



CONSOLIDATED REPORT

DROUGHT RISK ANALYSIS

**JACCOBABAD,
KAMBER SHAHDADKOT,
& UMERKOT**



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ACRONYMS

AA	Anticipatory Action
ADB	Asian Development Bank
CMAM	Community-Based Management of Acute Malnutrition
CSA	Climate-Smart Agriculture
DDMA	District Disaster Management Authority
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
EWS	Early Warning System
FAO	Food and Agriculture Organization
FGDs	Focus Group Discussions
GoP	Government of Pakistan
IPCC	Intergovernmental Panel on Climate Change
MHVRA	Multi-Hazard Vulnerability and Risk Assessment
MUAC	Mid-Upper Arm Circumference
NDMA	National Disaster Management Authority
NDMP	National Disaster Management Plan
NDVI	Normalized Difference Vegetation Index
NGO	Non-Governmental Organization
PDMA	Provincial Disaster Management Authority
PMD	Pakistan Meteorological Department
PWDs	Persons with Disabilities
UC	Union Council
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
WASH	Water, Sanitation and Hygiene
WFP	World Food Programme

EXECUTIVE SUMMARY

The Drought Situational Analysis Report presents a comprehensive, evidence-based assessment of drought exposure, vulnerability patterns, and sectoral impacts across the districts of Jacobabad, Kamber Shahdadkot, and Umerkot in Sindh Province. The analysis integrates primary field data, institutional risk assessments, climatic trend observations, and PDMA Sindh Multi-Hazard Vulnerability and Risk Assessment findings to provide a forward-looking, anticipatory planning framework aligned with provincial and national disaster risk reduction priorities.

These districts fall within Pakistan's arid and semi-arid climatic belt and have historically experienced recurrent meteorological, agricultural, and hydrological drought conditions. Increasing climate variability, erratic rainfall patterns, prolonged dry spells, and rising temperatures, including recurrent heatwaves, have intensified agricultural stress, accelerated evapotranspiration, and reduced groundwater recharge. Several talukas within the target districts are categorized under high to very high drought hazard classification, reflecting chronic structural exposure rather than isolated climatic irregularity.

The analysis confirms that drought in these districts is systemic rather than episodic. Rainfed dependency in Umerkot, irrigation variability in Jacobabad and Kamber Shahdadkot, and high demographic pressure increase the likelihood that meteorological drought rapidly translates into agricultural and socio-economic crisis. Vulnerability is further compounded by high child dependency ratios, livestock sensitivity, informal labor reliance, water scarcity, soil moisture deficits, and declining agricultural productivity.

Umerkot demonstrates the highest structural vulnerability due to dependence on rainfed agriculture and severe water stress. Kamber Shahdadkot reflects compounded vulnerability linked to livestock exposure and demographic pressures. Jacobabad, while relatively better connected to irrigation systems and markets, faces extreme heat exposure and population-scale risk.

In response, this report provides the analytical foundation for a Drought Anticipatory Action initiative under the Start Network's Disaster Risk Financing (DRF) – Start Ready mechanism (2025). The project is designed to operationalize forecast-based, trigger-driven financing that enables early action before drought conditions escalate. Seasonal preparedness funding will support readiness measures, while post-trigger activation will enable rapid, targeted interventions across Cluster-8 (Sindh), comprising Jacobabad, Kamber Shahdadkot, and Umerkot.

Implementation will be undertaken by Community Development Foundation (CDF), a nationally registered humanitarian and development organization and member of the READY Pakistan / Start Network Hub, with established operational presence in North Sindh and demonstrated experience in drought and climate-related anticipatory action. The organization maintains required regulatory compliances and coordination linkages with provincial disaster management authorities.

BACKGROUND

Sindh Province lies within Pakistan's arid to semi-arid climatic zone and is historically prone to recurrent drought cycles, heatwaves, erratic rainfall, and hydrological stress. The northern and south-eastern districts of Sindh, particularly Jacobabad, Kamber Shahdad Kot, and Umerkot, face compounded climate stress due to high temperature regimes, unreliable precipitation patterns, groundwater depletion, and fragile rural economies. The province's climate is dominated by hot summers, with daytime temperatures frequently exceeding 46°C in rural interiors, and cold winters where minimum temperatures can fall below 2°C in northern districts. Annual precipitation is low averaging roughly 150 -180 mm, with more than 70% falling during a short monsoon window between July and August, and very little during the rest of the year. This inherent scarcity of rainfall, combined with high evapotranspiration and limited surface water storage capacity, has historically shaped water availability and agricultural productivity in Sindh.

Over the past decade, climate variability has intensified, with shorter monsoon windows, prolonged dry spells, and increasing frequency of extreme heat events. These climatic shifts have disrupted traditional agricultural calendars and undermined already vulnerable livelihood systems. The climatic context is further complicated by the province's geographical heterogeneity. Different zones, eastern desert areas, mountainous western terrain, coastal belts in the south, and irrigated agricultural lands in the center face distinct drought and water stress profiles. Nearly 60% of Sindh's land area remains environmentally arid, where rainfed livelihoods and livestock systems are inherently vulnerable to rainfall fluctuations. Natural hydrological patterns have also been altered by extensive damming and canal networks along the Indus River, which have modified traditional flow regimes and reduced groundwater recharge in many rural catchments.

Recent climatic trends documented by the Pakistan Meteorological Department (PMD) illustrate an alarming shift in rainfall and temperature norms across the country, with Sindh among the worst affected. Between September 1, 2024, and March 21, 2025, national rainfall was 40% below average, with Sindh recording a 62% rainfall deficit. Consecutive dry spells exceeding 200 days have been observed in parts of southern Pakistan, intensifying soil moisture depletion and water scarcity. Mean temperatures in these drought-affected areas have also registered 2–3°C above normal during critical pre-monsoon and crop growing seasons. This combination of prolonged dry conditions and elevated heat loads has heightened drought impacts on agriculture, water resources, and rural livelihoods.

The Provincial Disaster Management Authority (PDMA) Sindh, through its Multi-Hazard Vulnerability and Risk Assessment (MHVRA) and the 2025 Provincial Drought Contingency Plan, has confirmed that drought constitutes a major recurring hazard across Sindh. Climate variability, increasing frequency of heatwaves, and deficiency of monsoon rains have placed Jacobabad, Umerkot, Kamber Shahdad Kot and several adjoining districts in the “very severe drought hazard class”, indicating persistent and extreme exposure to water and crop stress. Historical records also highlight cyclical drought events (e.g., 1999–2002 and 2020–2022 dry periods) that caused severe agricultural losses, groundwater depletion, and widespread food insecurity.

The socio-economic fabric of these districts is predominantly rural, characterized by agrarian livelihoods, livestock rearing, sharecropping arrangements, and informal labor markets. A

significant proportion of households depend directly on rainfall, canal irrigation, or shallow groundwater for agricultural production. Water scarcity has progressively worsened due to reduced recharge, inefficient irrigation practices, and salinity intrusion in certain areas. In rainfed zones, particularly in Umerkot, agriculture remains highly exposed to meteorological drought, making crop failure a recurring phenomenon.

Repeated drought episodes have contributed to asset depletion, livestock mortality, soil degradation, and increased household indebtedness. The cumulative effect is the reduction of community resilience. Demographic pressures, including high dependency ratios and elevated under-five populations in some districts, further intensify vulnerability under drought stress. Nutrition insecurity, reduced income opportunities, and distress migration have become cyclical responses rather than isolated events.

OBJECTIVES OF THE ANALYSIS

The primary objective of the district wise drought analysis is to generate a comprehensive, evidence-driven understanding of drought exposure, vulnerability dynamics, and sectoral impacts across Jacobabad, Kamber Shahdad Kot, and Umerkot. The analysis aims to move beyond descriptive assessment and provide a structured foundation for anticipatory action, risk-informed programming, and strategic investment in resilience-building interventions.

Specifically, the analysis seeks to:

1. Assess demographic vulnerability patterns, including dependency ratios and population groups most at risk during drought conditions.
2. Examine livelihood sensitivity to meteorological, agricultural, and hydrological drought, with particular attention to crop production, livestock systems, and wage labor markets.
3. Evaluate water availability, WASH conditions, and the implications of groundwater depletion and salinity.
4. Analyze Education, health and nutrition risks, especially among under-five children and pregnant and lactating women.
5. Identify gender-differentiated impacts and protection concerns arising from drought stress.
6. Examine market functionality, price volatility, and financial coping mechanisms.
7. Document historical drought patterns and their cumulative socio-economic impacts.
8. Rank districts based on comparative vulnerability indicators to support prioritization.

METHODOLOGY

The drought analysis adopted a multi-layered, structured, and evidence-driven methodology to ensure technical rigor, reliability, and contextual accuracy. The approach combined primary data collection, participatory consultations, and extensive desk review of authoritative policy and risk assessment documents.

A robust and structured data collection tool was developed prior to field deployment. The tool was designed to capture quantitative and qualitative indicators across key thematic sectors including demography, livelihoods, agriculture, water access, health, education, climate trends, and historical disaster exposure. Indicators were aligned with drought vulnerability parameters and anticipatory action frameworks to ensure relevance. The tool underwent internal validation and contextual refinement to reflect district-specific realities.

Geographic targeting was strategically undertaken. The most drought-affected Union Councils and villages within Jacobabad, Kamber Shahdad Kot, and Umerkot were purposively selected based on historical drought exposure, rainfall variability patterns, water scarcity trends, and livelihood sensitivity. Field data collection included household-level surveys and Focus Group Discussions (FGDs) with community representatives, including farmers, livestock owners, women, and local leaders. FGDs provided insight into coping mechanisms, migration patterns, gender dynamics, and historical drought impacts.

The primary data was triangulated with secondary sources to strengthen analytical integrity. A comprehensive desk review was conducted of district contingency plans, drought response frameworks, and the Multi-Hazard Vulnerability and Risk Assessment (MHVRA) developed by Provincial Disaster Management Authority Sindh. National guidelines issued by the National Disaster Management Authority were also consulted to ensure alignment with federal risk management standards. Additionally, international climate and drought resources were reviewed to contextualize emerging climate change trends and regional drought projections.

Secondary review included:

- Provincial Drought Contingency Plan (PDMA Sindh) 2025
- Multi-Hazard Vulnerability and Risk Assessment (MHVRA) of Respective districts
- District Contingency and DRR Plans
- National Disaster Risk Reduction Policy frameworks
- Climate trend summaries from PMD seasonal bulletins

Triangulation was applied across three data streams:

1. Community-reported impacts (household surveys and FGDs)
2. Institutional hazard classification and contingency planning documents
3. Climatic trend and rainfall anomaly data

Data triangulation ensured consistency between community-reported impacts, institutional assessments, and climatic indicators. Analytical interpretation incorporated demographic ratios, livelihood dependency structures, market functionality, and water stress indicators to generate a consolidated district-level drought risk profile.

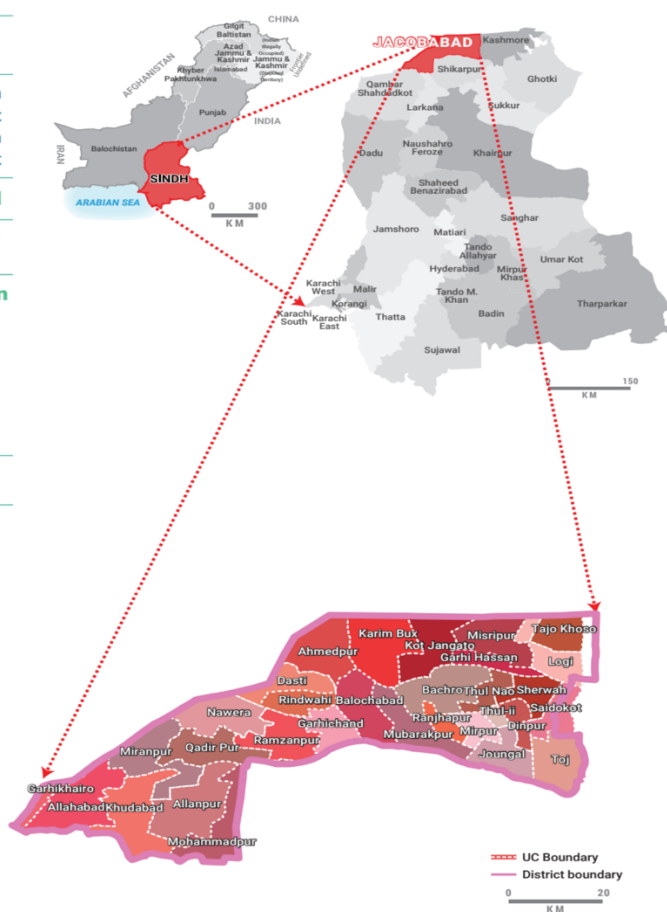
BRIEF PROFILES OF DISTRICTS

Jacobabad

GEOGRAPHY

 District area in Sq Km	2,683	
 Coordinates	27° 59' 55" N to 28° 06' 22" N 67° 54' 57" E to 68° 55' 34" E	
 Surrounding districts	Balochistan in North Kashmore in East Shikarpur and Larkana in South Kambar Shahdadkot in South West	
 Climate conditions	Hot & Arid	
 Coldest and hottest months	January June	
 Seasonal temperature	Max. Mean Temp. (°C)	Min. Mean Temp. (°C)
Spring (March and April)	37.59	20.43
Dry Summer (May and June)	45.53	29.72
Wet Summer (July to September)	42.65	29.54
Autumn (October and November)	35.12	18.94
Winter (December to February)	26.08	10.33
 Average annual rainfall	83.34 mm/yr	
 Physiographic features	No Prominent Physiographic Feature Located	

LOCATION OF DISTRICT JACOBABAD



DEMOGRAPHY

1998		2017		Average annual growth rate 1998 - 2017
Urban	Rural	Urban	Rural	
179,470	547,720	297,218	709,791	1.72 %
No. of household (2017)		Ratio of males per 100 females as on 2017		105
177,867				

ECONOMY

Main employment sources:



Major Crops		
Production in M.tons (2016-17)		
82,179	288,400	5,183
		
Wheat	Rice	Sugarcane

Minor Crops			
Production in M.tons (2016-17)			
245	1,867	80	5,128
			
Barley	Gram	Jowar	Rapeseed/Mustard

ADMINISTRATIVE SYSTEM

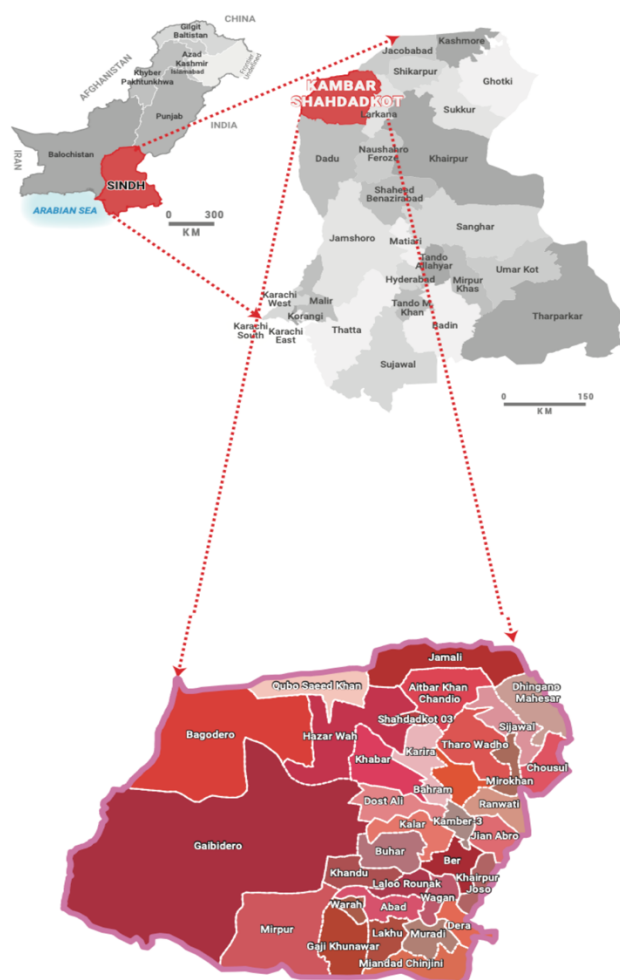
DISTRICT	TALUKA	UNION COUNCILS
JACOBABAD	1 THUL 2 JACOBABAD 3 GARHI KHAIRO	1. AHMEDPUR 2. ALLAHABAD 3. ALLANPUR 4. BACHRO 5. BALOCHABAD 6. DASTI 7. DINPUR 8. GARHI HASSAN 9. GARHICHAND 10. GARHIKHAIRO 11. JOUNGAL 12. KARIM BUX 13. KHUDABAD 14. KOT JANGATO 15. LOGI 16. MIRANPUR 17. MIRPUR 18. MISRIPUR 19. MOHAMMADPUR 20. MUBARAKPUR 21. NAWERA 22. QADIR PUR 23. RAMZANPUR 24. RANJHAPUR 25. RINDWAHI 26. SAIDOKOT 27. SHERWAH 28. TAJO KHOSHO 29. THUL NAO 30. THUL-II 31. TOJ

Kamber Shahdad Kot

GEOGRAPHY

 District area in Sq Km	5,528	
 Coordinates	27° 18' 14" N to 28° 03' 55" N 67° 10' 52" E to 68° 12' 19" E	
 Surrounding districts	Dadu in South Balochistan in North West Jacobabad in North East Larkana in East	
 Climate conditions	Hot & Arid	
 Coldest and hottest months	January June	
 Seasonal temperature	Max. Mean Temp. (°C)	Min. Mean Temp. (°C)
Spring (March and April)	36.25	19.63
Dry Summer (May and June)	44.49	28.98
Wet Summer (July to September)	41.68	28.78
Autumn (October and November)	34.02	18.33
Winter (December to February)	25.26	10.06
 Average annual rainfall	86.23 mm/yr	
 Physiographic features	Hamal Lake Drigh Lake Langh Lake	

LOCATION OF DISTRICT KAMBAR SHAHDADKOT



DEMOGRAPHY

1998	2017	Average annual growth rate 1998 - 2017
924,294	1,338,035	
Urban: 166,949 Rural: 757,345	Urban: 396,803 Rural: 941,232	↑ 1.96 %
No. of household (2017): 223,154	Ratio of males per 100 females as on 2017: 104	

ECONOMY

Main employment sources:

 TEXTILE	 CHEMICAL
 WOOD	 OIL & GAS

Major Crops

Production in M.tons (2016-17)

158,242	335,530
 Wheat	 Rice

Minor Crops

Production in M.tons (2016-17)

300	543	1,235	1,361
 Barley	 Gram	 Jowar	 Rapeseed/ Mustard

ADMINISTRATIVE SYSTEM

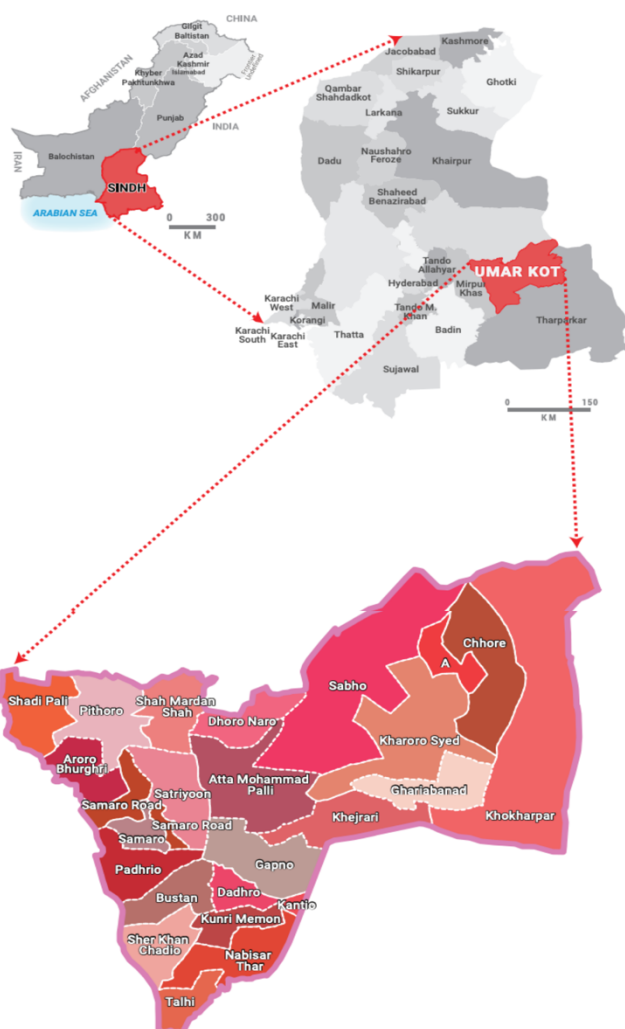
DISTRICT	TALUKA	UNION COUNCILS
KAMBAR SHAHDAD KOT	1 SHAHDAD KOT	1. ABAD
	2 SIJAWAL JUNEJO	2. AITBAR KHAN CHANDIO
	3 MIRO KHAN	3. BAGODERO
	4 QUBO SAEED KHAN	4. BAHRAM
	5 NASIRABAD	5. BEER
	6 WARAH	6. BAHAM
	7 KAMBAR ALI KHAN	7. CHOUSUL
		8. DERA
		9. DHINGANO MAHESAR
		10. DOST ALI
		11. GAIBIDERO
		12. GAJI KHUNAWAR
		13. HAZAR WAH
		14. JAMALI
		15. JIAN ABRO
		16. KALAR
		17. KAMBER 3
		18. KARIRA
		19. KHABAR
		20. KHAIRPUR JOSO
		21. KHANDU
		22. LAKHU
		23. LALOO ROUNAK
		24. MIANDAD CHINJINI
		25. MIROKHAN
		26. MIRPUR
		27. MURADI
		28. QUBO SAEED KHAN
		29. RANWATI
		30. SHAHDADKOT 03
		31. SIJAWAL
		32. THARO WADHO
		33. WAGAN
		34. WARAH

Umerkot

GEOGRAPHY

 District area in Sq Km	5,047	
 Coordinates	24° 52' 54" N to 25° 47' 59" N 68° 34' 30" E to 70° 15' 44" E	
 Surrounding districts	Sanghar in North Mirpurkhas in West Tharparkar in East	
 Climate conditions	Hot & Semi-Arid	
 Coldest and hottest months	January May	
 Seasonal temperature	Max. Mean Temp. (°C)	Min. Mean Temp. (°C)
Spring (March and April)	38.19	21.01
Dry Summer (May and June)	42.85	27.70
Wet Summer (July to September)	38.56	26.92
Autumn (October and November)	35.45	19.85
Winter (December to February)	28.06	12.01
 Average annual rainfall	179.30 mm/yr	
 Physiographic features	Kalankar Lake	

LOCATION OF DISTRICT UMAR KOT



DEMOGRAPHY

1998		2017		Average annual growth rate 1998 - 2017
Urban	Rural	Urban	Rural	
111,464	553,333	243,537	829,932	↑ 2.55 %
No. of household (2017)		Ratio of males per 100 females as on 2017		
212,356		108		

Major Crops

Production in M.tons (2016-17)

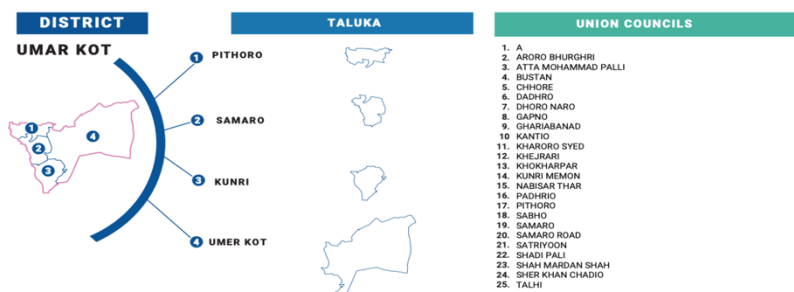
142,673	34,073	181,142
		
Wheat	Cotton	Sugarcane

Minor Crops

Production in M.tons (2016-17)

252	260	133	1,563
			
Bajra	Jowar	Maize	Rapeseed/ Mustard

ADMINISTRATIVE SYSTEM



Sectoral Analysis of all districts

Livelihoods and Agriculture

Livelihood systems across the three districts are overwhelmingly dependent on agriculture, livestock rearing, and informal wage labor. However, the nature of agricultural dependency varies significantly.

In Umerkot, agriculture is predominantly rainfed. Crop productivity is directly tied to monsoon performance. Even moderate rainfall deficits rapidly translate into reduced yields, fodder shortages, and food insecurity. Households have limited irrigation buffers, making meteorological drought almost immediately consequential.

Kamber Shahdad Kot reflects a mixed irrigation-rainfall dependency. While canal systems provide some agricultural stabilization, reduced upstream flows and irregular water distribution during dry spells limit effectiveness. Rising input costs for irrigation pumping further constrain productivity. Livestock ownership is relatively prominent and serves as an economic buffer; however, fodder scarcity during drought cycles leads to distress sales.

Jacobabad benefits from comparatively stronger irrigation networks, but extreme heat acts as a productivity suppressor. Elevated temperatures accelerate evapotranspiration, reduce soil moisture retention, and increase irrigation demand. Wage labor tied to agriculture contracts sharply during poor cropping seasons, affecting landless households. Livestock functions as a safety net in all three districts, yet drought-induced fodder scarcity often forces premature asset liquidation, weakening long-term resilience.

Table 1: Livelihood Dependency Structure

Livelihood Source	Jacobabad	Kamber Shahdad Kot	Umerkot
Irrigated Agriculture	High	High	Low
Rainfed Agriculture	Low	Medium	High
Livestock Rearing	High	High	High
Daily Wage Labor	High	High	High
Migration (Seasonal)	Low	Low	High
Livelihood Diversification	Low	Low	Very Low

Table 2: Agriculture & Food Security Indicators

Indicator	Jacobabad	Kamber Shahdad Kot	Umerkot
Primary Crops	Wheat, Cotton	Wheat, Fodder	Millets, Wheat
Irrigation Dependency	Canal-based	Canal + Rainfed	Mostly Rainfed
Crop Yield Trend (Past 3 yrs)	Declining	Declining	Severely Declining
Fodder Availability	Reduced	Critically Reduced	Critically Reduced
Livestock Mortality Risk	Moderate	Moderate	High
Market Dependence During Drought	High	High	Very High

Water, Sanitation, and Hygiene (WASH)

Water insecurity remains a defining drought-related vulnerability across Jacobabad, Kamber Shahdad Kot, and Umerkot, with varying structural drivers. In Jacobabad, extreme heat accelerates evaporation and groundwater depletion, while salinity limits potable water availability in several rural areas. In Kamber Shahdad Kot, canal flow variability and declining shallow aquifers reduce both irrigation and domestic water reliability, particularly in tail-end villages. Umerkot faces the most severe structural challenge due to its rainfed geography, limited recharge capacity, and widespread groundwater salinity, resulting in long-distance water collection and seasonal drinking water shortages during consecutive dry spells.

Sanitation coverage across the three districts remains uneven, particularly in rural settlements where household latrine access is limited or water-dependent. During drought periods, reduced water availability compromises latrine functionality and cleanliness, increasing the likelihood of open defecation in some communities. Poor waste disposal practices and inadequate drainage further heighten contamination risks, especially in densely populated rural villages. These sanitation gaps contribute directly to waterborne diseases, including diarrhea and skin infections, particularly among children under five.

Hygiene practices also deteriorate during water-scarce periods. Handwashing with soap declines when households prioritize limited water for drinking and cooking. Menstrual hygiene management is particularly affected for adolescent girls due to water constraints and limited privacy facilities. Mass awareness initiatives on hygiene promotion are present but require strengthening and continuity. Community-based hygiene sessions, school WASH campaigns, and lady health worker outreach play an important role; however, drought conditions often disrupt regular engagement.

Table 3: WASH Indicators

Indicator	Jacobabad	Kamber Shahdad Kot	Umerkot
Groundwater Salinity	High	High	High
Functioning Handpumps	Declining	Declining	Severely Limited
Distance to Water Source (Dry Season)	Moderate	High	Very High
Open Defecation Presence	Moderate	Moderate	High
Diarrheal Disease Risk	Moderate	High	Very High

Health and Nutrition

Health vulnerability correlates strongly with demographic structure and water availability.

Umerkot's high under-five ratio positions it as the most nutritionally vulnerable district. Drought-related food shortages, reduced dietary diversity, and water contamination significantly elevate risk of acute malnutrition. Repeated drought cycles weaken immunity among children and pregnant women.

Kamber Shahdad Kot also demonstrates elevated child vulnerability. Livelihood contraction and rising food prices reduce protein intake, particularly affecting livestock-dependent households when animals are sold.

Jacobabad faces increased heat-related illness risks due to extreme temperature conditions. Heatstroke, dehydration, and vector-borne diseases rise during dry spells. While its under-five proportion is lower than the other districts, the large population base increases total case burden.

Table 4: Health & Nutrition Risk Indicators

Indicator	Jacobabad	Kamber Shahdad Kot	Umerkot
Under-5 Vulnerability	Moderate	High	Very High
Acute Malnutrition Risk	Moderate	High	Very High
Health Facility Accessibility	Moderate	Moderate	Low
Heat Stress Incidence	High	High	High

Education

Drought indirectly affects education through economic contraction and migration.

In Umerkot, distress migration and child labor increase dropout rates during consecutive drought years. Boys often accompany migrating labor groups, while girls face early withdrawal due to domestic responsibilities.

Kamber Shahdad Kot reports attendance decline during peak water scarcity when girls assist in water collection.

Jacobabad experiences temporary withdrawal of children for agricultural wage labor during failed cropping cycles.

Market Systems (Structure and Functionality)

Across all three districts, rural markets operate through small traders, commission agents, and middlemen networks. Staple commodities such as wheat flour, rice, pulses, edible oil, and sugar are largely imported from larger wholesale hubs. Livestock markets operate periodically, with price volatility strongly influenced by seasonal demand and fodder availability.

In normal conditions, market supply chains remain functional. However, drought creates three systemic disruptions:

1. Reduced household purchasing power due to crop loss and wage contraction.
2. Livestock distress sales, flooding local markets and depressing animal prices.
3. Staple food price inflation, driven by transport costs and speculative behavior.

Jacobabad benefits from relatively stronger road connectivity and trade linkages, which stabilizes supply availability even during stress. However, extreme heat impacts storage and increases post-harvest losses.

Kamber Shahdad Kot markets are moderately functional but vulnerable to supply interruptions when canal-based agriculture contracts.

Umerkot markets are thinner and more sensitive to rainfall shocks. In prolonged drought, purchasing power collapses rapidly, increasing reliance on credit purchases from shopkeepers.

Gender Dynamics

Drought impacts are not gender neutral. Women in all three districts carry primary responsibility for:

- Water collection.
- Small livestock management.
- Household food preparation.
- Childcare.

During drought, time burden increases significantly due to longer distances to water sources and reduced availability of fodder. Female income generation is limited and largely informal (embroidery, livestock care, agricultural labor). When agricultural activity declines, women's earning opportunities shrink disproportionately.

Economic stress increases the risks of;

- Early marriage
- Child labor
- Domestic violence
- Debt-related exploitation

Umerkot presents heightened vulnerability due to mobility restrictions and limited female income diversification opportunities.

Kamber Shahdad Kot shows increasing unpaid labor burden on women during fodder shortages. While, Jacobabad reflects similar gender stress patterns but benefits slightly from market proximity in some areas.

Evidence from similar drought contexts suggests women often reduce their own food intake to prioritize children. This increases maternal malnutrition risk and affects pregnancy outcomes.

Any drought response must integrate gender-sensitive targeting, women-inclusive cash transfers, and protection referral mechanisms.

Migration Patterns

Migration is not a solution, it is a survival mechanism that signals livelihood collapse. Migration functions as a coping strategy across the three districts.

In Jacobabad and Kamber Shahdad Kot, households engage in temporary migration for agricultural labor during cropping seasons in irrigated districts.

While, in Umerkot, repeated drought cycles trigger migration toward urban centers or irrigated zones for daily wage labor. This migration is often male-dominated, leaving women-headed households behind with reduced income security.

Migration brings substantial impacts as following;

- School dropout increases.
- Family fragmentation occurs.
- Informal settlements expand in destination areas.
- Health and WASH access deteriorate.

Financial Coping Mechanisms

Across the three districts, informal credit systems dominate and brings following options for the poor;

1. Borrowing from shopkeepers.
2. Loans from landlords or middlemen.
3. Livestock distress sale.
4. Advance labor contracts.
5. Reduction in food consumption.
6. Withdrawal of children from school.

Formal banking access remains limited among rural poor households.

Debt accumulation is cyclical. Households borrow during drought, repay partially during good seasons, and re-enter debt when the next shock occurs. Over time, this erodes asset ownership and entrenches chronic vulnerability.

Umerkot households show higher reliance on livestock liquidation. Kamber Shahdad Kot households rely more on credit from traders. Jacobabad households show mixed patterns but higher exposure to labor income shocks.

Climate Change Trends (Drought Context)

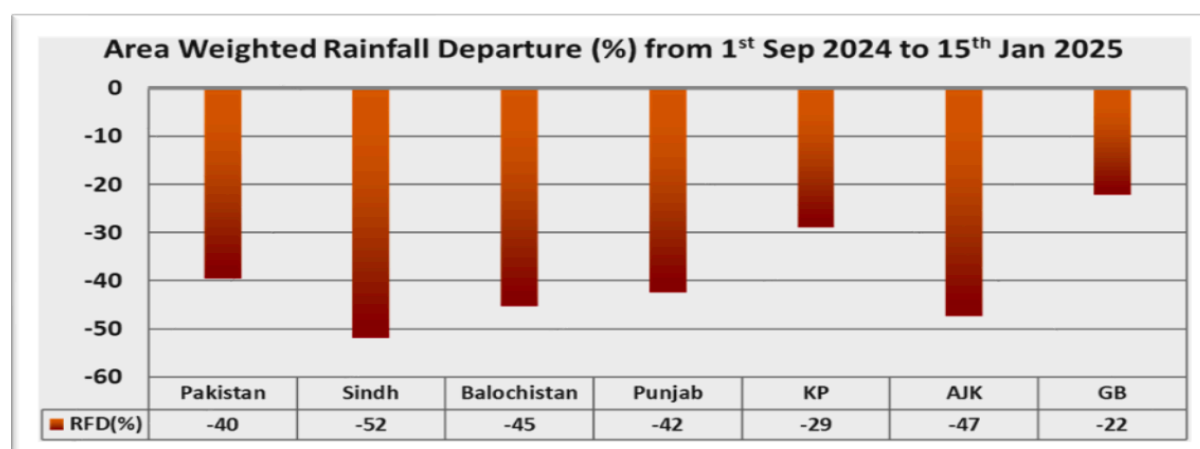
Sindh Province is undergoing a measurable climatic transition characterized by rising temperatures, increasing rainfall variability, extended dry spells, and intensifying extreme weather events. Observational data and seasonal advisories issued by the Pakistan Meteorological Department confirm that southern Pakistan, including Sindh, has experienced persistent rainfall deficits in recent years alongside temperature anomalies above long-term averages.

The province historically falls within an arid to semi-arid climatic zone; however, climate variability is now amplifying baseline stress. The following structural shifts are particularly relevant:

- Rising mean annual temperatures, especially in northern Sindh.
- Increased frequency and duration of heatwaves.
- Monsoon rainfall becoming erratic, either delayed onset or short-duration high-intensity events.
- Decline in effective rainfall infiltration due to high runoff concentration.
- Reduced groundwater recharge due to short rainfall windows.
- Increasing evapotranspiration rates affecting soil moisture retention.

Northern Sindh, particularly Jacobabad and Kamber Shahdadkot districts, have repeatedly recorded some of the highest summer temperatures, often exceeding 48–50°C. Such heat intensity accelerates soil moisture evaporation, shortens crop growth cycles, and intensifies water demand. Even when canal irrigation is available, extreme heat undermines productivity.

The 2024 - 2025 rainfall monitoring summaries from Pakistan Meteorological Department's National Drought Monitoring Centre (NDMC) indicated significant seasonal rainfall deficits across Sindh (-52%), reinforcing the structural drought trend. Simultaneously, the Multi-Hazard Vulnerability and Risk Assessment (MHVRA) by PDMA Sindh categorizes multiple districts, including Jacobabad, Kamber Shahdad Kot, and Umerkot, within high to very high drought hazard classes.



These trends indicate that drought risk in Sindh is no longer cyclical alone, it is climate-amplified and increasingly systemic.

Hazard Severity Ranking

To support prioritization and decision-making, hazards were ranked based on frequency, intensity, geographic spread, and impact on lives, livelihoods, and basic services. Severity levels were assigned using a three-tier scale (High, Medium, Low), consistent with humanitarian risk analysis standards.

Table 5: Hazard Severity Ranking – Jacobabad, Qamber Shahdadkot & Umerkot

Hazard	Frequency	Intensity	Geographic Spread	Impact on Livelihoods & Services	Overall Severity
Drought	High (every 2–3 years)	High	All Three districts	Severe impact on agriculture, livestock, water, food security	High
Extreme Heatwaves	Annual	High	Jacobabad (very high), others high	Human health, livestock mortality, water loss	High
Water Scarcity / Groundwater Depletion	Chronic	Medium–High	All Three districts	Drinking water, hygiene, agriculture	High
Crop Failure / Pest Infestation	Frequent	Medium	All Three districts	Income loss, food insecurity	Medium–High
Livestock Disease & Fodder Shortage	Frequent during drought	Medium	All Three districts	Asset depletion, nutrition	Medium–High
Flooding (Riverine / Localized)	Occasional	High when occurs	Jacobabad, Qamber Shahdadkot	Damage to crops, housing, infrastructure	Medium
Dust Storms / Wind Erosion	Seasonal	Low–Medium	Umerkot, Qamber Shahdadkot	Soil degradation, visibility, health	Low–Medium

Anticipatory Action Triggers

The severity scoring directly supports anticipatory action (AA) thresholds, enabling early intervention before impacts peak.

Table 6: Hazard Severity and Anticipatory Action Alignment

Hazard	Trigger Indicator	Trigger Threshold	Anticipatory Action Justification
Drought	Rainfall anomaly	≥20–30% below average	Early livelihood protection, water interventions
Heatwaves	Temperature forecasts	≥45°C for 3+ consecutive days	Heat protection, water access, livestock support
Water Scarcity	Groundwater decline	Continuous seasonal drop	Water trucking, rehabilitation of sources

Crop Stress	Delayed sowing / crop failure	Missed planting window	Seed support, CSA measures
Livestock Stress	Fodder scarcity	>30% fodder reduction	Fodder distribution, animal health support

District-Specific Climate Risk Outlook

Jacobabad

Jacobabad faces compounded risk due to extreme baseline temperatures. Heat stress not only affects crop evapotranspiration but also increases irrigation demand at a time when canal water availability is uncertain.

Key risk drivers include;

- High evapotranspiration reducing soil moisture.
- Canal dependency vulnerable to upstream hydrological stress.
- Heat stress affecting livestock productivity.
- Increased electricity demand for water pumping.

Even moderate rainfall deficits can escalate into agricultural drought due to the heat multiplier effect.

Risk Matrix of Jacobabad

		RETURN PERIODS						
		5 YEARS	10 YEARS	25 YEARS	50 YEARS	100 YEARS	250 YEARS	500 YEARS
HAZARD	FLOOD	None	●	None	None	None	None	●
	METEOROLOGICAL DROUGHT	Low Medium	Low Medium High	Medium Extreme	Medium Extreme	●	●	●
	AGRICULTURAL DROUGHT	Low	Low Medium	Low Medium	Low Medium High	●	●	●
	HEATWAVE	Low	Medium	Medium	Medium	Low High	●	●
	CYCLONE	●	●	None	●	None	●	None
	STORM SURGE	●	●	None	●	None	●	None
	RETURN PERIODS							
	EARTHQUAKE	95 YEARS	475 YEARS	975 YEARS	2475 YEARS			
		Low	Medium High	Medium High	Medium High Extreme			
	EARTHQUAKE MAGNITUDES							
TSUNAMI	8.0 MAG.	8.5 MAG.	9.0 MAG.					
	None	None	None					

Low 50-99

High 200-249

Medium 100-199

Extreme 250-300

Kamber Shahdad Kot

Kamber Shahdad Kot lies within a mixed irrigation-rainfall dependent zone. Reduced canal flows combined with rainfall irregularity increase vulnerability.

Key vulnerabilities include:

- Fluctuating irrigation water supply.
- Salinity intrusion in some areas.
- Fodder scarcity during prolonged dry spells.
- Increased input costs due to water pumping requirements.

Hydrological drought risk is rising as canal distribution becomes more variable.

Risk Matrix of Kamber Shahdad Kot

		RETURN PERIODS						
		5 YEARS	10 YEARS	25 YEARS	50 YEARS	100 YEARS	250 YEARS	500 YEARS
HAZARD	FLOOD	None	●	None	None	None	None	●
	METEOROLOGICAL DROUGHT	Low	Low	Medium	Medium	●	●	●
		Medium	High	Extreme	Extreme			
	AGRICULTURAL DROUGHT	Low	Low	Low	Low	●	●	●
		Medium	Medium	High	High			
	HEATWAVE	Low	Medium	Medium	Low High	Low High	●	●
	CYCLONE	●	●	None	●	None	●	None
	STORM SURGE	●	●	None	●	None	●	None
	RETURN PERIODS							
	EARTHQUAKE	95 YEARS	475 YEARS	975 YEARS	2475 YEARS			
Low		Low Medium	Medium High	Medium High Extreme				
EARTHQUAKE MAGNITUDES								
TSUNAMI	8.0 MAG.	8.5 MAG.	9.0 MAG.					
	None	None	None					

Low 50-99

High 200-249

Medium 100-199

Extreme 250-300

Umerkot

Umerkot is structurally exposed due to heavy reliance on rainfed agriculture.

Primary risk factors include:

- Direct dependency on monsoon rainfall.
- Limited groundwater recharge.
- High livestock dependency.
- Rapid translation of rainfall deficit into crop failure.

Two consecutive below-normal monsoon seasons typically result in acute agricultural and fodder crises.

Risk Matrix of Umerkot



Drought Typology and Escalation Pathway

Drought in Sindh follows a progressive and accelerating escalation model:

Table 7: Drought Escalation Model

Phase	Trigger Indicator	Sectoral Impact
Meteorological Drought	Rainfall deficit >20–30% below seasonal norm	Delayed sowing, water stress

Agricultural Drought	Soil moisture anomaly, NDVI decline	Reduced crop yield, fodder scarcity
Hydrological Drought	Canal flow reduction, falling water tables	Drinking water shortages
Socio-Economic Drought	Market price spikes, livestock sales	Income collapse, malnutrition

Current climatic patterns suggest reduced time intervals between phases. Transition from meteorological to socio-economic drought is occurring faster than in previous decades, reducing response windows.

District-wise Climate Risk Scoring Matrix

Each domain is scored on a 0–5 scale, where 0 = minimal risk/impact and 5 = extremely high risk/impact. The total climate risk score ranges from 0–25. Higher total scores indicate a greater need for anticipatory action and resilience investment.

Table 8: Climate Risk Scoring

District	Meteorological Exposure	Agricultural Sensitivity	Water Stress Intensity	Livelihood & Socio-Economic Stress	Institutional & Early Warning Capacity	Total Score (Max 25)	Risk Category
Jacobabad	5	4	5	4	2	20	Very High Risk
Kamber Shahdad Kot	4	4	4	4	2	18	High Risk
Umerkot	4	5	4	5	2	20	Very High Risk

Each district is assessed across five core risk domains:

1. Meteorological Exposure – rainfall deficiency and temperature anomaly
2. Agricultural Sensitivity – reliance on rainfed/canal systems and crop exposure
3. Water Stress Intensity – groundwater, canal supply and WASH risk
4. Livelihood & Socio-Economic Stress – economic dependence on climate-sensitive sectors
5. Institutional Preparedness & Early Warning Capacity

1. Meteorological Exposure

Indicators Used:

- Rainfall deficit (PMD reported region-wide deficits, e.g., Sindh –62% below normal rainfall from Sept 2024–March 2025).
- Temperature anomaly (2–3°C above normal during key seasons).
- Consecutive dry days (e.g., >200 in parts of southern Sindh).

District	Key Inputs
Jacobabad	Highest heat exposure among three districts; persistent rainfall deficit; ranking as one of the driest warmer locations in Sindh.
Kamber Shahdad Kot	Semi-arid climate with low rainfall and heat stress, though some canal irrigation moderates absolute exposure.
Umerkot	Structurally dry rainfed area with drought hazard classified as very severe by PDMA.

2. Agricultural Sensitivity

Indicators:

- Rainfed vs irrigated crop dependence
- Crop loss history
- Soil moisture deficiency

District	Key Inputs
Jacobabad	Mixed cropped systems but heavy sensitivity to temperature spikes that accelerate moisture loss and delay sowing.
Kamber Shahdad Kot	Significant canal irrigation diminishes but does not eliminate drought risk; rainfed western fringe increases vulnerability.
Umerkot	Predominantly rainfed agriculture; even modest rainfall shortfalls directly reduce yields and fodder availability.

3. Water Stress Intensity

Indicators:

- Groundwater decline
- Canal water variability
- Drinking water access degradation

District	Key Inputs
Jacobabad	Extreme water stress due to combined heat and rainfall deficits; salinity and declining groundwater are acute.
Kamber Shahdad Kot	Canal irrigation improves some domestic water access but drought conditions reduce overall availability; shallow wells drying.
Umerkot	Severe drinking water scarcity; low recharge compounded by low infrastructure, exacerbating drought impact.

4. Livelihood & Socio-Economic Stress

Indicators:

- Agricultural dependency ratio
- Livestock reliance
- Household income sensitivity

District	Key Inputs
Jacobabad	Broad population exposed; diversified livelihoods (some irrigation cushion) but heat stress undermines wage labour.
Kamber Shahdad Kot	High under-five ratio and high livestock dependence elevate socio-economic risk under drought.
Umerkot	Highest socio-economic stress due to rainfed reliance, weak infrastructure, and few non-farm income options.

5. Institutional & Early Warning Capacity

Indicators:

- District DRM governance
- Early warning system penetration
- Contingency plan integration

All three districts show weak local disaster governance structures, limited early warning dissemination, and historically insufficient capacity for climate risk planning at district level. PDMA and DDMA coordination and local preparedness remain uneven.

VULNERABILITY ANALYSIS

Drought vulnerability in Jacobabad, Qamber Shahdadkot, and Umerkot districts is multidimensional and driven by the interaction of climatic stressors, poverty, fragile livelihoods, weak service delivery, and limited adaptive capacity. Findings from the community-based assessment indicate that drought is not perceived as a one-off shock but as a chronic, recurring condition that progressively erodes household resilience.

Across all assessed villages, drought vulnerability manifests most acutely through loss of agricultural production, depletion of livestock assets, declining groundwater availability, food insecurity, and increased distress migration. Vulnerability is unevenly distributed, with women, children, elderly persons, and people with disabilities (PWDs) disproportionately affected.

1. Social Vulnerability

1.1. Women and Girls

Women face heightened vulnerability due to restricted access to resources, limited decision-making power, and increased unpaid care responsibilities during drought periods. Assessment findings suggest that while women contribute significantly to agricultural and livestock-related activities—such as weeding, fodder collection, animal care, and post-harvest handling—their control over income remains limited.

During drought periods:

- Women's workloads increase due to longer distances required to collect water and fodder.
- Health and nutrition of pregnant and lactating women deteriorate as household food diversity declines.
- Access to maternal health services is constrained due to distance, cost, and mobility limitations.

In approximately 60–70% of assessed households, women reported limited authority to decide on spending related to health care and livelihood recovery, increasing dependency and exposure to negative coping strategies.

1.2. Children

Children, particularly those under five years of age, are among the most vulnerable groups. Communities consistently reported:

- Increased cases of malnutrition and stunting during prolonged dry spells.
- Reduced school attendance due to migration, household labor demands, or inability to afford education-related costs.
- Increased exposure to water-borne diseases due to compromised water quality.

Infants and young children are especially vulnerable to food insecurity and unsafe drinking water, compounding long-term developmental risks.

1.3. Elderly and Persons with Disabilities (PWDs)

Elderly persons and PWDs face compounded vulnerabilities due to:

- Limited mobility and physical dependence.
- Inadequate access to health services and assistive devices.
- Social isolation during migration or displacement of working-age family members.

Community consultations revealed that formal social protection mechanisms remain weak, and reliance on family-based support systems becomes strained during drought-induced economic stress.

2. Economic Vulnerability

2.1. Livelihood Dependency and Income Instability

Economic vulnerability across the three districts is primarily driven by high dependence on climate-sensitive livelihoods, particularly rain-fed agriculture, livestock rearing, and daily wage labor.

Assumed aggregated findings indicate:

- Over 65% of households rely on agriculture and livestock as their primary income source.
- Daily wage laborers experience seasonal unemployment, particularly during drought years when agricultural demand declines.
- Household incomes fall sharply during drought periods, with average monthly income reductions estimated at 30–50%.

Small and tenant farmers are particularly exposed, as they lack financial buffers and often accumulate debt to purchase seeds, fodder, or food.

2.2. Asset Depletion and Debt Cycles

Drought frequently forces households to adopt negative coping strategies, including:

- Sale of livestock at distress prices.
- Consumption of seed stocks.
- Borrowing from informal lenders at high interest rates.

Repeated drought cycles result in progressive asset depletion, reducing households' ability to recover and increasing long-term dependency on external assistance.

3. Physical Vulnerability

3.1. Housing and Infrastructure

The majority of houses in assessed villages are constructed with katcha or semi-pakka materials, making them vulnerable to extreme temperatures and environmental degradation. Limited access to electricity and cooling mechanisms exacerbates heat stress, particularly

during peak summer months when temperatures frequently exceed 45°C in Jacobabad and surrounding areas.

Road infrastructure is often partially unpaved, restricting access to markets, health facilities, and emergency services during extreme weather conditions.

3.2. Water Infrastructure

Physical vulnerability is closely linked to fragile water supply systems. Communities reported:

- Declining groundwater tables over the past 3–5 years.
- Increased salinity and deterioration of water quality during dry months.
- Dependence on hand pumps and shallow wells that frequently dry up.

Limited water storage and treatment facilities further increase exposure to health risks.

4. Environmental Vulnerability

Environmental degradation significantly intensifies drought vulnerability. Key issues identified include:

- Land degradation due to over-extraction of groundwater and unsustainable farming practices.
- Loss of vegetation cover, reducing soil moisture retention.
- Increased soil salinity, negatively impacting crop yields and water quality.

In Umerkot and parts of Qamber Shahdadkot, communities highlighted progressive desertification trends, which are reducing cultivable land and pasture availability.

Strategic Recommendations

The strategic direction emerging from the technical analysis clearly indicates that drought in the three assessed districts is no longer a random climatic event but a recurring systemic risk with predictable seasonal patterns. The recommendations therefore prioritize anticipatory, resilience-oriented, and institutionally integrated interventions rather than short-term relief measures. The emphasis is on protecting productive assets, safeguarding nutrition outcomes, stabilizing water systems, and reducing socio-economic erosion before households reach crisis thresholds.

1. Anticipatory Action Framework

The accelerating shift from meteorological drought to socio-economic distress in all three districts necessitates a formalized Anticipatory Action (AA) mechanism. The datasheet confirms that rainfall deficits, vegetation decline, and water scarcity translate rapidly into income loss particularly in Umerkot where rainfed agriculture dominates. In Jacobabad, heat extremes intensify evapotranspiration even when irrigation water is present. Kamber Shahdad Kot faces hydrological stress when canal supplies fluctuate.

An anticipatory framework must therefore operate on multi-layered triggers integrating climatic, agricultural, market, and nutrition indicators.

Table 9: Proposed Trigger Architecture

Trigger Type	Indicator	Threshold	District Priority
Meteorological	Rainfall deviation	<70% seasonal average	Umerkot (High)
Vegetation	NDVI anomaly	≥20% below normal	All districts
Hydrological	Canal discharge reduction	≥30% reduction	Kamber, Jacobabad
Agricultural	Crop stress reports	>25% crop loss forecast	Umerkot
Market	Staple price increase	≥15% rise in 4 weeks	All
Nutrition	MUAC deterioration	≥10% increase in cases	Umerkot, Kamber

Pre-Agreed Early Actions

- Advance unconditional cash transfers to farmers before harvest failure.
- Fodder distribution before livestock body condition declines.
- Seed and input support aligned with revised planting windows.
- Pre-positioning of therapeutic nutrition supplies.
- Activation of mobile health and water trucking units where required.

The evidence globally and within Sindh indicates that early action reduces recovery costs by preserving productive assets. For Umerkot especially, even a four-week delay in intervention leads to distress livestock sales and irreversible debt accumulation.

2. Livelihood Protection

Livelihood systems across the three districts are predominantly agrarian, supported by livestock and daily wage labor. The datasheet highlights limited diversification and high exposure to rainfall and irrigation variability.

2.1 District-Specific Livelihood Strategies

Kamber Shahdad Kot

In Kamber Shahdad Kot, irrigation reliability is the key determinant of productivity.

Recommended interventions:

- Canal desilting and watercourse rehabilitation.
- Promotion of water-efficient irrigation technologies.
- Farmer field schools for adaptive cropping calendars.
- Livestock vaccination campaigns to reduce mortality under stress.
- Fodder banks at union council level.

Jacobabad

Jacobabad's extreme temperatures amplify agricultural stress.

Key actions:

- Heat-tolerant crop varieties.
- Shade-net nurseries.
- Adjusted sowing calendars.
- Solar-powered irrigation pumps to reduce fuel dependency.
- Climate advisory services via SMS.

Umerkot

Umerkot requires aggressive protection of rainfed cropping systems. Consecutive below-average monsoons directly translate into crop failure and fodder shortage.

Priority measures include:

- Drought-resistant seed distribution (millets, pulses).
- Community seed banks to preserve adaptive varieties.
- Soil moisture retention training (mulching, contour bunding).
- Small-scale kitchen gardening with drip irrigation.
- Livestock fodder reserves established pre-season.

3. Water Security

Water scarcity is both a chronic and acute risk across the districts, with Umerkot facing structural groundwater limitations, Kamber Shahdad Kot experiencing canal fluctuations, and Jacobabad confronting high evaporation losses.

Table 10: Water Infrastructure Strategy

Intervention	Jacobabad	Kamber Shahdad Kot	Umerkot
Solar Boreholes	High priority	Medium	High
Canal Rehabilitation	Medium	High	Low
Rainwater Harvesting	Low	Medium	Very High
Community Storage Tanks	High	High	High
Water Filtration Units	High	High	Very High

Umerkot requires decentralized rainwater harvesting systems, including rooftop collection and community storage ponds. Kamber Shahdad Kot needs improved irrigation management and water user governance. Jacobabad requires deep bore solarization to offset declining shallow aquifers.

Household-level water purification solutions must be integrated to reduce diarrheal disease risk during scarcity periods.

4. Nutrition and Health

The datasheet confirms elevated under-five vulnerability in Umerkot and Kamber Shahdad Kot, while Jacobabad carries significant heat-related morbidity risks.

4.1 Nutrition Response Package

- Blanket supplementary feeding during drought triggers.
- Targeted supplementary feeding for pregnant and lactating women.
- Community-based Management of Acute Malnutrition (CMAM) expansion.
- Nutrition-sensitive cash top-ups.

4.2 Health Response

- Mobile health units deployed in remote villages.
- Heatstroke response centers in Jacobabad.
- Immunization continuity during migration cycles.
- Integrated WASH-health awareness campaigns.

Nutrition surveillance must be institutionalized through quarterly MUAC screenings and linked to district early warning dashboards.

5. Education Continuity

Drought impacts school attendance through migration, labor shifts, and water burden. Umerkot records the highest dropout vulnerability during drought cycles.

Strategic measures:

- Conditional cash transfers tied to school attendance.
- School feeding programs to incentivize retention.
- Safe water access in schools.
- Temporary learning centers in migration-prone villages.
- Adolescent girls' retention programs.

Education stabilization prevents long-term poverty entrenchment and child labor escalation.

6. Gender-Responsive Programming

Women's workload intensifies during drought due to water collection, livestock care, and household food management. Female-headed households experience compounded vulnerability.

Priority interventions:

- Direct cash transfers to women.
- Women-managed micro-livestock grants (goats, poultry).
- Inclusion of women in drought planning committees.
- Protection referral pathways integrated into drought response.
- Safe water access points reducing travel distance.

Maternal nutrition support must be integrated into anticipatory triggers to prevent intergenerational malnutrition.

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