff events, but the broader hydrological concern will be reduced water availability, declining soil moisture, pressure on local water sources, and stress on irrigation and livestock water demand.

a. **<u>September 2026.</u>** The hydrological outlook for September 2026 indicates an overall low to moderate flood hazard potential across Pakistan, with residual localized risks expected in the northern, glaciated, and steep catchment areas. The month is expected to mark a gradual transition from active monsoon runoff conditions toward post-monsoon hydrological stress, with declining river inflows, reduced catchment recharge, falling soil moisture, and increasing pressure on reservoir and irrigation management.

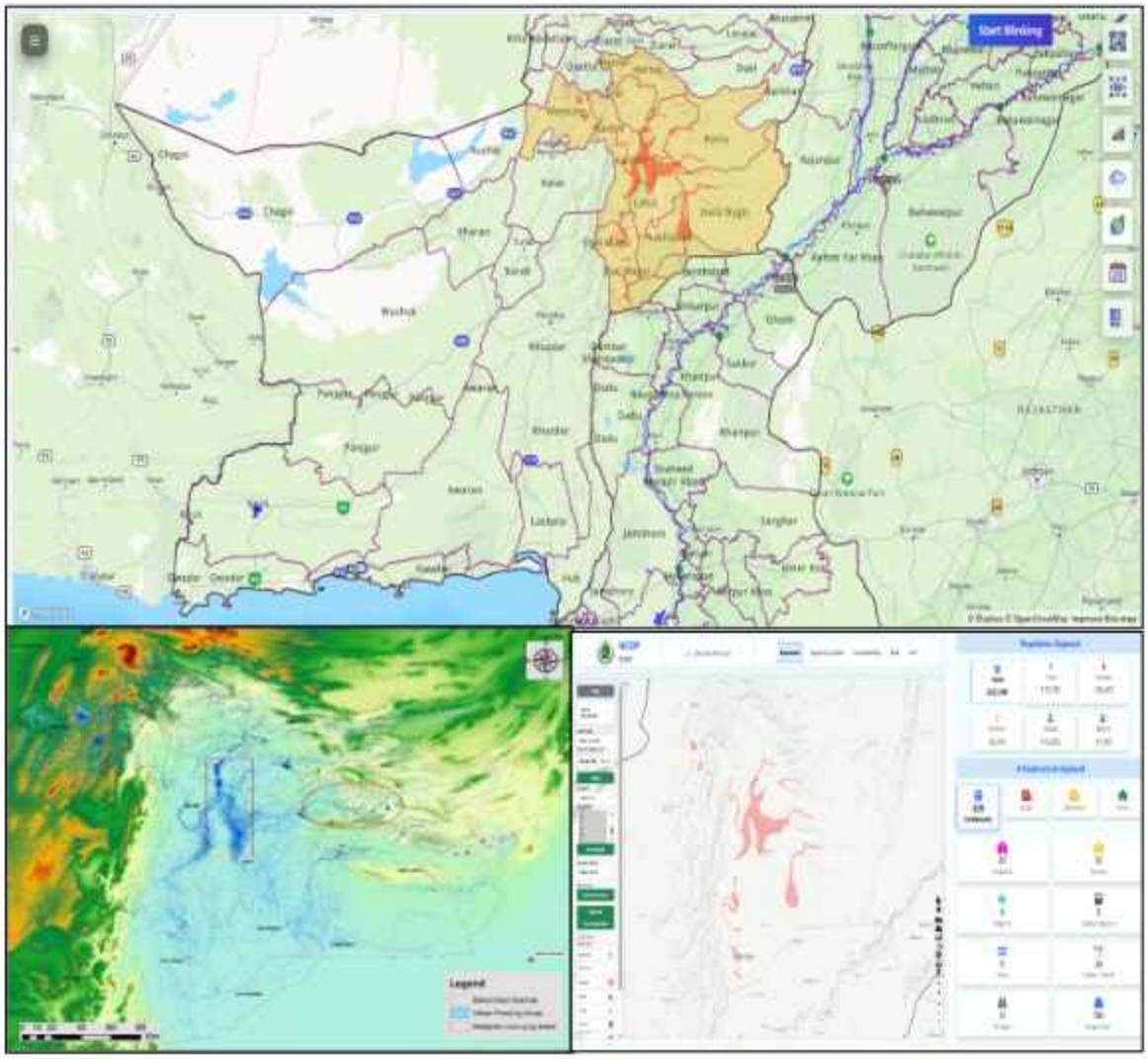


Figure 54 Flash Flood Prone areas of North Eastern Balochistan Areas

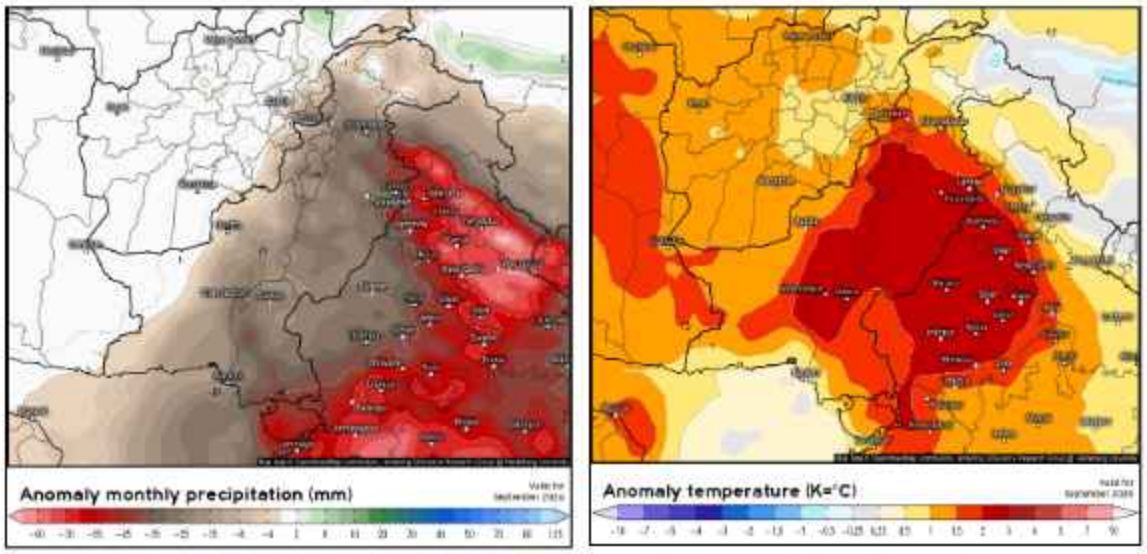


Figure 55 September Precipitation and Temperature Anomaly

12. Flows in the Upper Indus Basin are likely to show a gradual reduction compared to July and August. However, residual snow and glacier melt may continue to support moderate flows in glacier-fed tributaries during the early part of the month. The Indus River system, particularly upstream and downstream of Tarbela, will require continued monitoring for inflow trends, reservoir storage, downstream releases, and irrigation demand. As the month progresses, weakening melt contribution and limited catchment recharge may lead to a steady decline in inflows, increasing the importance of water allocation planning for the coming Rabi season.

13. Residual hydrological risks will remain concentrated in Gilgit-Baltistan, Khyber Pakhtunkhwa, Azad Jammu and Kashmir, and the upper Indus tributary valleys. Some local convective precipitation events may occur over western parts of Pakistan particularly over Suleiman and Kirthar range mountain areas as high temperatures create low pressure area causing light air to rise upwards creating environment for sudden rain downpours. Whereas upper areas may continue to face localized GLOF, flash/debris flow, landslide, slope failure, and sudden streamflow rise risks, particularly where unstable slopes, glacier lakes, moraine-dammed channels, or blocked drainage paths already exist.

14. In Punjab, the main hydrological concern will shift toward reduced surface water availability, irrigation stress, and declining soil moisture. The transboundary threat from the Ravi, Chenab, Sutlej, Jhelum, and Indus River belts should remain under routine monitoring for upstream flow variability and transboundary flow releases.

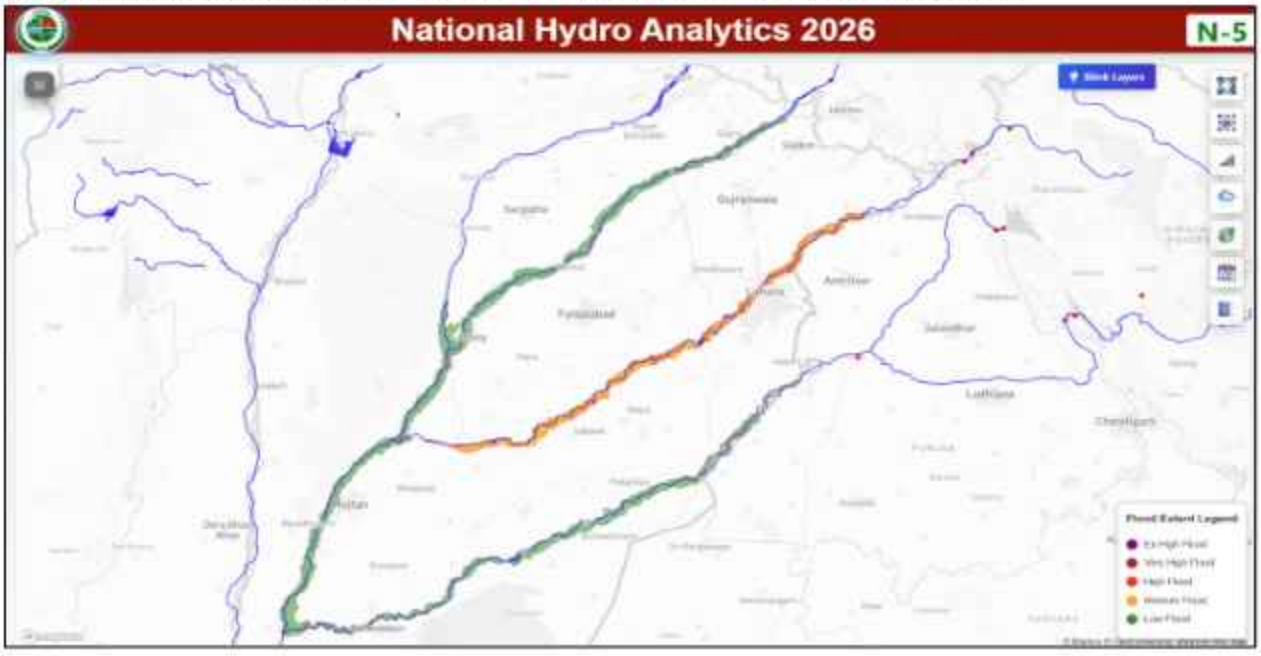


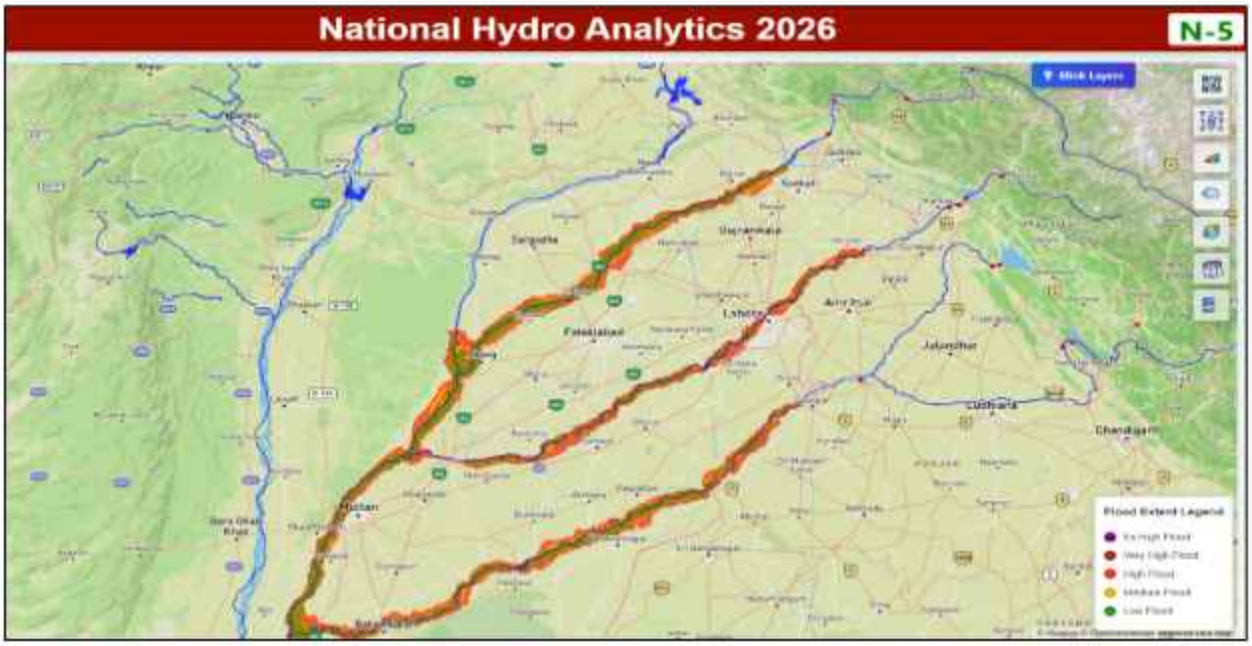
Figure 56 Low to Medium Flood Risk in Eastern Rivers.

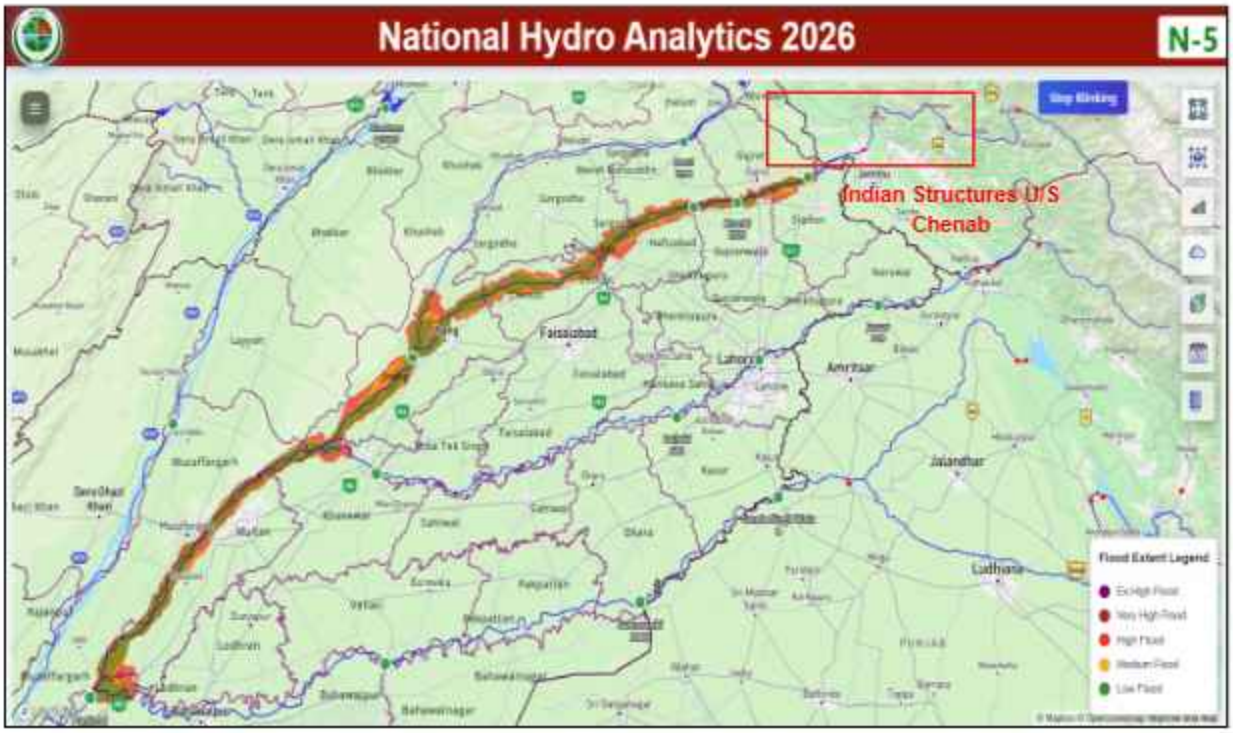
15. **Transboundary Hydrological Risk.** A key concern for August & September is the transboundary river system, especially the Ravi, Chenab, and Sutlej rivers. Priority downstream districts include Lahore, Nankana Sahib, Sheikhupura, Sialkot, Gujrat, Wazirabad, Kasur, Okara, and Pakpattan. Reservoir conditions in Indian catchments, particularly Thein, Bhakra, and Pong dams, require close monitoring because any upstream release or catchment-generated flow may create downstream response in Pakistan. The Ravi basin needs particular attention due to the relatively higher storage status of Thein Dam as compare to last year and also w.r.t long-term averages. The dam operation capability is in the control of the Indian dam authorities, if they continue to storage water in their reservoirs without control releases, and couple the dam release with any unusual strong weather system impacting the thein dam catchment areas, then the possibility of flood coming towards Pakistan cannot be ruled out. The relevant dept of Pakistan should closely monitor the situation. NDMA keeping in view the pro-active disaster management have calculated the exposure incase low, medium or even high flood scenario occurs in eastern rivers as shown below.

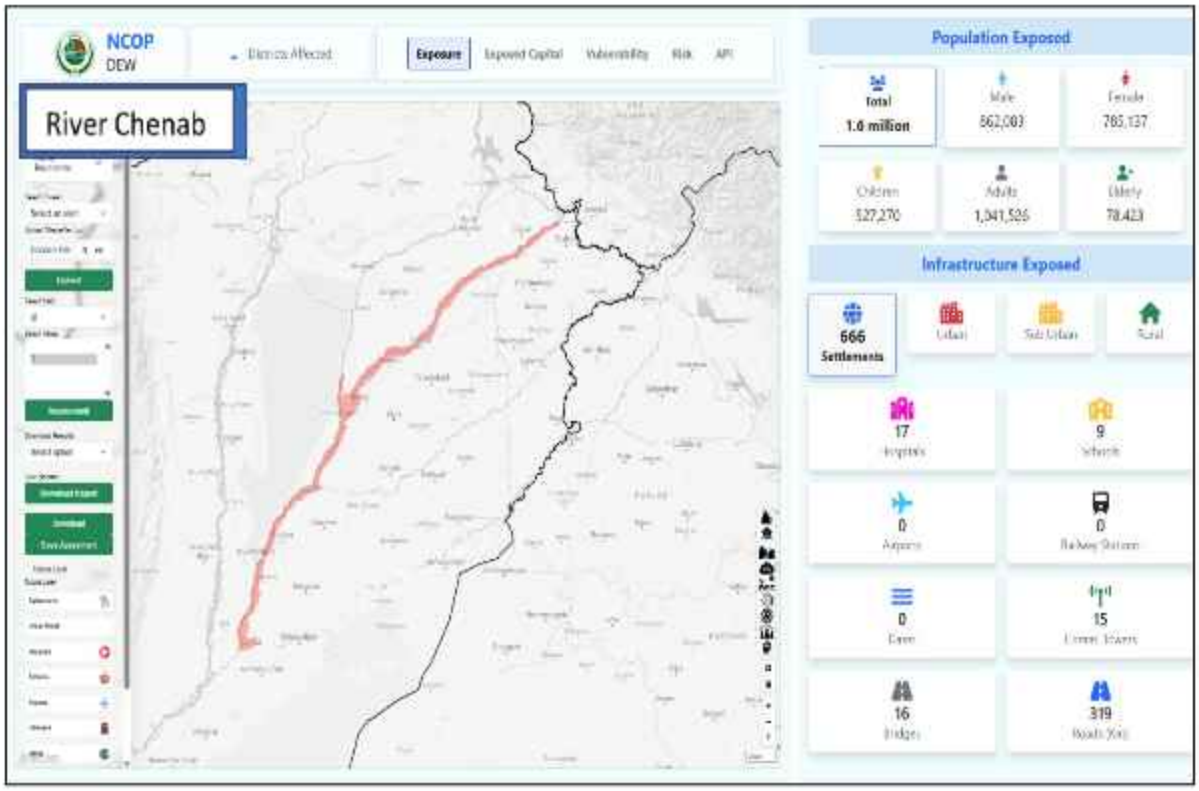
Figure 57 Reservoir Level and Percentage Storage Filled in Thein Dam

Figure 58 Reservoir Level and Percentage Storage Filled in Pong & Bhakra Dam

16. Across **Punjab**, widespread riverine flooding is not the primary signal, but localized hydrological impacts remain possible. The main areas of concern are the **Ravi, Chenab, Sutlej, and Indus River belts**. Short-duration runoff in hill torrent catchments may cause rapid flow generation, localized inundation, erosion, and damage to rural infrastructure.




National Hydro Analytics 2026
N-5
Indian Structures D/S
Chenab
Faisalabad
Lahore
Amritsar
Jalandhar
Ludhiana
Flood Extent Legend


NCOP
DEW
River Chenab
Exposure
Population Exposed
Total
1.6 million
Male
862,083
Female
785,137
Children
527,270
Adults
1,341,526
Elderly
78,423
Infrastructure Exposed
666
Settlements
17
9
0
0
0
15
16
319

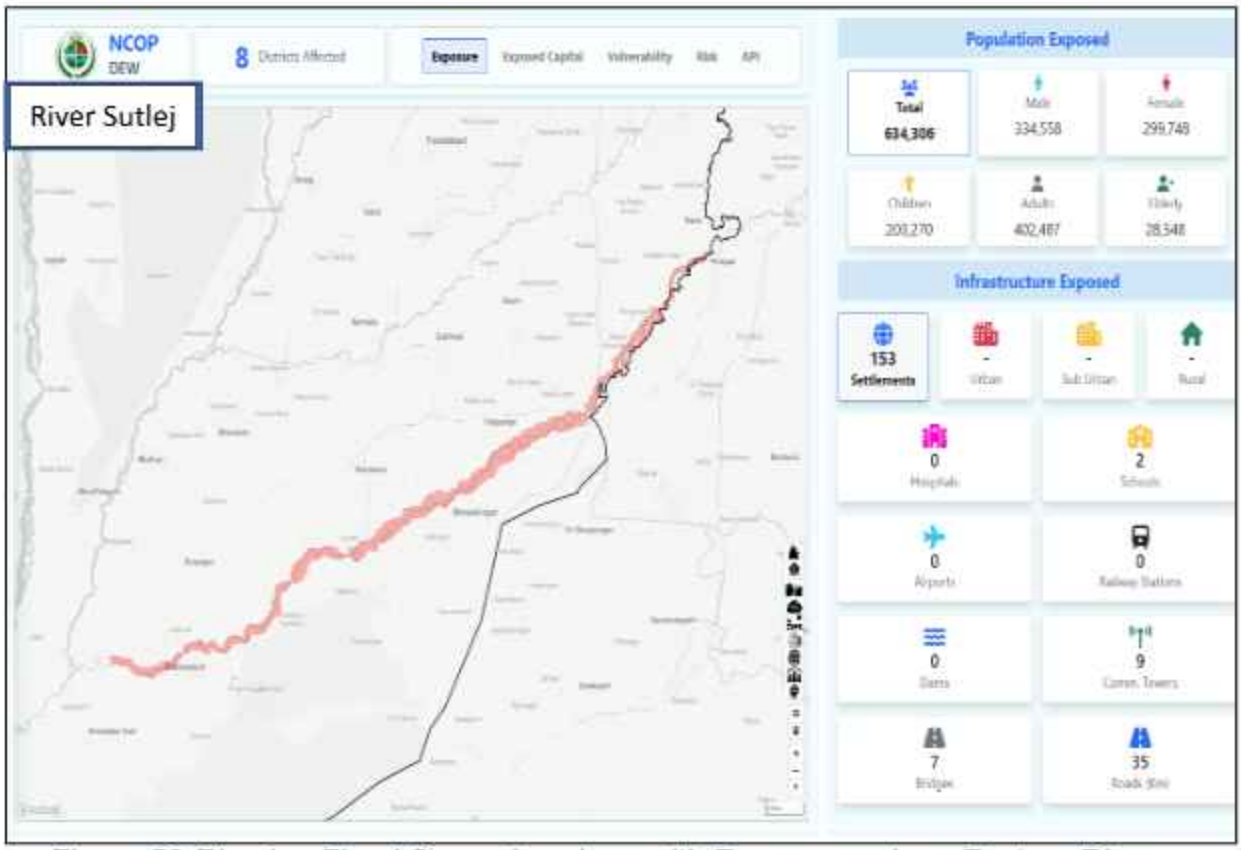


Figure 59 Riverine Flood Scenarios along with Exposures along Eastern River

17. **Kharif 2026 Water Availability.** For Kharif 2026, the forecast of water availability indicates broadly normal to slightly above-normal conditions in the major reservoir system. Seasonal availability is projected at 66.90 MAF against a normal of 66.25 MAF, reflecting a small overall surplus at the national scale. Tarbela is forecast to contribute 52.40 MAF compared with a normal of 50.43 MAF, while Mangla is projected at 14.50 MAF against a normal of 15.82 MAF. This suggests that aggregate water availability for the upcoming Kharif season is expected to remain generally adequate, although its temporal distribution may remain uneven through the season. Reduced snow depth in northern catchments, altered melt timing, and the likelihood of fluctuating spring and summer rainfall may all influence how this water becomes available over time. In this context, although the seasonal outlook remains broadly favorable, close monitoring of snowmelt progression, inflow trends, and rainfall-driven runoff will remain essential for early warning, reservoir operations, and downstream risk management.

Figure 60 Forecast for Water Availability (MAF) for 2026 (Source PMD)

DEBRIS FLOW, MUDFLOW AND GLACIAL LAKES OUTBURST FLOOD (GLOF)

1. From July to September 2026, northern Pakistan is expected to experience peak summer melting conditions coinciding with the active South Asian Monsoon season. Sustained above-normal temperatures across the Karakoram, Himalaya, and Hindu Kush ranges will continue to accelerate glacier ablation and the expansion of moraine- and ice-dammed glacial lakes. Simultaneously, episodic monsoon incursions into Gilgit-Baltistan, upper Khyber Pakhtunkhwa, and Azad Jammu & Kashmir are likely to generate moderate to heavy rainfall events over high mountain catchments.

2. The combined influence of elevated meltwater production and intense rainfall is expected to significantly increase hydrostatic pressure on glacial lake dams, enhancing the probability of Glacial Lake Outburst Floods (GLOFs). Saturated slopes, weakened moraines, and unstable sediment deposits may further trigger flash floods, debris flows, mudflows, landslides, and riverbank erosion in vulnerable valleys. Peak risk is anticipated during July and August when glacier melt rates and monsoon activity are expected to overlap.

3. Catchments containing rapidly expanding glacial lakes, surge-type glaciers, and steep mountain terrain will remain particularly susceptible to sudden flood surges and sediment-laden flows. Downstream communities, transportation corridors, bridges, hydropower infrastructure, irrigation networks, and agricultural lands may face heightened exposure to flood-related impacts. The risk is expected to gradually decline during September as temperatures begin to decrease and monsoon activity weakens; however, localized heavy rainfall events may still trigger flash floods and slope failures in vulnerable areas.

   a. **July 2026.** July is expected to be the most critical month for cryosphere-related hazards. Seasonal temperature anomalies of approximately +3°C to +7°C over parts of Gilgit-Baltistan, Upper Chitral, and adjoining high mountain regions are likely to accelerate glacier ablation and the depletion of remaining seasonal snowpack. Simultaneously, above-normal precipitation is projected over portions of northern Gilgit-Baltistan and upper catchments.

4. The combination of intense glacier melt and rainfall-induced runoff may significantly increase glacial lake volumes and hydrostatic pressure on moraine dams. Existing glacial

lakes are expected to expand rapidly, increasing the likelihood of lake overtopping or dam failure. Outlook is projected to be as below: -

a. Exceptional glacier and snowmelt rates.
b. Rapid expansion of glacial lakes.
c. Increased meltwater discharge into streams and rivers.
d. High probability of GLOFs in vulnerable valleys.
e. Frequent flash floods, debris flows, and mudflows.
f. Increased riverbank erosion and sediment transport.

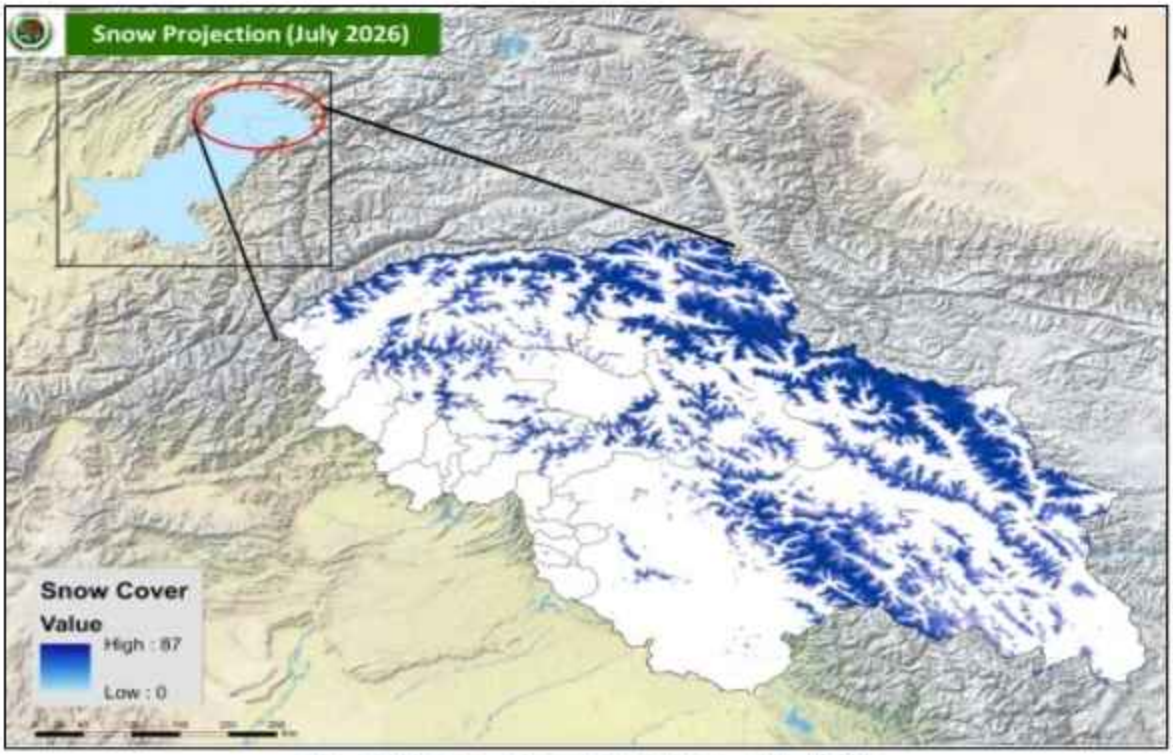


Figure 61 Snow Cover Projection – July 2026

5. **August 2026.** Temperature anomalies remain positive across northern Pakistan, although lower than July. However, glaciers will continue responding to the accumulated summer heat, sustaining high meltwater production. Precipitation anomalies indicate generally below-normal rainfall over much of the HKH region.

6. While rainfall-triggered flooding may reduce compared to July, glacial lakes are expected to remain near their seasonal maximum extent. The large volume of stored meltwater will continue to pose a substantial GLOF threat, particularly where unstable moraine dams, ice-contact lakes, or surge-type glaciers are present. Outlook is projected to be as below: -

a. Continued high glacier melt despite reduced rainfall.

b. Glacial lakes remain enlarged and highly stressed.

c. Potential for sudden lake failures triggered by icefalls, rockfalls, or internal dam weakening.

d. Localized debris flows associated with glacier-fed streams.

e. Increased sediment movement in steep valleys.

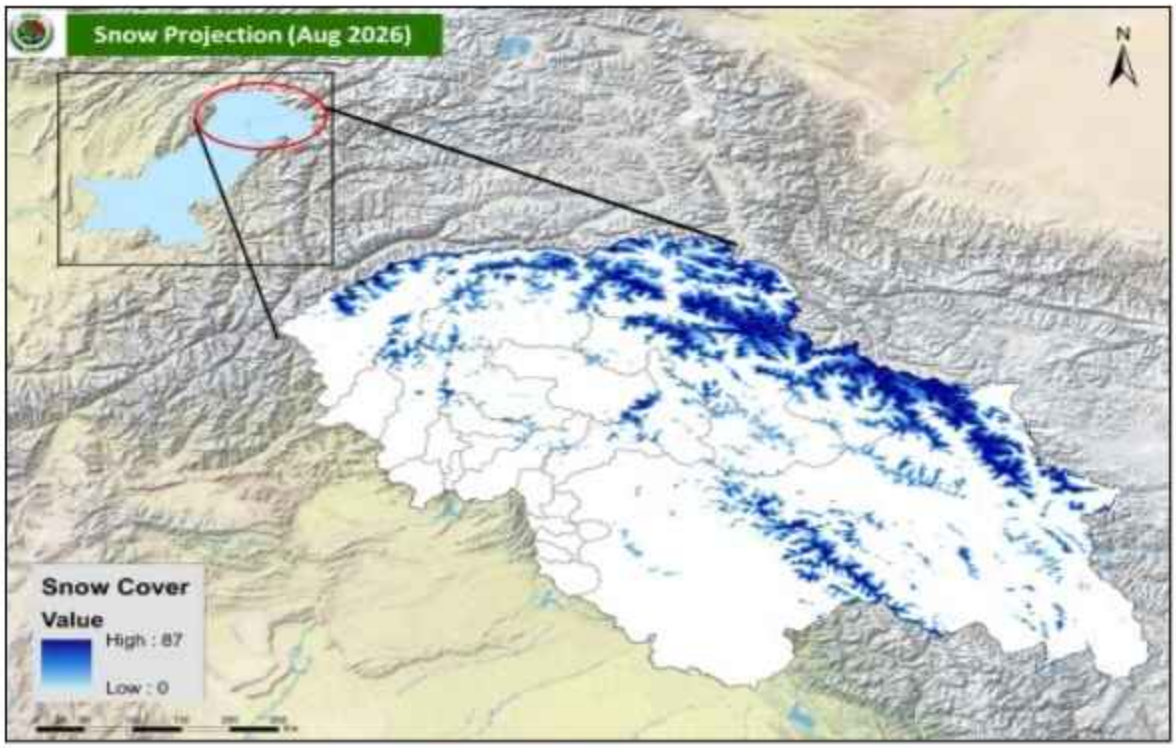


Figure 62 Snow Cover Projection – August 2026

7. **September 2026.** Temperature anomalies remain slightly above normal, but seasonal cooling will gradually reduce melt rates. Precipitation is projected to remain below normal across much of northern Pakistan. Consequently, overall hydrological stress on glacial systems is expected to decline.

8. Nevertheless, glacial lakes will likely remain enlarged following two months of intense melt. Residual risks will persist, especially in catchments containing rapidly evolving lakes or surge-type glaciers. Outlook is projected to be as below: -

a. Gradual reduction in glacier melt rates.

b. Seasonal maximum lake volumes persist.

c. Residual GLOF risk remains in vulnerable catchments.

d. Isolated debris flows and mudflows possible / localized rainfall events.

e. Decreasing flood and sediment transport activity.

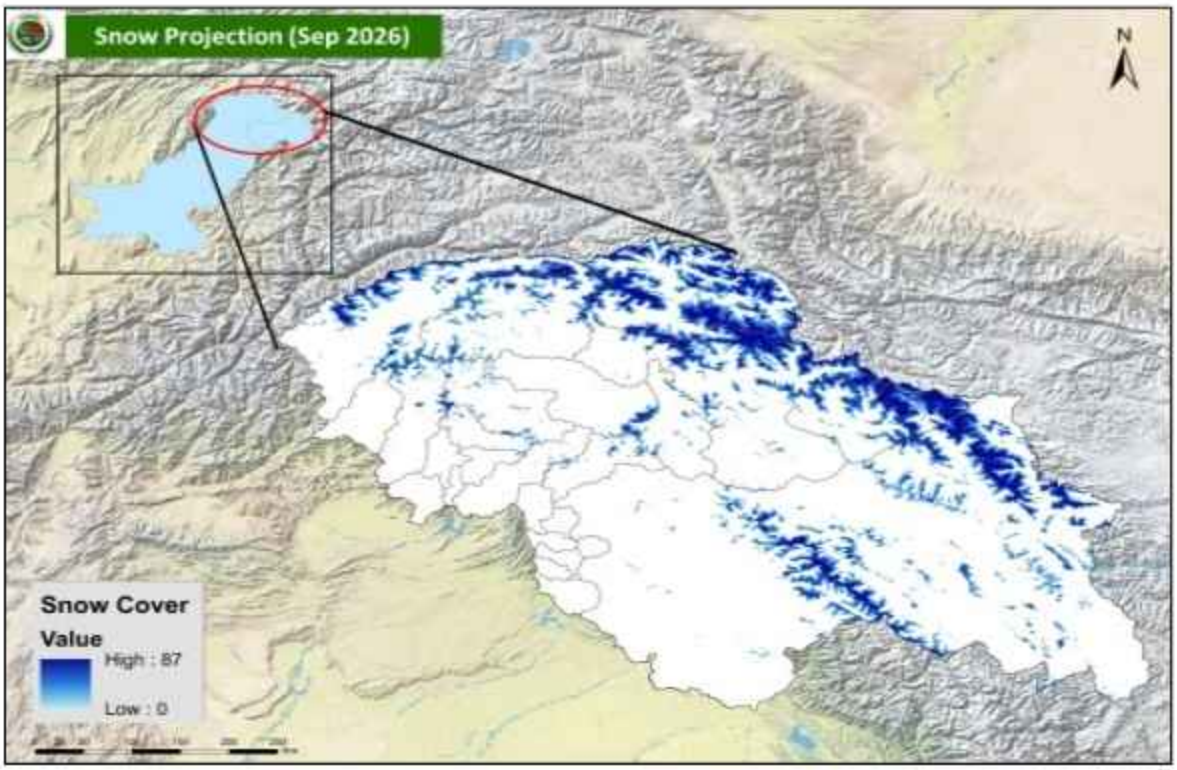


Figure 63 Snow Cover Projection – September 2026

9. **Seasonal Evolution of Risk**

Month	Temp Trend	Precipitation Trend	Glacier/ Snow Melt	GLOF Risk	Debris & Mudflow Risk
July	Above Normal	Increasing Monsoon Activity	High	High	High
Aug	Above Normal	Peak Monsoon Influence	Very High	Very High	Very High
Sept	Near to Above Normal	Decreasing but Episodic Rainfall	Moderate to High	Moderate to High	Moderate

10. **GLOF Vulnerability JAS 2026**. As sustained high temperatures following the May–June warming period continue to drive intense glacier and seasonal snow melt, during July–September 2026, northern Pakistan is expected to remain in a peak GLOF susceptibility phase. This results in continuous meltwater accumulation in supraglacial and proglacial zones, causing rapid expansion and deepening of glacial lakes. These lakes,

often impounded by moraine dams, ice cores, or unconsolidated sediments, remain structurally weak and highly prone to failure under persistent thermal stress.

a. During July and August, hydrostatic pressure in glacial lakes increases significantly due to sustained inflow, weakening moraine stability through seepage, internal piping, and outlet erosion. NDMA advisories highlight that monsoon rainfall, slope failures, ice calving, and landslides into lake bodies act as key external triggers, often initiating sudden moraine breach or overtopping. These processes can rapidly generate Glacial Lake Outburst Flood (GLOF) events with little or no warning.

11. Once triggered, GLOFs travel rapidly through steep, confined valleys, carrying water, debris, and boulders, causing severe damage to settlements, bridges, roads, irrigation systems, and hydropower infrastructure. Consistent with NDMA risk profiling, Hunza, Ghizer, Gupis-Yasin, Shigar, Skardu, Astore, and Upper Chitral remain the most vulnerable basins. By September, although monsoon intensity and temperatures decline, residual melt and weakened moraine structures continue to sustain GLOF risk, requiring continuous monitoring and early warning.

Figure 64 Vulnerable GLOF Sites

Figure 65 Vulnerable Glacial Lakes

HEATWAVE

1. A heatwave is defined as a prolonged period of abnormally high temperatures, often accompanied by low rainfall, clear skies and persistent hot winds. In Pakistan, heatwaves occur in two forms: (a) dry heatwaves under high-pressure systems (April–June), and (b) humid heatwaves that elevate the Heat Index during the pre-monsoon period. Urban Heat Island effects in major cities further intensify impacts.

2. **Heatwave Projection (July–September 2026).** During July–August 2026, Pakistan is expected to experience generally warmer-than-normal conditions, primarily driven by a developing El Niño and below-normal monsoon rainfall. July will witness short duration heatwave episodes during extended dry spells, particularly over southern Punjab, Sindh, and parts of Balochistan, while August is expected to transition into a period of mild to moderate heat stress, moderated by intermittent monsoon activity and localized rainfall events.

   a. **July 2026.** July 2026 is expected to mark the onset of a significant heatwave phase across Pakistan, driven by a combination of above-normal temperatures, weak monsoon penetration, and prolonged dry conditions. Heat Index anomalies are projected to range between +2°C to +3°C higher than previous year. The anticipated weak advancement of the monsoon is likely to limit the usual cooling effects associated with seasonal rainfall, while extended dry spells between isolated precipitation events will allow heat to accumulate rapidly. Reduced cloud cover and lower atmospheric moisture levels are expected to further enhance daytime heating, while above-normal night-time temperatures will restrict overnight cooling and recovery from daytime heat stress. Urban centres of Punjab and Sindh, specifically, could experience relatively higher temperatures due to localized microclimatic influences such as the Urban Heat Island effect.

3. The highest heatwave risk is expected across Southern Punjab, including Bahawalpur, Rahim Yar Khan, Bahawalnagar, and D.G. Khan; Sindh, particularly Jacobabad, Kashmore, Sukkur, Larkana, and Khairpur; the plains of Balochistan, including Sibi, Nasirabad, Jaffarabad, and Dera Murad Jamali; the Potohar Region, including Chakwal, Attock, Jhelum, and Rawalpindi Division; and Southern and Central Khyber Pakhtunkhwa, particularly D.I. Khan, Tank, Bannu, and Lakki Marwat. These conditions are likely to result in frequent heatwave episodes lasting between three and

five consecutive days, increasing the risk of heat exhaustion, heatstroke, and other heat-related illnesses.

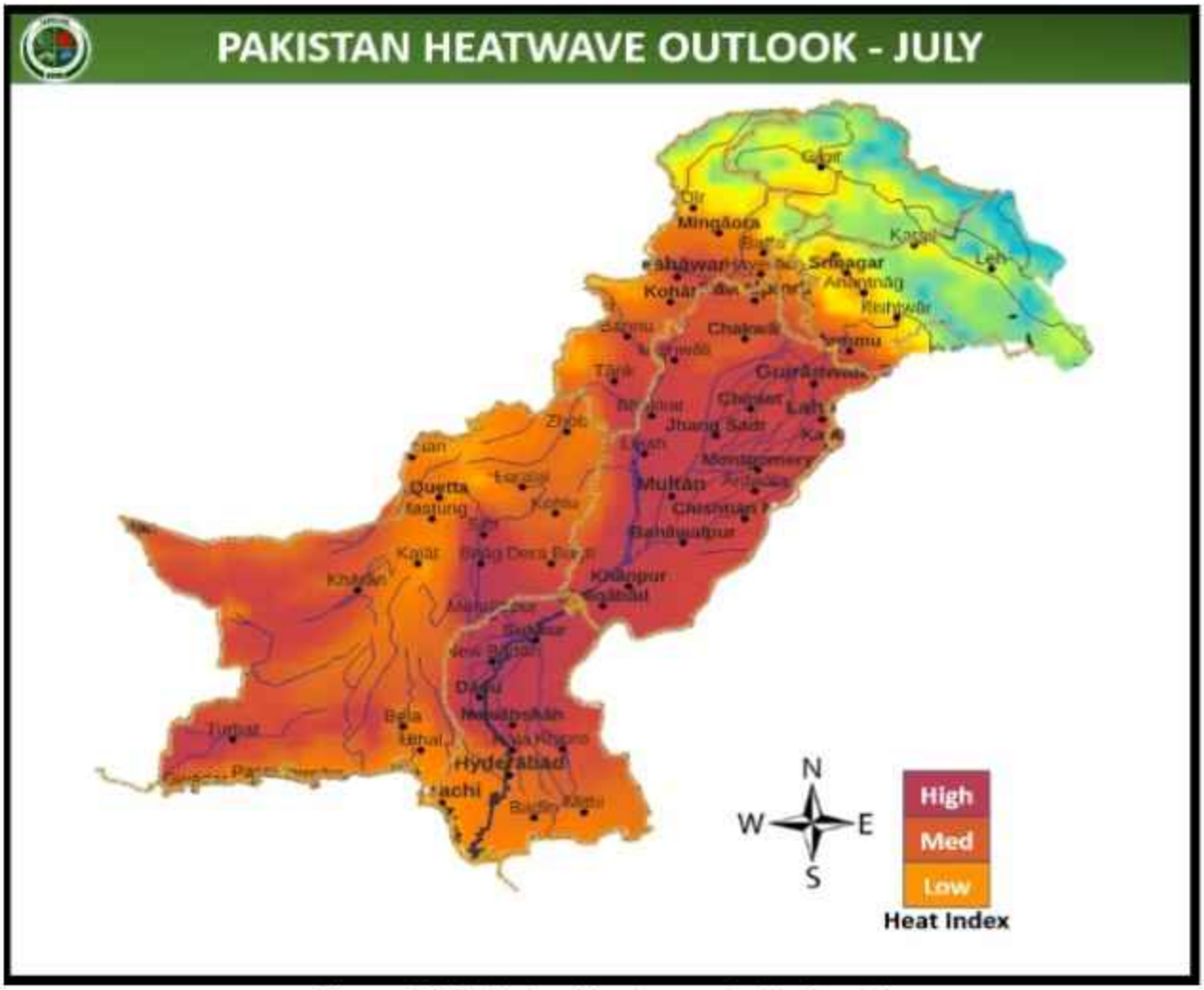


Figure 66 Pakistan Heatwave Outlook - July

a. **August 2026.** August 2026 is projected to be the t critical month of the season, with the potential for widespread and prolonged heat stress across Pakistan. Although August is typically the wettest month of the monsoon season, forecasts indicate that rainfall may remain at only 35–50% of normal levels, creating conditions conducive to heatwave development. Heat Index anomalies are projected to range between +2°C to +3°C higher than previous year. Limited rainfall is unlikely to provide meaningful thermal relief, and periods of elevated humidity following isolated precipitation events may generate dangerously high heat index values, making temperatures feel substantially hotter than measured air

temperatures. Continuous exposure to elevated temperatures since July is also expected to result in cumulative heat stress impacts on both human and natural systems.

4. The areas most vulnerable to these conditions include Central and Southern Punjab, Upper and Central Sindh, Eastern Balochistan, Southern Khyber Pakhtunkhwa, and major urban centers such as Islamabad, Rawalpindi, Lahore, Faisalabad, Multan, Hyderabad, Sukkur, and Peshawar.

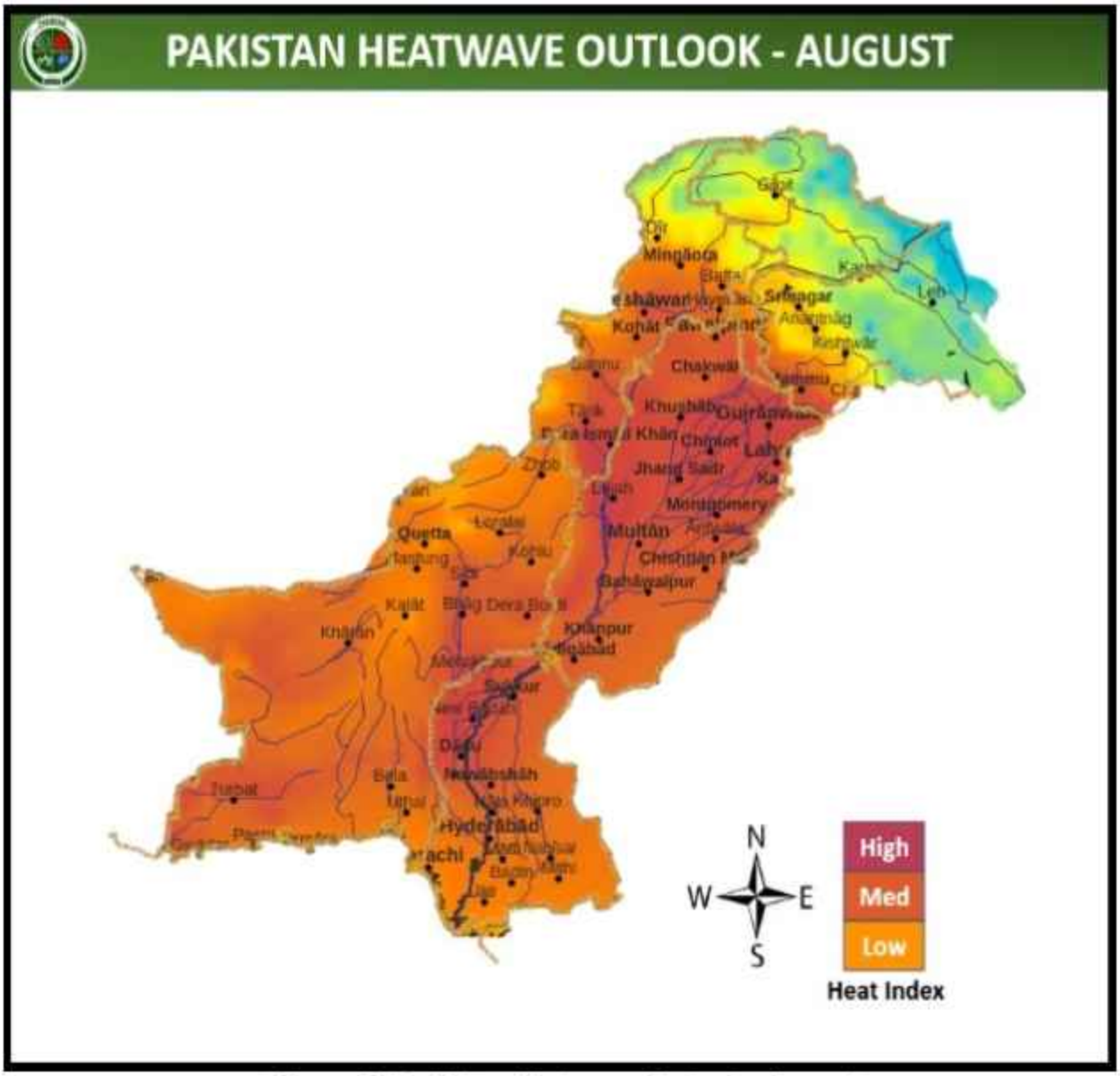


Figure 67 Pakistan Heatwave Outlook - August

FOREST FIRES

1. **July-August-September Overview.** The forest fire outlook for the monsoon period (July–September 2026) indicates reduction in wildfire risk across Pakistan, primarily driven by monsoon precipitation spells This moisture-enhancing factor generally reduce fuel dryness, limit ignition potential, and suppress fire spread across most ecological areas particularly northern forested zones of the country.

2. However, the outlook highlights strong spatial variability in rainfall distribution, which leads to uneven fire risk conditions. In particular, Balochistan may continue to experience moderate fire risk levels, especially during July, due to comparatively lower monsoon penetration, limited rainfall, and persistently dry vegetation conditions. These factors maintain a higher susceptibility to ignition in localized areas despite the broader monsoon influence across the country.

   a. During August and September, a precipitation deficit is expected, which may partially reduce the typical moisture benefits associated with the monsoon season. This deficit can maintain moderate dryness in certain regions. Consequently, while most forested zones of Pakistan are still expected to remain under low to moderate fire risk. In this context, Balochistan is likely to persist at low to moderate fire risk levels throughout August and September, driven by patchy rainfall distribution, sparse vegetation cover, and localized dry spells. Overall, the seasonal pattern reflects a generally suppressed but spatially heterogeneous fire risk regime, where monsoon conditions reduce large-scale fire potential, but regional dryness especially in western and southwestern Pakistan continues to warrant careful monitoring and preparedness.

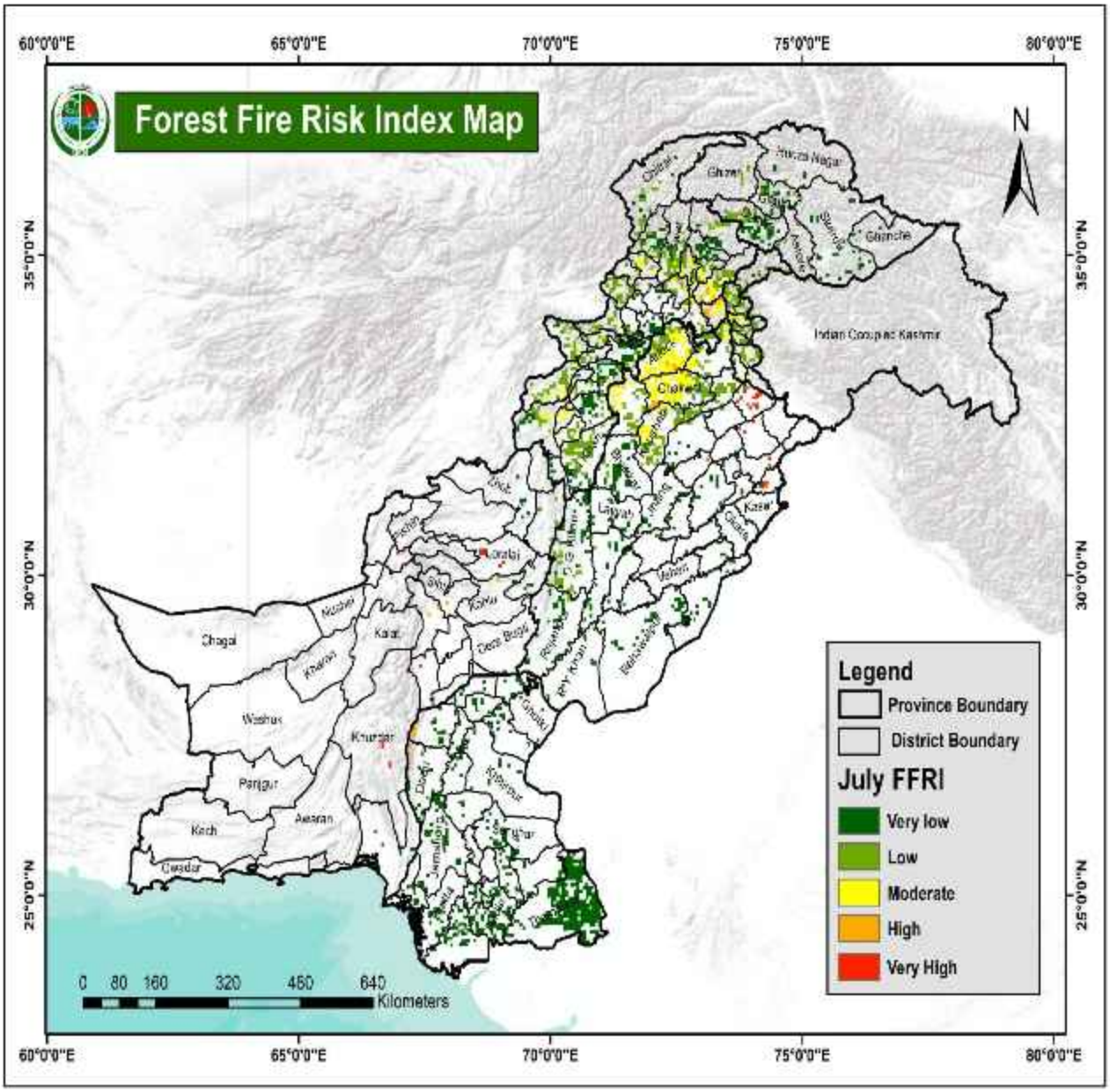


Figure 68 Forest Fire Risk Index Map

LANDSLIDES

1. **Landslide Early Warning Overview-July.** During July 2026, landslide susceptibility across the mountainous regions of Khyber Pakhtunkhwa, Azad Jammu & Kashmir, and Gilgit-Baltistan is expected to remain within High to Very High-risk categories. This elevated risk is driven by two convergent factors as projected by the monthly seasonal forecast.

a. First, a positive precipitation anomaly of +10 mm to +20 mm is forecast across the monsoon-influenced belts of northern Pakistan (reported by NDMA Met Team), indicating above-normal rainfall during the core monsoon month. Within KP, tehsils receiving direct monsoon incursion at elevated risk include Kalam, Mulkhow, Mastuj, Drosh, and Chitral, where rainfall-induced slope failures are expected. Within AJK, Sharda and Athmuqam tehsils along the Neelum Valley corridor fall under the highest rainfall impact zone.

b. Second, a positive surface temperature anomaly of +1°C to +2°C is projected across KP, GB, and AJK, which accelerates glacier melt and snowmelt in high-altitude catchments. Within GB, tehsils most influenced by thermal-driven meltwater include Gojal, Shigar, Astore, Nagar, Sikandar Abad, and Al Abad, where glacier-fed valleys (Hunza, Shigar, Astore) will experience enhanced slope saturation.

c. The simultaneous occurrence of enhanced monsoon rainfall and temperature-driven meltwater production creates a combined slope saturation effect that exceeds the impact of either forcing alone. This will increase pore-water pressure within soil and rock slopes, reduce effective stress, and elevate the probability of both shallow translational slides and deeper rotational failures. Tehsils where this convergence is most pronounced include Gojal and Astore (GB) receiving both rainfall and meltwater, Kalam and Chitral (KP) under peak monsoon with steep forested topography, and Sharda and Athmuqam (AJK) along the Neelum River cut slopes.

d. The most vulnerable physiographic settings include monsoon-dominant valleys (Neelum, Jhelum, Kunhar, Panjkora), glacier-fed valleys (Hunza, Shigar, Astore, Chitral), and transport corridors with unstable slopes. Specific transport segments and high-probability sites requiring enhanced

monitoring include the Karakoram Highway (KKH N-35) from Gojal to Diamir, with particularly vulnerable sites at Hassanabad landslide surrounding area near tunnels, Shishkat to Gulmit section, and the Ghizer River confluence near Gahkuch, as well as the KKH cut slopes through Sikandar Abad and Al Abad tehsils (Chalt-Chaprote section).

e. The Shimshal Valley local road connecting to Shimshal village travers's active landslide and lose sediments and debris flow fans with peak susceptibility during July. The Gilgit–Ghizer Shandur Road (N-140) from Gilgit to Gupis-Yasin Valley, including the Ghizer River gorge section near Phandar and the Yasin Valley approach through Darkut and Thoi, is vulnerable to both meltwater-induced and rainfall-triggered failures. The Neelum Valley Road (Jehlum Valley Road, S-2) between Sharda and Athmuqam, including Keran, Jura, and Dawarian sites where the road is carved into steep Neelum River cut slopes, remains highly susceptible.

f. The Lowari Pass Road from Drosh to Lowari Tunnel and beyond to Chitral town, including Arandu road and Shishi Koh valley, is highly vulnerable to monsoon rainfall. The Swat Valley Road (N-95) from Bahrain to Kalam, including Matiltan, Utror, Gabral, and Ushu valley approaches, lies within the peak monsoon precipitation zone with steep forested slopes.

g. The Babusar Pass Road (N-15) from Naran to Chilas via Babusar Pass, crossing Upper Chilas tehsil, experiences snowmelt-monsoon transition during July, with active slope failures near Tatta Pani and Thalichi, while the Chilas-Dassu-Pattan section along the Indus River section (KKH N-35 continuation) remains critically exposed to both river bank erosion and slope instability, particularly around Dassu bridge approach and Pattan landslide zone. The second half of July 2026, corresponding to peak monsoon incursion into northern Pakistan, represents the interval of highest landslide probability. Tehsil-wise susceptibility assessments derived from historical hotspot inventories and forecast anomalies are presented below.

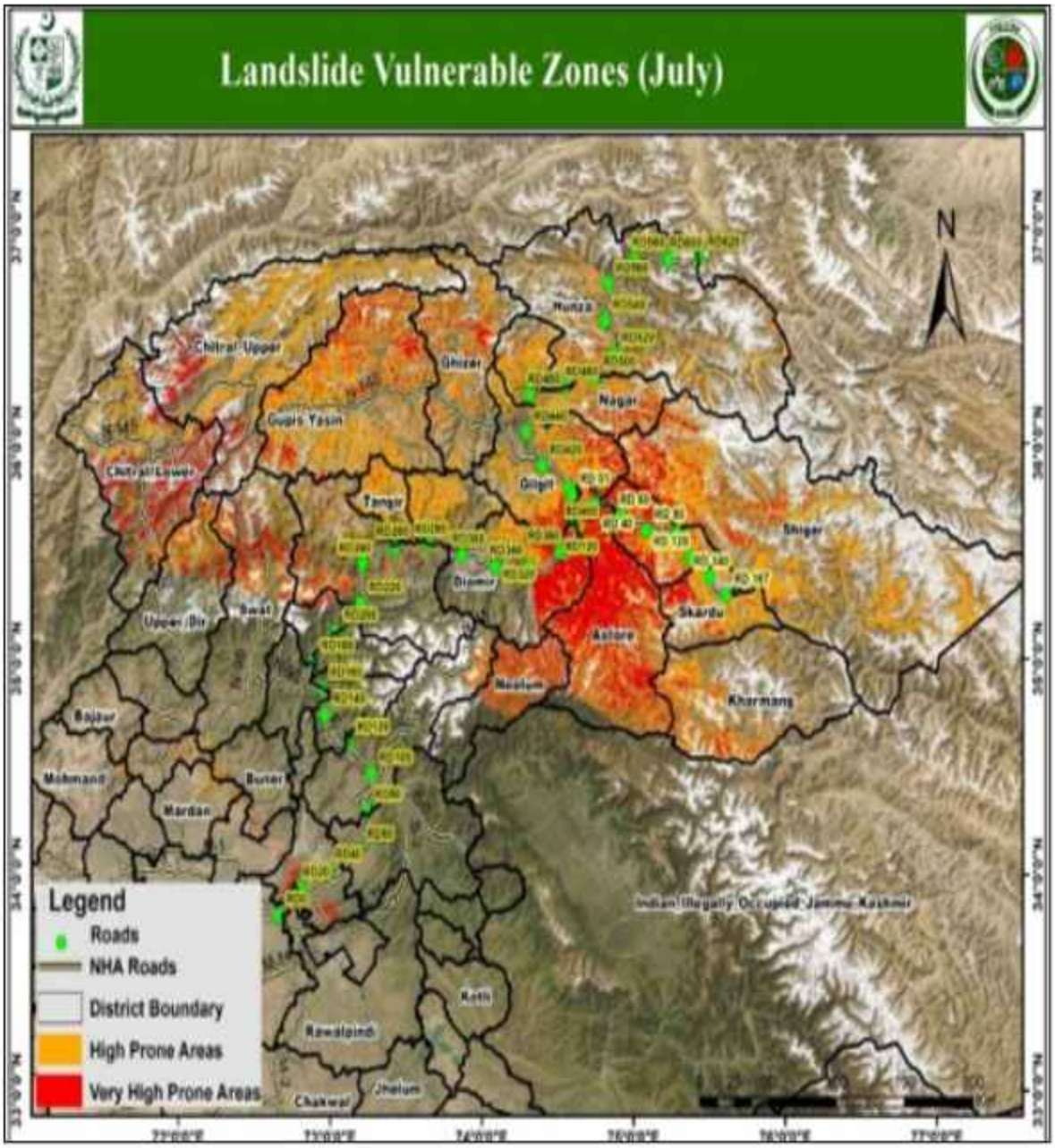


Figure 69 Landslide Vulnerable Zones for July

LANDSLIDE VULNERABLE SITES FOR JULY

Tehsil	Vulnerable Sites	Risk Level
Gilgit Baltistan (GB)		
Gojal	Attabad, Shishkat, Shimshal Valley Road	High to Very High
Shigar	Arandu, Askole-Braldu valley	High
Astore	Rama, Gorikot, Rattu, Minimarg road, Rupal valley	High
Nagar	Hoper glacier local road	High
Sikandar Abad	Sikandarabad-Nagar, Chalt, Chaprote.	High
Al Abad	Karimabad-Hassanabad, Ultar/Hassanabad glacier	High
Ishkoman	Ishkoman valley road, Immit, Chatorkhand	Moderate to High
Yasin	Yasin valley, Darkut.	Moderate to High
Gupis	Gupis town, Yasin-Gupis junction	Moderate
Phandar	Phandar valley, Shandur Road	Moderate
Tangir	Tangir valley access, Indus-facing slopes	Moderate
Darel	Darel valley, Gumari/Phuguch	Moderate
Skardu	Kachura-Satpara, Hargisa/Manthal, Strangbut	Moderate
Kharmang	Mehdiabad, Tolti, Olding, Shingo valleys	Moderate
Khaplu	Khaplu-Saling-Machulo, Thagas/Yugo, Barah Nala	Moderate
Mashabbrum	Hushe valley, Machulo-Halday, Kondus/Saltoro	Moderate
Rondu	Dambudas, Tormik, Haramosh section	Moderate

Upper Chilas	Tatta Pani, Babusar-Naran, KKH cliff sections	Moderate
Gultari	Gultari valley, Minimarg-Gultari	Low to Moderate
Daghoni	Daghoni-Dansam, Shyok riverbank	Low to Moderate
Shounter	Shounter valley, Rattu-Shounter link	Low to Moderate
Khyber Pakhtunkhwa (KP)		
Mulkhow	Mulkhow valley road, Booni-Mulkhow side valleys	High
Mastuj	Mastuj-Shandur Road, Booni-Mastuj road, Brep.	High
Lotkoh	Garam Chashma/Lotkoh valley road, Arkari valley, Karimabad/Susoom	Moderate to High
Chitral	Denin, Ayun-Bumburet Road, Chitral-Mastuj road	High
Drosh	Drosh-Lowari tunnel approach, Arandu road, Shishi Koh valley, Mirkhani side slopes	High
Shrengal	Sheringal/Patrak Road	Moderate to High
Kalkot	Kalkot-Kumrat valley, Thal/Patrak access, Dojanga side valleys	Moderate to High
Kalam	Matiltan, Utror, Gabral, Mankiyal, Ushu valley, Kalam-Bahrain road	High to Very High
Kandia	Kandia valley, Ghatti, Zarar Dara 1 and 2, Indus-side access	Moderate
Barang	Barang valley, hill slopes above local roads, Dir steep nullahs	Moderate
Daggar	Daggar-Buner, Gokand, Karakar Pass, Chagharzai side valleys	Moderate

AJK		
Sharda	Sharda town slopes, Sharda-Kel Road, Surgan/Basari side valleys, Neelum River bank cuts	High to Very High
Athmuqam	Athmuqam town and bypass slopes, Leswa, Dawarian, Keran, Jura, Neelum road cut slopes	High to Very High

2. **Landslide Early Warning Overview-August.** During August 2026, landslide susceptibility across the mountainous regions of Khyber Pakhtunkhwa, Azad Jammu & Kashmir, and Gilgit-Baltistan is expected to remain within Moderate to High-risk categories, though at levels reduced from July 2026 due to a negative rainfall anomaly. Despite this reduction, August remains the climatological peak of the monsoon season, and sufficient baseline rainfall combined with sustained thermal forcing will maintain active landslide hazard across northern Pakistan. A negative rainfall anomaly of -15 mm to -35 mm is forecast over KP, AJK, and most of GB, indicating drier-than-normal conditions compared to the August climatological baseline. However, the baseline normal for August in these regions is substantially high (typically 100-200 mm in monsoon).

3. Therefore, even with a negative anomaly, absolute rainfall amounts remain sufficient to cause soil saturation, increased pore-water pressure, and slope failures. Simultaneously, a positive thermal anomaly of +1°C to +2°C persists over northern GB (Hunza, Gojal, Nagar, Astore, Ghizer-Talidas), while central GB and northern KP/AJK show a moderate anomaly of +0.5°C to +1°C. This thermal forcing continues to accelerate glacier melt and snowmelt in high-altitude catchments, adding to slope saturation.

a. The combination of reduced-but-still-significant monsoon rainfall and sustained meltwater production maintains landslide susceptibility at Moderate to High levels during August 2026. Within Gilgit-Baltistan, tehsils experiencing High landslide susceptibility during August 2026 include Gojal, Al Abad, Talidas Ghizer, Sikandar Abad, and Nagar, where the Karakoram Highway (KKH N-35) traverses the Attabad Lake, hassanabad landslide zone, Chipurson Valley confluence, and the Shimshal Valley access road. Astore tehsil remains at High risk along the Rama, Gorikot, Rattu, and Minimarg roads.

b. Shigar tehsil shows High risk, particularly in the Khurdupin Valley, as well as the Shigar-Askole road and Basha valley. Rondu, Skardu, and Gilgit tehsils show Moderate risk. Diamer district tehsils (Upper Chilas, Tangir, Darel) show risk along the Chilas–Dassu–Pattan section (KKH N-35). Khaplu, Kharmang, Mashabbrum, Gultari, Daghoni, and Shounter show Low to Moderate risk.

c. Within Khyber Pakhtunkhwa, Chitral (Mulkhow, Mastuj, Lotkoh, Chitral, Drosh), Swat (Kalam), Upper Dir (Shrengal), and Kohistan (Kandia, Battera Kolai, Pattan, Palas) show Moderate to High risk from reduced-but-significant monsoon rainfall. The Lowari Pass corridor (N-45), Swat Valley Road (N-95), and Babusar Pass Road (N-15) require continued monitoring. Battagram (Allai) and Mansehra (Balakot) show Moderate risk. Haripur shows Low to Moderate risk. Within Azad Jammu & Kashmir, Neelum district (Sharda, Athmuqam, Leepa, Kel, Taobat) shows Moderate to High risk along the Neelum Valley Road. Muzaffarabad shows Moderate risk.

4. In conclusion during August 2026, rainfall is reduced compared to normal, yet August remains a hazardous month due to high baseline monsoon rainfall and sustained meltwater contribution. Landslide risk is assessed as Moderate to High-lower than July but sufficient to require continued early warning and preparedness. Tehsil-wise susceptibility assessments derived from historical hotspot inventories and forecast anomalies are presented below.

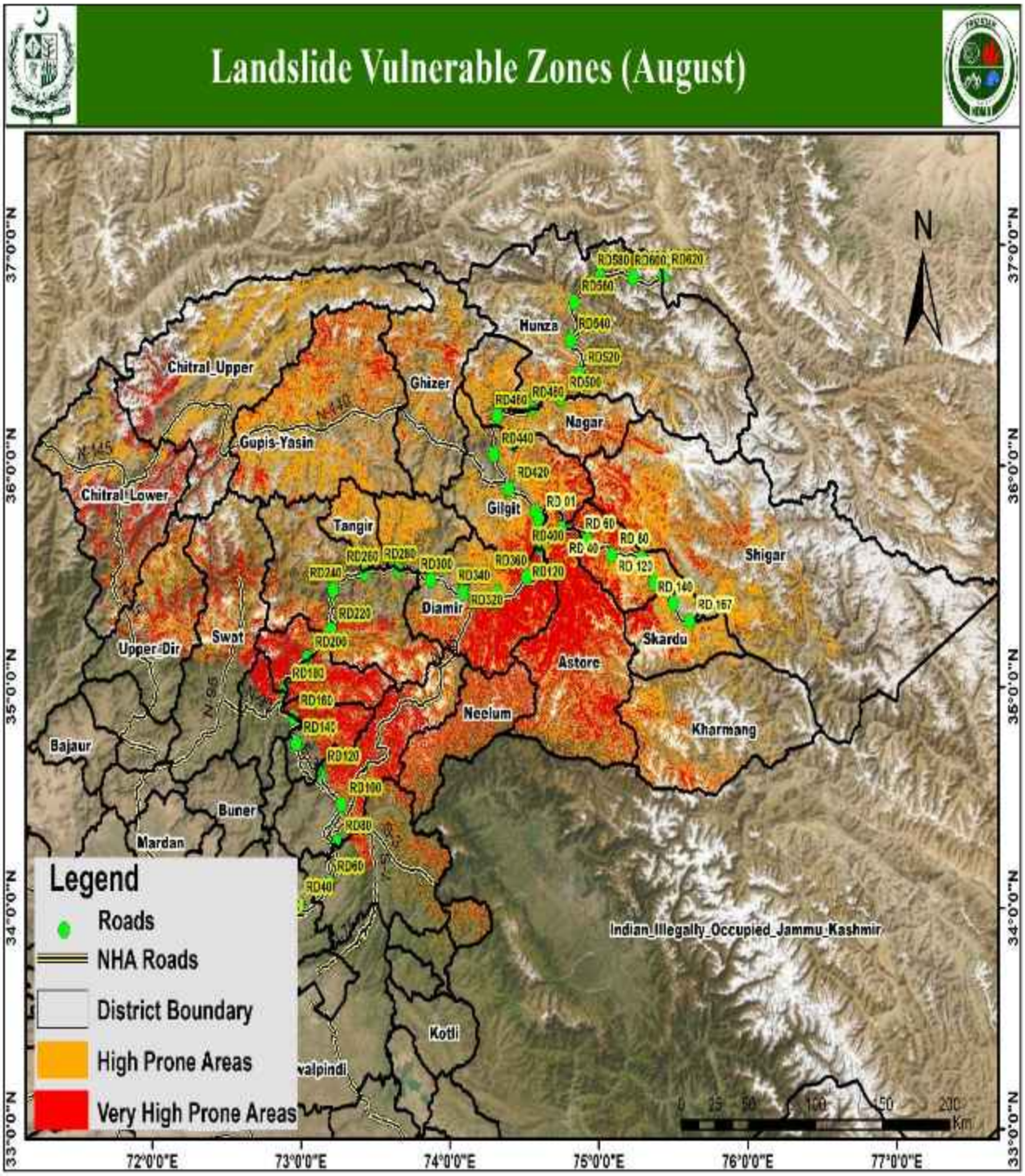


Figure 70 Landslide Vulnerable Zones for August

LANDSLIDE VULNERABLE SITES FOR AUGUST

Gilgit Baltistan (GB)		
Tehsil	**Vulnerable Sites**	**Risk Level**
Gojal	Attabad, Shishkat, Shimshal Valley Road	High
Al Abad	Karimabad-Hassanabad, Ultar/Hassanabad glacier	High
Sikandar Abad	Sikandarabad-Nagar, Chalt, Chaprote.	High
Nagar	Hoper glacier local road	High
Astore	Rama, Gorikot, Rattu, Minimarg road, Rupal valley	High
Shigar	Arandu, Askole-Braldu valley	High
Gupis	Gupis town, Yasin-Gupis junction	Moderate to High
Yasin	Yasin valley, Darkut.	Moderate to High
Ishkoman	Ishkoman valley road, Immit, Chatorkhand	Moderate to High
Phandar	Phandar valley, Shandur Road	Moderate to High
Rondu	Dambudas, Tormik, Haramosh section	Moderate
Skardu	Kachura-Satpara, Hargisa/Manthal, Strangbut	Moderate
Gilgit		Moderate
Upper Chilas	Tatta Pani, Babusar-Naran, KKH cliff sections	Moderate
Tangir	Tangir valley access, Indus-facing slopes	Moderate
Darel	Darel valley, Gumari/Phuguch	Moderate
Khaplu	Khaplu-Saling-Machulo, Thagas/Yugo, Barah Nala	Low to Moderate
Kharmang	Mehdiabad, Tolti, Olding, Shingo valleys	Low to Moderate

Mashabbrum	Hushe valley, Machulo-Halday, Kondus/Saltoro	Low to Moderate
Gultari	Gultari valley, Minimarg-Gultari	Low to Moderate
Daghoni	Daghoni-Dansam, Shyok riverbank	Low to Moderate
Shounter	Shounter valley, Rattu-Shounter link	Low to Moderate
Khyber Pakhtunkhwa (KP)		
Tehsil	**Vulnerable Sites**	**Risk Level**
Mastuj	Mastuj-Shandur Road, Booni-Mastuj road, Brep.	Moderate to High
Mulkhow	Mulkhow valley road, Booni-Mulkhow side valleys	Moderate to High
Lotkoh	Garam Chashma/Lotkoh valley road, Arkari valley, Karimabad/Susoom	Moderate to High
Chitral	Denin, Ayun-Bumburet Road, Chitral-Mastuj road	Moderate to High
Drosh	Drosh-Lowari tunnel approach, Arandu road, Shishi Koh valley, Mirkhani side slopes	Moderate to High
Shrengal	Sheringal/Patrak Road	Moderate to High
Kalkot	Kalkot-Kumrat valley, Thal/Patrak access, Dojanga side valleys	Moderate to High
Kalam	Matiltan, Utror, Gabral, Mankiyal, Ushu valley, Kalam-Bahrain road	Moderate to High
Kandia	Kandia valley, Ghatti, Zarar Dara 1 and 2, Indus-side access	Moderate
Battera Kolai	Badakot-UC,Kolai-Palas Indus-facing slopes, access tracks between Kolai/Batera and Palas valleys.	Moderate

Pattan	Sholgarah-to-Pattan section; Jijal area; Dubair valley/Dubair nullah; Pattan-to-Bursin	Moderate
Palas	Lower Palas Road; Palas nullah and tributary fans; Palas-Indus slopes	Moderate
Allai	Thandol village; Banna valley; Rashang valley; Batila side slopes; Biari-Jumbera access corridors; Allai valley road slopes	Moderate
Balakot	Ghanool area on Mansehra-Naran-Jalkhad road; Balakot-to-Kaghan/Naran route; Kewai-Shogran road; Paras/Suki Kinari side; Mahandri-Kaghan-Naran upper valley slopes; Kunhar valley road cuts.	Moderate
Daggar	Daggar-Buner, Gokand, Karakar Pass, Chagharzai side valleys	Moderate
Barang	Barang valley, hill slopes above local roads, Dir steep nullahs	Moderate

AJK		
Tehsil	**Vulnerable Sites**	**Risk Level**
Sharda	Sharda town slopes, Sharda-Kel Road, Surgan/Basari side valleys, Neelum River bank-cut slopes and road-cut cliffs.	Moderate to High
Athmuqam	Athmuqam town and bypass slopes, Leswa, Dawarian, Keran, Jura, Neelum road cut slopes and tributary fan areas.	Moderate to High
Leepa	Reshian Gali slopes; Dao Khan; Nowkot, Kasirkot and Chananian side valleys	Moderate to High
Kel	Shaikh Bela ; Kel-Arang Kel access slope and doli/track approaches; Kel-Sharda cut slopes; Kel-Janawai / upper Gurez	Moderate

Taobat	Helmet village slopes; Janwai to Halmat side valleys; Sardari and upper Gurez / Neelum riverbank slopes; Taobat Bala / Taobat Payeen	Moderate
Muzaffarabad	Ambore; Muneeri; Pir Chinasi Road and upper hill slopes; Jhelum Valley roadside slopes; Patikka; Domel; Chattar, Gojra and Naluchi.	Moderate

5. **Landslide Early Warning Overview-September.** During September 2026, landslide susceptibility across the mountainous regions of Khyber Pakhtunkhwa, Azad Jammu & Kashmir, and Gilgit-Baltistan is expected to decline from the July-August peak, settling into Low to Moderate risk categories, however, with localized pockets of Moderate to high risk persisting in glacier-fed valleys. This reduction in overall susceptibility is driven by the retreat of the southwest monsoon and the transition to post-monsoon conditions, as projected by the monthly seasonal forecast.

d. A negative rainfall anomaly of -4 mm to -15 mm is forecast across northern Pakistan (reported by NDMA Met Team), indicating below-normal precipitation during September. This rainfall deficit limits new soil saturation and reduces the frequency of rainfall-triggered slope failures. However, a positive thermal anomaly of +0.5°C to +1.5°C persists across KP, GB, and AJK, continuing to drive glacier melt and snowmelt in high-altitude catchments. Consequently, the primary landslide trigger during September 2026 shifts from monsoon rainfall-dominated (July-August) to meltwater-dominated, with thermal-driven slope saturation and debris flow activity becoming the main contributing factors in glacier-fed terrain.

e. Within Gilgit-Baltistan, tehsils where meltwater-induced landslide and debris flow susceptibility persists at Moderate levels include Gojal and Aliabad-karimabad, where the Chipurson Valley (a high-altitude tributary of upper Hunza) and the Shimshal Valley access road remain vulnerable to debris flows and slope failures during sustained warm spells.

f. The Shimshal Valley access road from Gojal tehsil, traversing active landslide and debris flow fans, requires continued monitoring as thermal anomalies sustain meltwater production. Additional GB tehsils with

persistent meltwater influence include Gupis, Yasin, Ishkoman, and Punial (Ghizer district), where the Gilgit-Ghizer Road along the Ghizer River gorge remains susceptible to melt-induced debris flows; Chilas, Tangir, and Darel (Diamer district), where the Chilas-Dassu-Pattan section along the Indus River gorge (KKH N-35) continues to experience bank erosion and slope instability. Nagar Valley, where glacier-fed streams transport debris onto the Karakoram Highway near Hisper and Hopar; and Astore, Rama, and Minimarg, maintain moderate to high slope instability along the Astore valley road. Tehsils showing risk during September include Skardu, Roundu, Shigar Valley, and Kharmang Valley, where meltwater contribution rise as temperatures rise.

g. Within Khyber Pakhtunkhwa, the negative rainfall anomaly (-4 to -15 mm) substantially reduces monsoon-triggered landslide activity compared to July-August. Tehsils with Moderate risk include Drosh and Chitral (Chitral Lower), and Mastuj (Chitral Upper), where the Lowari Pass Road retains more vulnerability to meltwater contribution from high-altitude catchments. Dir, Wari, and Kalkot, along with Bahrain, Kalam, and Matta, show declining risk as the Swat Valley Road returns to near-normal conditions. Kandia, Seo, and Dassu Upper Areas (Kohistan Upper), Balakot, Kaghan, and Naran (Mansehra), and Allai (Battagram) are assessed at moderate to high risk, with the Babusar Pass Road from Naran to Chilas showing snowmelt contribution.

h. Within Azad Jammu & Kashmir, the Neelum district tehsils of Athmuqam, Sharda, Kel, and Taobat experience declining monsoon influence, with risk reduced to Low to Moderate during September. However, the Neelum Valley Road between Sharda and Athmuqam, including Keran, Jura, and Dawarian sections, retains residual vulnerability to debris flows and slope failures triggered by localized convective rainfall or sustained warm spells affecting high-altitude catchments feeding the Neelum River.

i. The most critical transport corridor requiring continued monitoring during September 2026 is the Karakoram Highway (KKH N-35), particularly from Gojal to Gilgit, where meltwater-driven debris flows and slope failures may occur at Hassanabad landslide zone, Attabad Lake corridor (Shishkat-

Gulmit section), Chipurson Valley, and the Ghizer Talidas area, as well as the KKH through Sikandar Abad and Al Abad tehsils.

j. The Shimshal Valley access road remains vulnerable to debris flow events during periods of elevated temperature. The Gilgit-Ghizer Road, the Chilas-Dassu-Pattan section and the Neelum Valley Road require continued early warning dissemination, though at moderate alert levels compared to July-August.The first half of September 2026 may retain some residual monsoon influence, while the second half shows progressive drying and stabilization of slopes, with landslide activity becoming increasingly confined to glacier-proximal zones and steep meltwater channels. Tehsil-wise susceptibility assessments derived from historical hotspot inventories and forecast anomalies are presented below.

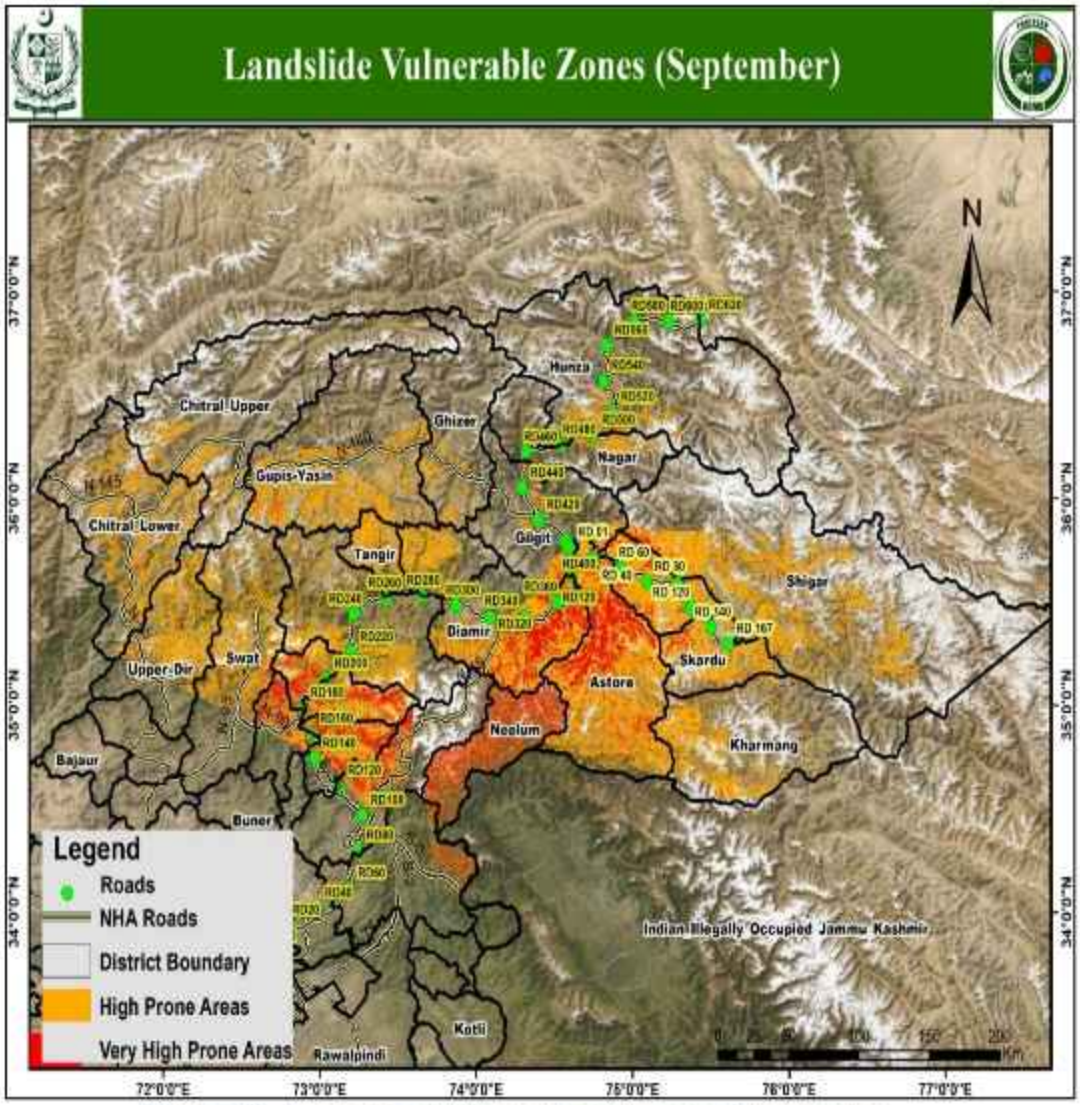


Figure 71 Landslide Vulnerable Zones for September

LANDSLIDE VULNERABLE SITES FOR SEPTEMBER

Gilgit Baltistan (GB)		
Tehsil	**Vulnerable Sites**	**Risk Level**
Hunza	Aliabad, Gojal	Moderate
Ghizer	Gupis, Yasin, Ishkoman, Punial, talidas	Moderate
Diamer	Chilas, Tangir, Darel	Moderate
Nagar	Nagar Valley	Moderate
Astore	Astore, Rama, Minimarg	Low to Moderate
Gilgit	Nomal Naltar	Moderate
Skardu	Skardu, Roundu	Moderate
Shigar	Shigar Valley	Moderate
Kharmang	Kharmang Valley	Moderate
Khyber Pakhtunkhwa (KP)		
Chitral Lower	Garam Chashma road, Drosh, Chitral	Moderate to high
Chitral Upper	Mastuj	Moderate
Swat	Bahrain, Kalam, Matta	Low to Moderate
Kohistan Upper	Kandia, Seo, Dassu Upper Areas	Moderate to high
Mansehra	Balakot, Kaghan, Naran	Low
AJK		
Neelum	Athmuqam, Sharda, Kel, Taobat	Low to Moderate

6. **Comparative Analyses.** July 2026 represents the period of highest landslide susceptibility across Gilgit-Baltistan, Khyber Pakhtunkhwa, and Azad Jammu & Kashmir, driven by the simultaneous occurrence of above-normal monsoon rainfall (+10 to +20 mm anomaly) and elevated temperatures (+1°C to +2°C anomaly). The combination of intense

precipitation and accelerated glacier/snowmelt produced widespread slope saturation, increasing pore-water pressure and triggering both shallow and deep-seated slope failures. Consequently, several tehsils, including Gojal, Astore, Kalam, Sharda, and Athmuqam, were assessed within High to Very High-risk categories, while major transport corridors such as the Karakoram Highway (N-35), Gilgit-Ghizer-Shandur Road (N-140), Swat Valley Road (N-95), Neelum Valley Road, and Lowari Pass Road faced elevated disruption potential. July therefore constituted the peak warning period, with the second half of the month identified as the interval of greatest landslide probability.

a. During August and September 2026, landslide susceptibility showed a progressive decline, reflecting the weakening influence of the monsoon. Although August remained hazardous due to the climatological monsoon peak, the forecast negative rainfall anomaly (-15 to -35 mm) reduced overall susceptibility from July levels, resulting primarily in Moderate to High-risk conditions. By September, with the retreat of the southwest monsoon and a further reduction in rainfall (-4 to -15 mm anomaly), landslide activity became increasingly controlled by temperature-driven glacier and snowmelt rather than rainfall. As a result, risk became concentrated within glacier-fed valleys and debris-flow-prone corridors of Hunza, Ghizer, Nagar, Astore, Chitral, Kohistan, and Neelum Valley, while many rainfall-dominated areas experienced stabilization.

7. Overall, the three-month progression indicates a transition from a rainfall-and-meltwater-driven regional landslide threat in July, to a reduced but still significant hazard in August, and finally to a localized meltwater-dominated hazard in September, with risk increasingly confined to high-altitude glacierized catchments and steep mountain transport corridors.

CYCLONES

1. **Hazard Overview**. Tropical cyclones are among the most destructive hydro-meteorological hazards affecting Pakistan's coastal regions, particularly along the Arabian Sea coastline. Cyclones develop due to a combination of warm sea surface temperatures, atmospheric instability, low-pressure systems, high moisture availability, and favorable wind circulation patterns. Their impacts are not limited to strong winds but extend to storm surge, coastal flooding, extreme rainfall, erosion, and disruption of critical infrastructure.

   a. Climate variability and rising ocean temperatures are altering cyclone risk patterns by creating conditions conducive to stronger, more moisture-rich systems. Rising sea surface temperatures increase the energy available for cyclone intensification, while changing atmospheric circulation may influence cyclone tracks and rainfall distribution.

   b. An analysis of multi-model global ensemble seasonal data reveals an increasingly unstable marine environment. Driven by positive Sea Surface Temperature (SST) anomalies combined with fluctuating atmospheric sea level pressures and altered low-level wind fields, the North Arabian Sea exhibits a moderate to high risk of tropical depressions or cyclonic storms. This assessment outlines mandatory strategic guidelines for federal, provincial, and district disaster management tiers to ensure a proactive, synchronized response to impending hydro-meteorological hazards.

Figure 72 Cyclone Compound Matrix

2. **Comparative Analysis (2020–2026).** The recent cyclones affecting Pakistan's coastal region, including Cyclones Tauktae (2021), Gulab–Shaheen (2021), Biparjoy (2023), Asna (2024), and Shakhti (2025), developed under a combination of exceptionally warm Arabian Sea sea-surface temperatures, elevated ocean heat content, favorable moisture availability, and periods of reduced vertical wind shear. Several of these systems were further supported by active monsoon circulation, enhanced convection, and favorable large-scale atmospheric conditions that allowed rapid intensification or unusual storm tracks toward the northern Arabian Sea.

3. In comparison, the projected 2026 climate background is expected to be dominated by a strong El Niño and a weakly positive Indian Ocean Dipole (IOD), creating a different large-scale environment. While Arabian Sea temperatures are likely to remain above normal and capable of supporting tropical cyclone development, El Niño-related atmospheric suppression may reduce the frequency of organized cyclonic disturbances and weaken monsoon circulation over the region. Consequently, the 2026 season may not necessarily produce as many favorable genesis opportunities as observed during some recent cyclone years; however, any system that does form over the anomalously warm Arabian Sea could still intensify rapidly and pose a significant threat to the Sindh and Makran coasts. Therefore, despite potentially lower cyclone frequency, the risk of isolated high-impact events characterized by strong winds, storm surges, coastal flooding, and extreme rainfall cannot be ruled out, warranting continuous monitoring of sea-surface temperatures, ocean heat content, Madden-Julian Oscillation activity, and vertical wind shear throughout the cyclone season, as tabulated below: -

Cyclone	Year	Peak Intensity Segment	Landfall	Impact
Tauktae	2021	Category 4 Equivalent	Gujarat, India	Karachi (Severe dust storm/heatwave)
Shaheen	2021	Severe Cyclonic Storm	Oman	Karachi, Makran Coastal Belt
Biparjoy	2023	Category 3 Equivalent	Pak-India Border	Keti Bandar, Badin, Thatta
Asna	2024	Cyclonic Storm	Skirted off-shore	Coastal Sindh & Balochistan
Shakhti	2025	Severe Cyclonic Storm	Recurved/ Weakened	Coastal Sindh, Hub, Lasbela

4. **Global Drivers of Tropical Cyclone Genesis Along the Pakistan Coast**

a. **El Niño**. The risk of tropical cyclone development over the Arabian Sea and along the Pakistan coast is primarily influenced by a combination of large-scale oceanic and atmospheric drivers. During 2026, a strong El Niño is projected to modify atmospheric circulation patterns across the Indian Ocean, potentially creating periods of reduced vertical wind shear and favorable environmental conditions for cyclone intensification over the Arabian Sea. Concurrently, a near-neutral to weakly positive Indian Ocean Dipole (IOD) may contribute to above-normal sea surface temperatures across the western Indian Ocean, enhancing oceanic heat availability for tropical cyclone formation.

b. **Madden-Julian Oscillation (MJO)**. The Madden-Julian Oscillation (MJO) will remain an important short-term trigger for cyclone genesis. Active MJO phases propagating across the Indian Ocean can significantly enhance convection, moisture convergence, and low-pressure development, increasing the likelihood of cyclonic disturbances. Elevated sea surface temperatures and high ocean heat content across the Arabian Sea may further support the rapid intensification of any developing system by providing additional latent heat energy.

c. **Other Drivers**. Other critical drivers include low vertical wind shear, enhanced low-level cyclonic vorticity, favorable positioning of the Intertropical Convergence Zone (ITCZ), and the strength of the monsoon trough over the northern Indian Ocean. Periods characterized by suppressed outgoing longwave radiation (OLR) and increased convective activity may indicate enhanced cyclone formation potential. Collectively, these global and regional climate drivers suggest that the Pakistan coastal belt, particularly the Sindh and Makran coasts, should remain under close monitoring during the pre-monsoon (May-June) and post-monsoon (October-November) cyclone seasons, when environmental conditions are typically most favorable for tropical cyclone development in the Arabian Sea.

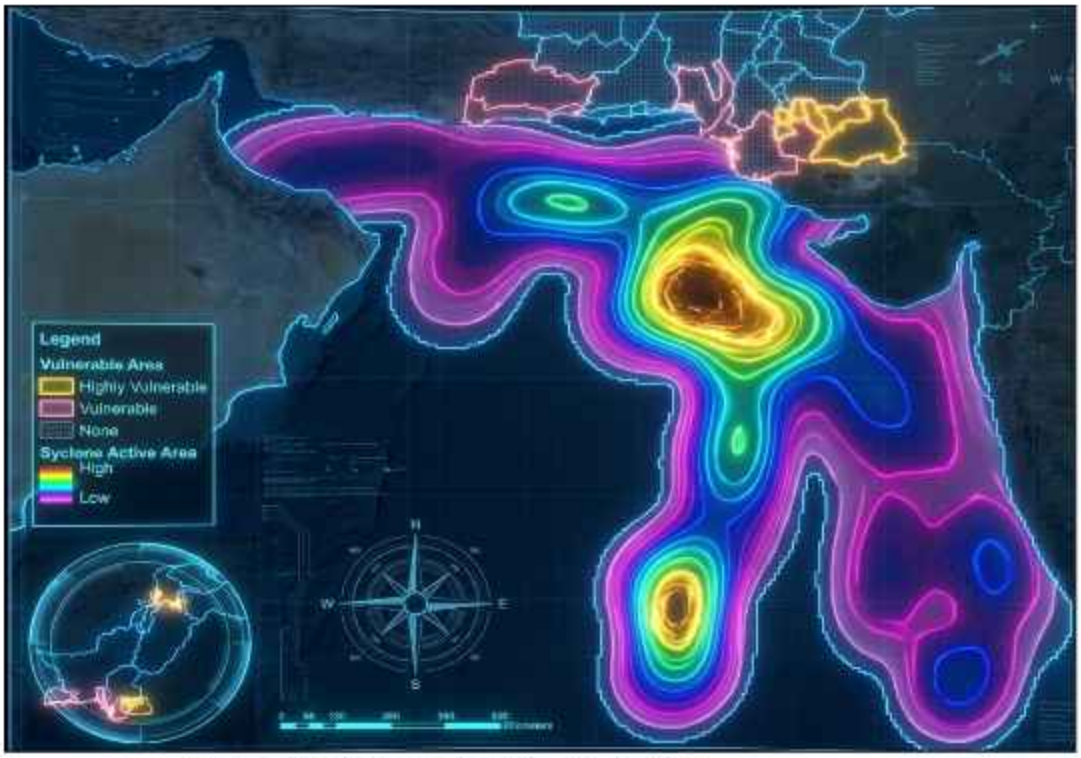


Figure 73 Cyclonic Activity Risk Zone

5. **Outlook for July 2026.** During July 2026, tropical cyclone development along the Pakistan coast is expected to remain constrained by the broader influence of a strong El Niño event, which typically suppresses large-scale convection and weakens monsoon circulation across the northern Indian Ocean. Although a weakly positive Indian Ocean Dipole (IOD) and above-normal Arabian Sea temperatures continue to provide a favorable oceanic energy source, atmospheric conditions are projected to remain only marginally supportive of organized cyclogenesis. The Madden-Julian Oscillation (MJO) is not expected to provide sustained enhancement of convection during much of the month, while the active monsoon trough over the subcontinent is likely to focus weather activity inland rather than over the northern Arabian Sea. Consequently, despite the presence of warm waters and adequate moisture availability, the overall combination of global climate drivers suggests limited cyclone genesis potential during July, with monsoon-related heavy rainfall and localized flooding representing the primary coastal hazards.

6. In July 2026, thermal dynamics across the North Arabian Sea are projected to remain relatively stable, with marine baselines displaying only slight positive warm anomalies hovering between +0.2°C and +0.5°C. Simultaneously, atmospheric pressure fields reveal pronounced negative sea level pressure anomalies concentrated over inland Pakistan, a configuration that stabilizes a normal to slightly enhanced seasonal monsoon

trough line. In terms of wind regimes, positive wind speed anomalies ranging from +1.5km/h to +5km/h will develop over the East-Central Arabian Sea, effectively extending rich moisture plumes into southeast Sindh, particularly the Tharparkar region, while lighter, negative anomalies are noted over inland Balochistan. Consequently, this month is classified as LOW RISK for tropical cyclogenesis; however, standard monsoonal risks for heavy localized precipitation and urban flooding remain actively monitored for coastal hubs including Karachi, Thatta, and Badin.

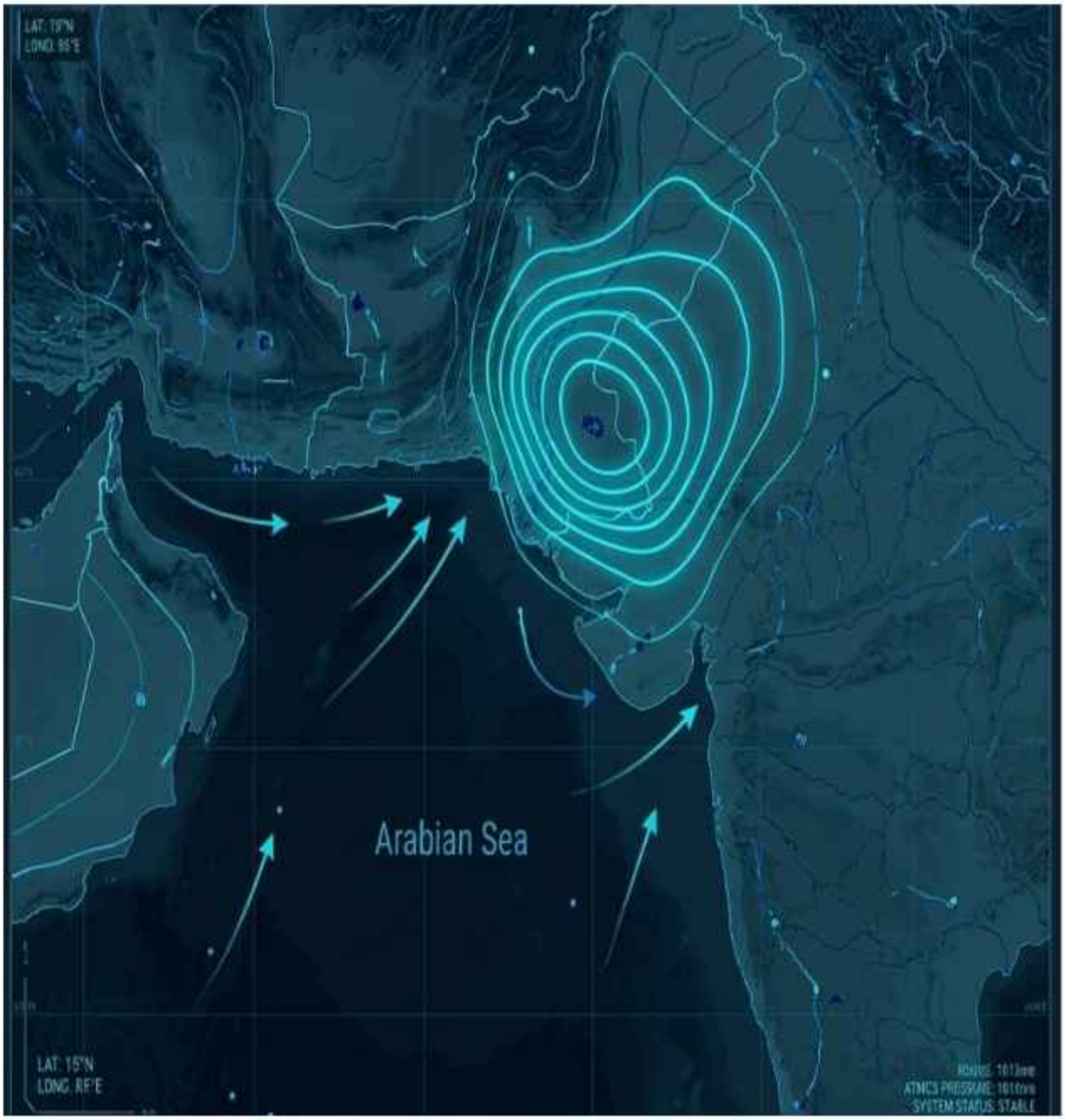


Figure 74 Cyclone Projection July

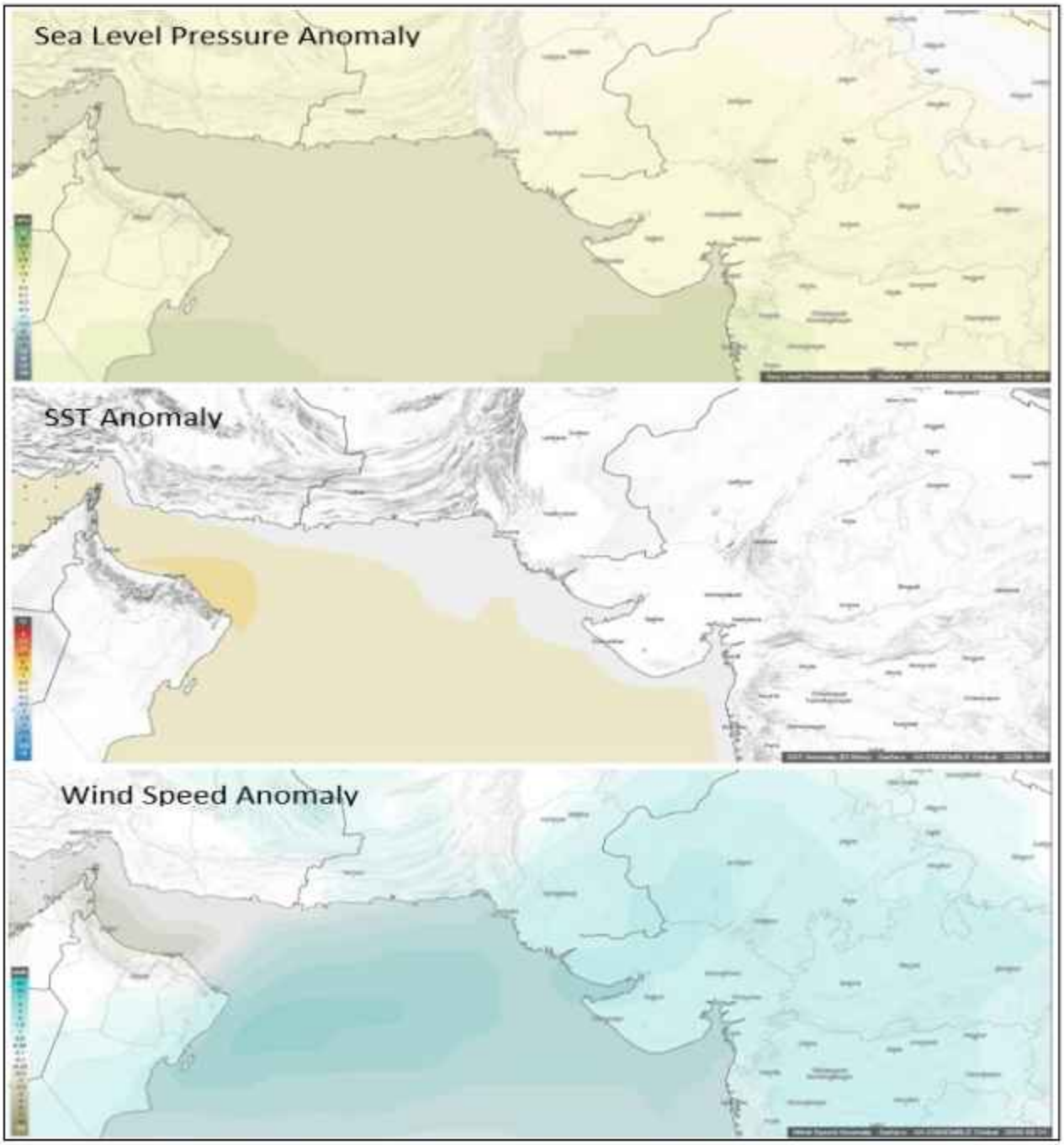


Figure 75 Sea level pressure, SST, Wind Speed Anomalies for July

7. **Outlook for August 2026.** The gradual warming of the Arabian Sea during August occurs within a broader climate setting characterized by strong El Niño conditions, weakly positive IOD influence, and increasing ocean heat content across the northern Indian Ocean. Although El Niño may continue to suppress large-scale monsoon activity, the combination of warmer sea surface temperatures, enhanced low-level moisture transport, and intermittent Madden-Julian Oscillation activity may create favorable conditions for the development of deep depressions and organized low-pressure systems over the Arabian

Sea. Historically, August serves as a transitional month during which marine energy begins to accumulate, increasing the probability of cyclonic disturbances affecting the northern Arabian Sea and Pakistan's coastal waters.

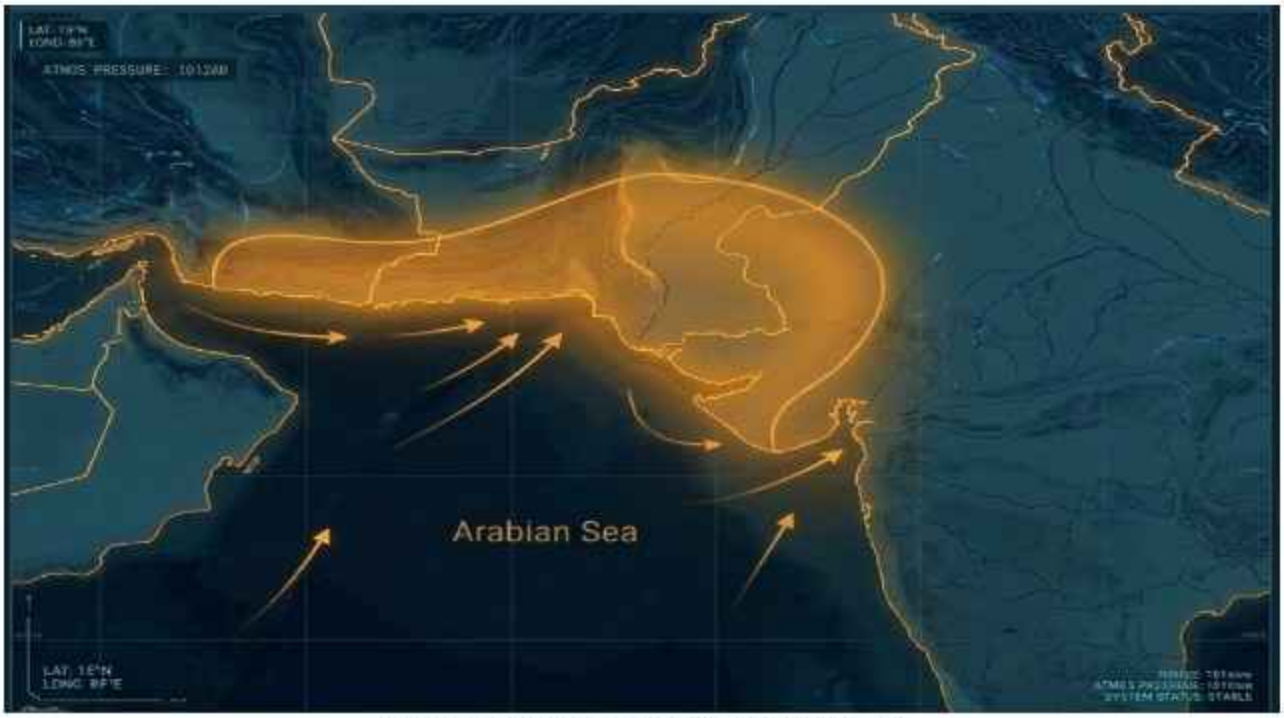


Figure 76 Cyclone Projection August

8. The atmospheric setup transitions significantly into August 2026 as thermal dynamics begin to consolidate across the central and northern basins of the Arabian Sea, with sea surface temperatures settling uniformly at a warmer +0.5°C above seasonal means. This oceanic warming is accompanied by a developing atmospheric pressure anomaly where a broad zone of weaker, lower-than-normal sea level pressure spreads directly over the northern marine environment, effectively elevating overall column instability. Wind regimes complement this instability as enhanced wind speed vectors persist across the coastal shelf, feeding deep, low-level marine moisture straight into southern Sindh and the lower Indus Delta. Based on these evolving parameters, there is moderate risk rating, noting that the regional matrix is shifting toward supporting deep maritime depressions or early-stage cyclonic formations, which amplifies the immediate threat of coastal inundation and high surf for the Indus Delta, Pasni, and Gwadar.

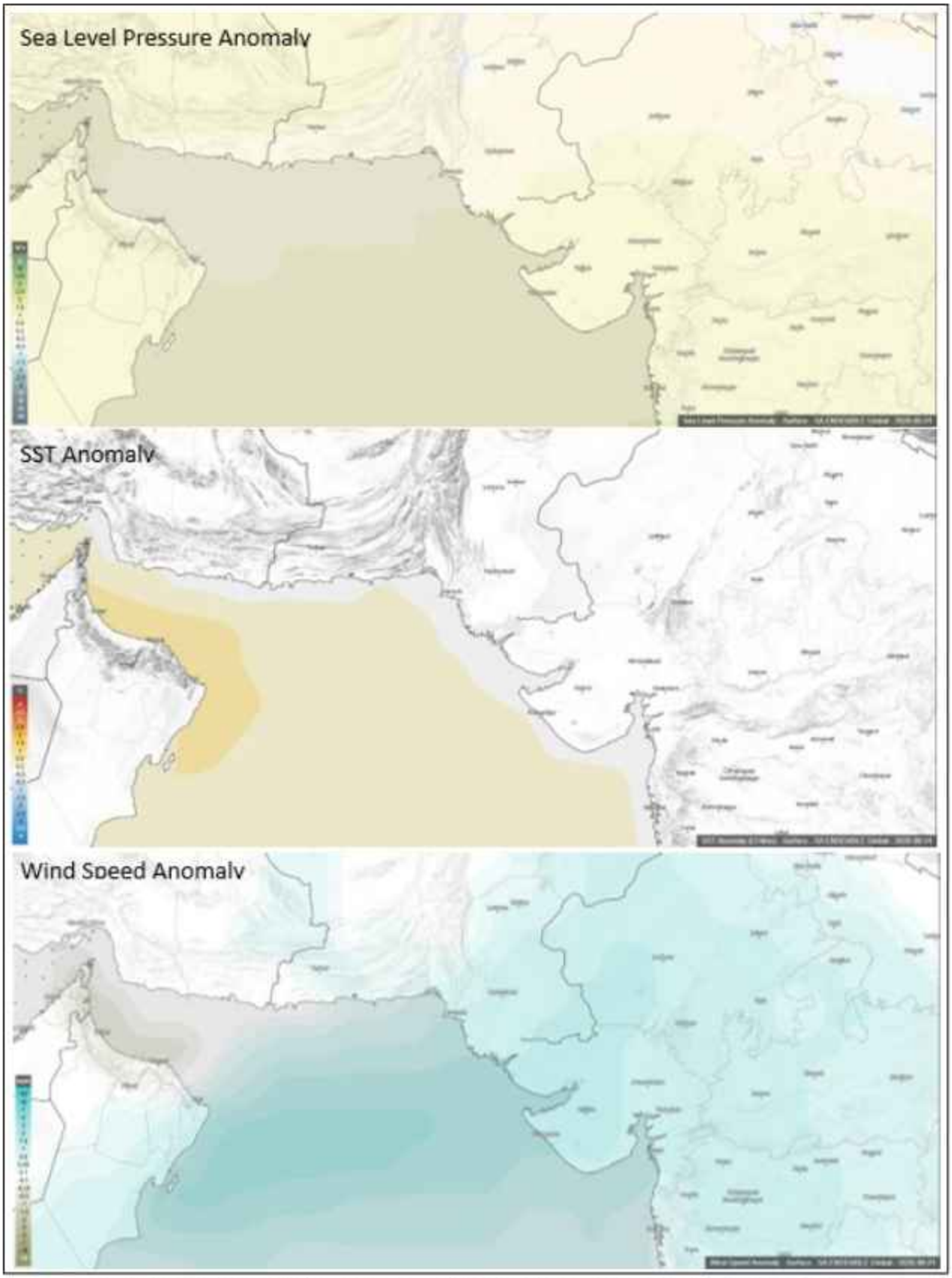


Figure 77 Sea level pressure, SST, Wind Speed Anomalies for August

9. **Outlook for September 2026.** September represents the most climatologically favorable month for cyclone development within the JAS period as the Arabian Sea typically reaches its highest sea surface temperatures and ocean heat content. During 2026, the influence of anomalously warm waters, weakening monsoon circulation, and the seasonal retreat of the monsoon trough may create an environment conducive to organized cyclonic circulation over the northern Arabian Sea. While El Niño conditions may continue to limit the overall number of disturbances, any system that develops during this period could encounter highly favorable thermodynamic conditions for intensification. Consequently, the convergence of elevated oceanic heat, reduced marine pressure, enhanced moisture availability, and favorable wind patterns significantly increases cyclone genesis potential near the Pakistan coast during September.

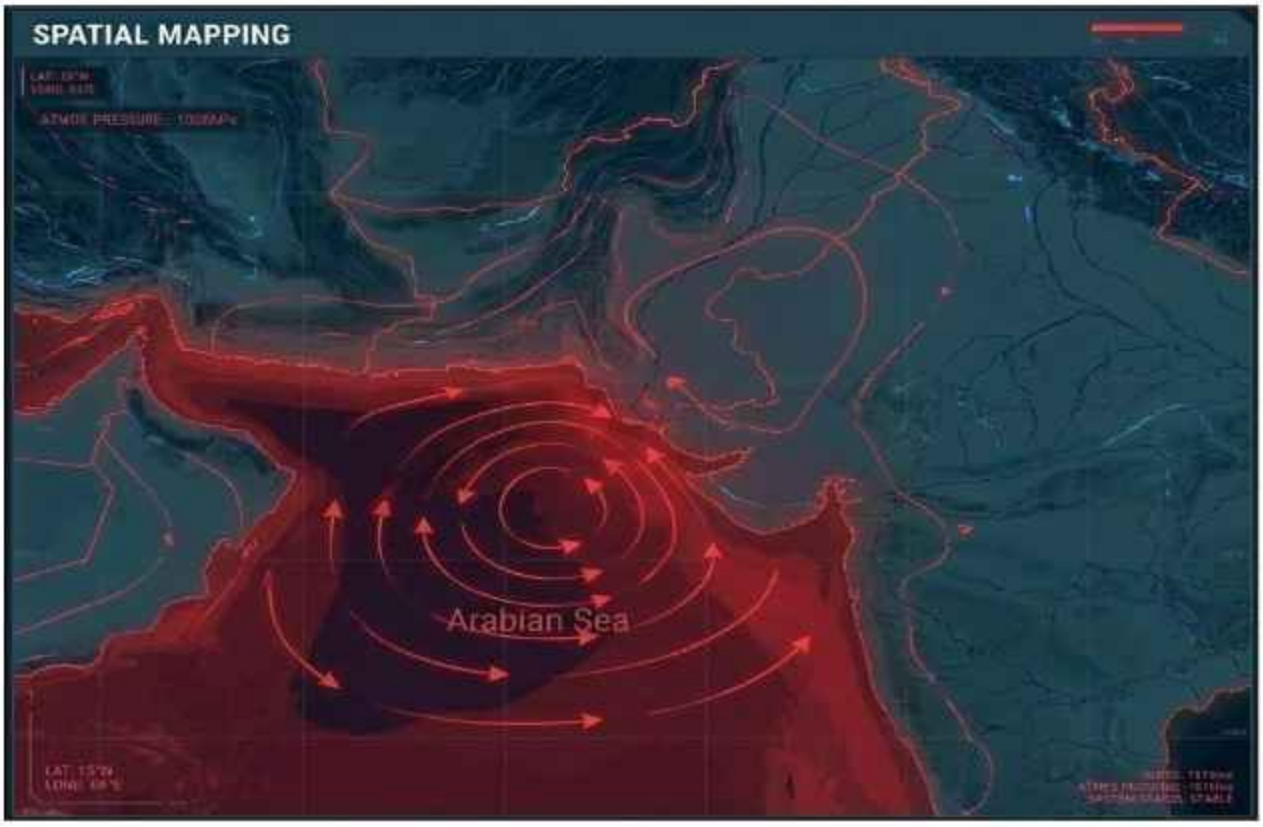


Figure 78 Cyclone Projection September

10. By September 2026, the coastal risk profile reaches its peak as thermal anomalies sharply intensify, expanding to elevated values between +0.5°C and +1.5°C directly parallel to Karachi, the Indus Delta, and the entire Makran coast. This severe thermal loading coincides with a major atmospheric shift where inland landmasses transition toward positive pressure anomalies of +0.2 to +1.0hPa—signalling the inland withdrawal of the seasonal monsoon—while the adjacent marine basin maintains weaker, highly

volatile pressure field. Most critically, wind regimes undergo a dangerous transition, shifting into a distinct, well-organized cyclonic circulation signature directly over the northern marine basin that converges straight toward Pakistan's coastline. Due to this highly alarming convergence of high thermal energy, low barometric marine pressure, and strong cyclonic vorticity, there is a HIGH-RISK rating for this period, warning that the final month of the quarter presents an optimal, dangerous window for severe cyclogenesis.

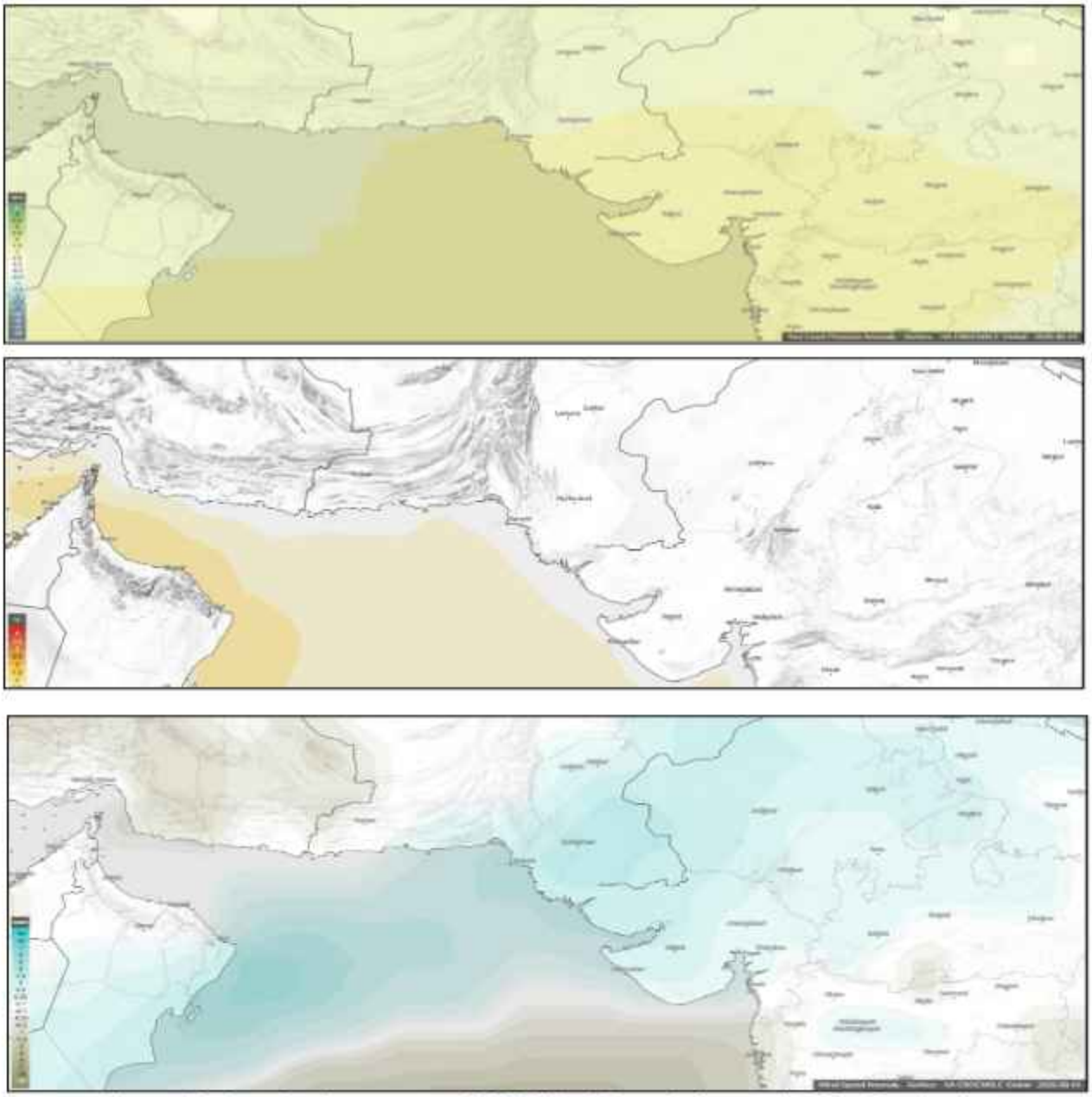


Figure 79 Sea level pressure, SST, Wind Speed Anomalies for September

11. **Seasonal Cyclone Risk Assessment for Pakistan Coast (JAS 2026).** Overall, the July–September 2026 cyclone season is expected to exhibit a progressive increase in cyclone genesis potential across the northern Arabian Sea. July is projected to remain largely dominated by monsoon-related weather systems with limited support for organized tropical cyclone formation despite adequate moisture availability. During August, warming sea surface temperatures, increasing ocean heat content, and enhanced marine instability may elevate the risk of deep depressions and early-stage cyclonic systems. By September, environmental conditions become most favorable for tropical cyclone development as oceanic heat reaches seasonal maxima and atmospheric circulation patterns transition toward a post-monsoon configuration. Although the projected strong El Niño may reduce the overall frequency of tropical cyclones compared with some recent active seasons, the persistently warm Arabian Sea and elevated ocean heat content suggest that any cyclone that does develop could intensify rapidly and produce significant impacts. Therefore, the highest coastal hazard risk during JAS 2026 is expected during late August and particularly September, with Sindh and the Makran coast remaining vulnerable to strong winds, heavy rainfall, storm surges, coastal flooding, and marine hazards.

DISASTER IMPACT ON MAJOR KHARIF CROPS OF PAKISTAN

1. Agriculture constitutes a vital component of Pakistan's economy, serving as a key driver of food security, employment, and economic development. The sector includes crop cultivation, livestock production, fisheries, and forestry, and contributes approximately **23.4%** to the national GDP, while providing employment to **37–42%** of the labor force. Beyond its economic significance, agriculture supports agro-based industries, rural livelihoods, and national food systems, making it highly important for sustainable development and resilience to climatic and environmental challenges. The agricultural system of Pakistan is predominantly based on the Indus Basin Irrigation System, which supports the production of major crops for Rabi and Kharif seasons. Agricultural productivity in Pakistan is largely influence by climatic conditions, water availability, soil resources, and seasonal cropping patterns. Pakistan's agricultural system is divided into two major cropping seasons Rabi and Kharif. The Rabi season is characterized by the cultivation of crops such as wheat, spring maize, pulses, and various vegetables, while the Kharif season primarily includes rice, cotton, maize, and sugarcane. These cropping seasons play a vital role in ensuring food security, supporting rural livelihoods, and contributing to the country's agricultural production throughout the year.

2. **Agricultural Production Trends and Disaster Impacts on Major Kharif Crops (2021–2025).** Agricultural production remained relatively stable during 2021–22, with only minor disaster-related impacts observed across major Kharif crops. Rice and sugarcane experienced limited losses, while cotton and maize recorded comparatively higher reductions due to localized climatic stresses. Overall, production remained close to its estimated potential under normal conditions.

   a. During **2022–2023**, the four major Kharif crops, rice, cotton, maize, and sugarcane were cultivated on a combined area of 8.16 million hectares. Rice occupied the largest area 2.98 million hectares, followed by cotton 2.14 million hectares, maize 1.72 million hectares, and sugarcane 1.32 million hectares. The season was significantly affected by the impacts of the 2022 floods, particularly on rice and cotton production.

3. Rice production recovered strongly in year **2023–2024** after the severe impacts of the 2022 floods, increasing from 7.32 to 9.87 million tons. Cotton showed the largest recovery, more than doubling from 4.91 to 10.22 million bales as cultivated area and crop conditions improved after the flood-affected season. Maize production declined from 10.99

to 9.85 million tons due to reduced cultivated area. Sugarcane remained relatively stable, with production decreasing only marginally from 87.98 to 87.64 million tons.

4. The year **2024–2025**, rice remained relatively stable with production of 9.78 million tons from approximately 3.6 million hectares. Cotton production declined significantly to 5.52 million bales, while maize production fell to 9.30 million tons. Sugarcane production also decreased slightly to 83.5 million tons, despite a marginal increase in cultivated area.

a. During the **2025–26** crop year, rice production is estimated at 9.99 million tons, with approximately 1.51 million tons lost due to disaster events and adverse climatic conditions. Cotton production is estimated at 7.05 million bales, with losses of around 3.45 million bales, making it the most affected crop. Maize production is estimated at 9.70 million tons, with an estimated loss of 2.30 million tons, while sugarcane production is estimated at 84.50 million tons, with losses of approximately 3.80 million tons. These figures indicate that, under normal conditions, the production of all major Kharif crops would have been substantially higher. Losses due to disaster or climatic activities and potential production without disaster along with actual production are shown in the following table.

5. **DISASTER IMPACTS ON MAJOR KHARIF CROPS PRODUCTION (2021–2025)**

Crop	(2021-22) Production (M T/B)	Loss Due to Disaster (M T/B)	Potential output w/o Disaster (M T/B)	(2022-23) Production (M T/B)	Loss Due to Disaster (M T/B)	Potential Production w/o Disaster (M T/B)	(2023-24) Production	Loss Due to Disaster (M T/B)	Potential Production w/o Disaster (M T/B)
Rice	9.32	0.30	9.62	7.32	2.00	9.32	9.78	0.30	10.08
Cotton	8.33	2.23	10.56	3.9	4.41	8.31	8.35	2.37	10.72
Maize	9.52	1.31	10.83	8.74	1.50	10.24	9.21	0.92	10.13
Sugarcane	88.65	0.60	89.25	87.64	1.50	89.14	86.4	1.64	88.04

1. **Production Targets and Spatial Distribution of Major Kharif Crops (2026)**

According to the Ministry of National Food Security & Research (MNFSR), Government of Pakistan, production targets for major Kharif crops for 2026–27 were approved during the Federal Committee on Agriculture meeting held on 14 April 2026. The Committee deliberated on production targets for essential Kharif crops. The associated spatial distribution map shows the major cultivation areas of rice, cotton, maize, and sugarcane across Pakistan. This provides an overview of the national production outlook and the geographical distribution of major Kharif crops, serving as a basis for assessing potential climate-related risks and their implications for agricultural productivity. Forecasted medium to high flooding in the Kabul, Swat, and Upper Indus rivers during July could pose a significant risk to agricultural production in flood-prone regions.

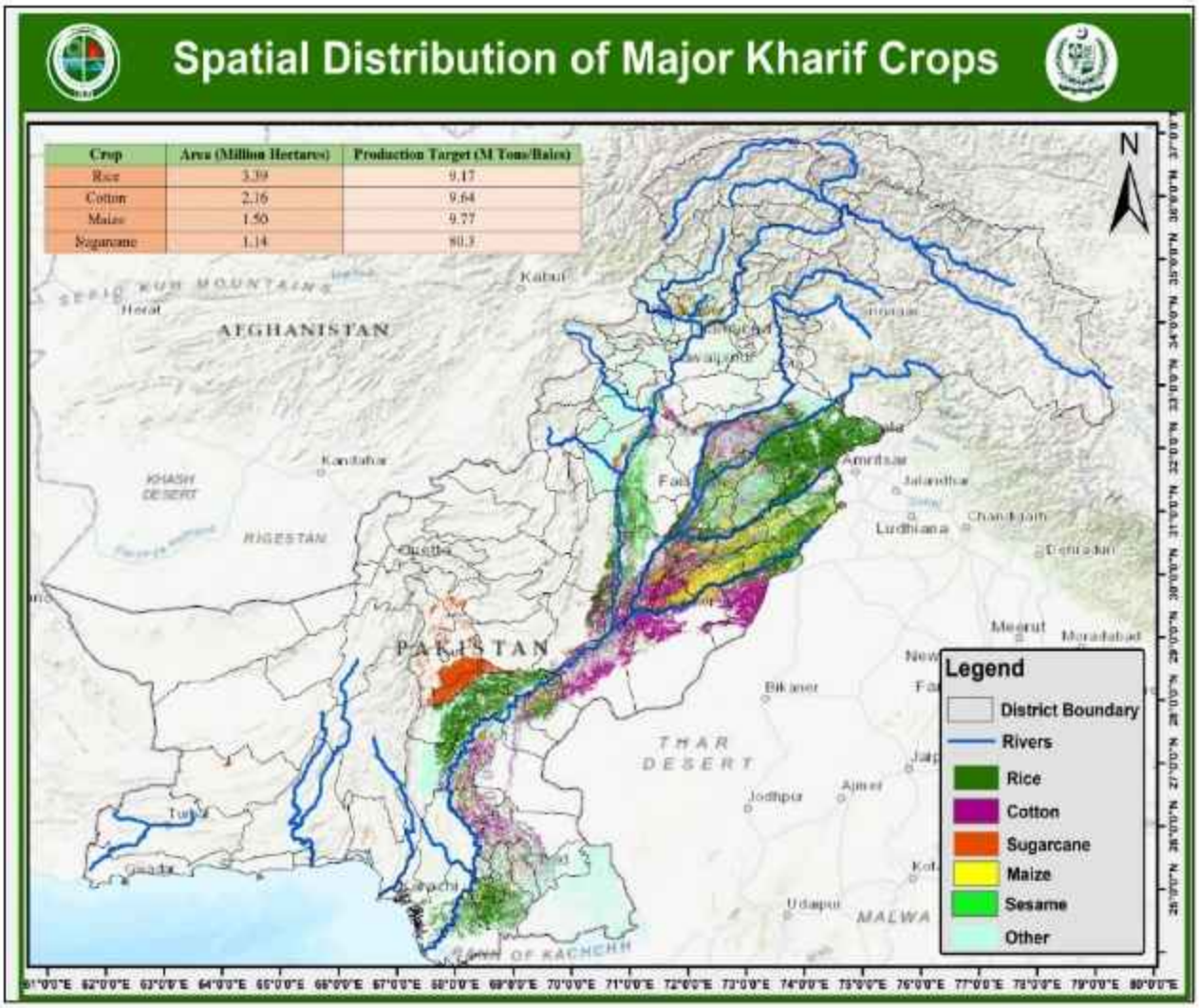


Figure 80 Spatial Distribution of Major Kharif Crops

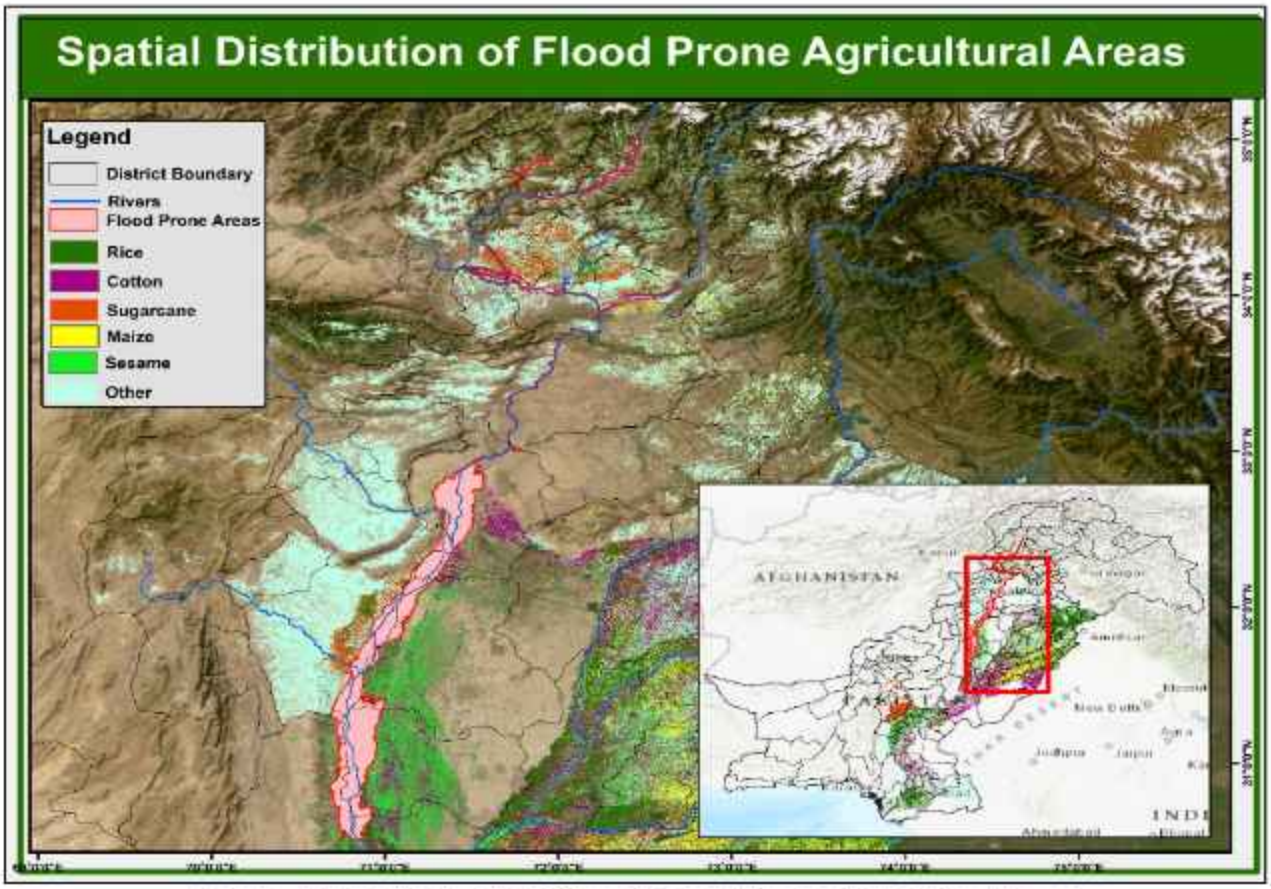


Figure 81 Spatial Distribution of Flood Prone Agricultural Areas

2. **Projected Impacts of Climatic Conditions on Major Kharif Crops Production (2026).** The Kharif season in Pakistan is highly dependent on monsoon rainfall and favorable temperature conditions. Based on meteorological projections indicating below-normal rainfall and above-normal temperatures during July to September, major Kharif crops are expected to experience varying degrees of moisture stress, heat stress, and reduced productivity. The severity of these impacts depends largely on the crop growth stage, as critical phenological stages such as flowering, pollination, grain filling, and boll formation are particularly sensitive to water deficits and elevated temperatures. Under the projected climatic conditions and prolonged disaster scenario the cumulative seasonal production losses could potentially reach approximately 6–14% for rice, 10–17% for cotton, 8–14% for maize, and 6–11% for sugarcane. The estimated losses represent potential reductions in final crop production at harvest resulting from disaster impacts occurring during critical crop growth stages between July and September 2026. The following table summarizes the anticipated disaster impacts and estimated production losses for major Kharif crops under the projected climate scenario.

CLIMATIC CONDITIONS IMPACT - MAJOR KHARIF CROPS PRODUCTION (2026)

Months	Crop	Crop Stage	Disaster Impact	Est Production Loss (%)
July	Rice	Transplanting	Transplant shock, Increased irrigation demand, Poor root development	1-3
	Cotton	Vegetative growth	Moisture stress, Reduced plant vigor, Increased pest pressure	2-4
	Maize	Sowing	Poor germination	2-3
	Sugarcane	Stem elongation	Reduced stem growth, Lower biomass accumulation	1-2
Aug	Rice	Tillering	Reduced tiller formation, Lower potential panicle number	2-4
	Cotton	Flowering and boll formation	Flower shedding, Boll abortion	3-6
	Maize	Vegetative	Reduced leaf area, Moisture stress	2-5
	Sugarcane	Grand growth stage	Lower cane weight and biomass production	2-4
Sept	Rice	Booting & flowering	Spikelet sterility, Reduced pollination efficiency, Lower grain set	3-7
	Cotton	Boll development & opening	Smaller boll size, Premature boll opening	5-7
	Maize	Tasseling & grain formation	Reduced grain filling	4-6
	Sugarcane	Cane elongation & biomass accumulation	Lower cane weight and biomass	3-5

3. **Overall Assessment and Recommendations.** The forecasted below-normal rainfall and above-normal temperatures during July to September 2026 are likely to negatively affect major Kharif crops during their critical growth stages. Cotton is expected to face the highest level of risk, particularly during flowering and boll development, while rice and maize may experience significant impacts during reproductive stages. Continuous monitoring of climatic conditions, irrigation resources, and crop performance will be essential for reducing potential production losses and facilitating timely interventions by Pakistan agricultural authorities.