



IMPACT OF CLIMATE CHANGE ON WOMEN & CHILDREN

Exploring Vulnerabilities and Resilience on Women and Children to Climate-Related Hazard in Logar and Wardak Provinces, Afghanistan



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About This Research

This research investigates climate change impacts on women and children in Logar and Maidan Wardak provinces, Afghanistan, providing evidence-based recommendations for adaptation interventions.

Research Team:

- Sayed Abdul Baset Rahmani,
- Dr. Najib Loodin,
- Sayed Shoaib Sadaat,
- Dr. Mujib Rahman Ahmadzai,
- Royal Hadid,
- S.A. Fatah Rahmani

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For more information, contact:

| info@tlo-afghanistan.org

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Acronyms

AHP	Analytic Hierarchy Process
CHIRPS	Climate Hazards Group InfraRed Precipitation with Station data
CI	Consistency Index
CR	Consistency Ratio
DEM	Digital Elevation Model
FAO	Food and Agriculture Organization
FGD	Focus Group Discussion
GIS	Geographic Information System
GRACE	Gravity Recovery and Climate Experiment
HBS	Heinrich Böll Stiftung
KII	Key Informant Interview
MCDA	Multi-Criteria Decision Analysis
MODIS	Moderate Resolution Imaging Spectroradiometer
NATO	North Atlantic Treaty Organization
ND-GAIN	Notre Dame Global Adaptation Initiative
NDVI	Normalized Difference Vegetation Index
NEPA	National Environmental Protection Agency
NGO	Non-Governmental Organization
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
SPI	Standardized Precipitation Index
SPSS	Statistical Package for the Social Sciences
TLO	The Liaison Office
UN	United Nations
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
VCI	Vegetation Condition Index
WASH	Water, Sanitation, and Hygiene
WFP	World Food Programme
WHO	World Health Organization
WLC	Weighted Linear Combination



Executive Summary

Afghanistan ranks sixth among countries most susceptible to climate impacts and seventh least prepared for adaptation (ND-GAIN, 2021; UNDP, 2023). Despite minimal greenhouse gas contributions, the country faces escalating climate-related disasters—droughts, floods, extreme temperatures, erratic rainfall—threatening food security, water availability, health outcomes, and livelihoods. Women and children bear disproportionate burdens due to pre-existing vulnerabilities, limited disaster mobility, and exclusion from decision-making processes. This study documents climate change impacts on women and children in Logar and Maidan Wardak provinces (1.17 million people, 97-99% rural) through mixed-methods research integrating 400 (651 children under 5, 847 women aged 18-49, 741 children aged 5-18) household surveys, 25 key informant interviews (15 female and 10 male experts), focus group discussions, and GIS spatial analysis using the Analytic Hierarchy Process. The research addresses critical knowledge gaps in gender-disaggregated climate impacts at provincial and district levels where adaptation interventions must be implemented. All statistics presented in this report, unless otherwise cited, represent original findings from field research conducted October-November 2025 across six districts in both provinces.

Critical Findings

Category	Impact Area	Critical Statistics
Climate Exposure	Drought/water scarcity	91.2% households
	Flooding	76.0% households
	Extreme heat	52.2% households
Health Crisis	Children with health problems	90.5% (651 under age 5)
	Women with health problems	85.5% (847 aged 18-49)
Service Disruption	Food insecurity	95.8% households
	Education disruption	87.0% households
	Water access disruption	84.8% households
Decision-Making Gaps	Male-dominated decisions	86.7% households
	Women lack disaster training	69% households
	Women in community planning	Only 10%
Priority Needs (Top 3)	Protection infrastructure	91.75% households
	Cash assistance	55.0% households
	Water/sanitation systems	51.25% households

Key Insights

The Water-Everything Connection: Water scarcity (91.2%) drives agricultural failure, which drives food insecurity (95.8%), which drives malnutrition (18.5% children, 7.25% women), which drives disease vulnerability (64.5% child diarrhea, 74.5% women's waterborne disease). Water infrastructure improvements could create cascading benefits across health, nutrition, education, and livelihoods.

Women's Knowledge Disconnect: Women possess detailed operational knowledge about water sources, food management, child nutrition, and household health—precisely the domains most affected by climate change. Yet only 10% participate in community disaster planning and 86.7% of household climate decisions remain male-dominated. This knowledge disconnect undermines adaptation effectiveness.

Children's Developmental Crisis: The 651 children under 5 face overlapping health threats during critical developmental windows: 64.5% diarrheal disease, 31.5% respiratory problems, 24.5% dehydration, 18.5% malnutrition. These conditions interact synergistically—malnutrition weakens immunity while disease worsens nutritional status.

Geographic Vulnerability Concentration: AHP spatial analysis reveals climate hazards are not uniformly distributed. High-risk zones identified through GIS mapping align precisely with districts reporting most severe household impacts. In Maidan Wardak Province, 35-40% of territory faces high flood risk combined with severe groundwater depletion, creating compound hazards where communities repeatedly experience both droughts and floods. Targeted infrastructure investments in identified high-risk zones could protect disproportionate numbers of vulnerable women and children.

Climate as Cross-Cutting Crisis: Climate change is not a single-sector issue but affects health, education, livelihoods, water, food security, gender equity, and social structures simultaneously. The 91.2% drought drives the 42% agricultural collapse, which drives the 95.8% food insecurity, which drives the 18.5% child malnutrition, while healthcare access barriers (43%) prevent treatment.

Resource Constraints Prevent Adaptation: The 41.75% who have taken no adaptation measures reflects not lack of knowledge but lack of resources. Households experiencing 95.8% food insecurity cannot afford infrastructure improvements, livelihood diversification, or other adaptations. This explains why top priorities focus on resource provision (91.75% infrastructure, 55% cash, 51.25% water systems, 33.75% livelihood inputs).

I Provincial Patterns

Logar Province: River valley topography, higher population density, better infrastructure baseline but greater flood exposure. More piped water access (12%) and community well systems. Priorities include flood protection infrastructure and agricultural recovery.

Maidan Wardak Province: Mountainous terrain, dispersed settlements, geographic isolation. Greater reliance on springs and traditional karizes vulnerable to drought. Healthcare access more challenging (24% no access vs. 3.9% Logar). Higher disaster mortality despite fewer affected (57 deaths vs. 27 in Logar over 2012-2025). Priorities include all-weather road access, remote healthcare delivery, and communication systems.

I Urgent Recommendations

1. Water Infrastructure (51.25% priority): Climate-resilient water systems with women's input in design, addressing 91.2% drought exposure and 84.8% water disruption
2. Protection Infrastructure (91.75% priority): Drainage, flood walls, retaining walls preventing damage affecting 76% of households

3. Cash Assistance (55% priority): Immediate support for 95.8% food insecure, enabling survival and adaptation
4. Livelihood Recovery (33.75% priority): Seeds, tools, livestock for 42% agriculture-dependent households; time-sensitive for planting seasons
5. Women's Training (38.75% priority): Disaster preparedness for 69% currently untrained, delivered through accessible, practical programs
6. Early Warning Systems (24% priority): Gender-responsive communication reaching 41% without current access
7. Healthcare Access: Mobile services, community health workers, emergency response for 43% facing barriers
8. Women's Participation: Systematic inclusion in the 90% of disaster planning currently excluding women; recognition of operational knowledge in strategic decisions

I The Path Forward

This research documents a climate crisis that has moved from future threat to present emergency affecting 3,474 individuals in this sample alone, with 2,239 vulnerable women and children bearing disproportionate burdens. Communities demonstrate resilience through housing relocation (28.75%), crop adaptation (24.25%), and sophisticated coping strategies, while clearly articulating their needs: protection infrastructure (91.75%), cash assistance (55%), water systems (51.25%), and women's training (38.75%).

The pathway forward requires matching resources to need scale, centering the 90% of women currently excluded from disaster planning, and addressing underlying vulnerabilities rather than symptoms alone. Climate change in Logar and Maidan Wardak is not a projection—it is a documented emergency. The question is whether response will match the urgency, scale, and sophistication of the challenge communities face.



Introduction

Afghanistan, a Central Asian States grapples with humanitarian crisis and devastating impacts of climate changes (Masood et al., 2022; Rajmal et al, 2022). Climate change does not affect populations uniformly; rather, it amplifies existing inequalities and vulnerabilities within communities (UN Women, 2022). In Afghanistan, the intersection of climate change with entrenched with gender-based challenges, constraints, and limited child protection systems create a compounding crisis for women and children (CARE Zaki, 2023). Women, who have limited participation in decision-making processes and face restricted mobility and economic opportunities, face significant challenges in responding to climate-induced shocks such as drought, flooding, and food insecurity. Children, particularly girls, experience heightened risks of malnutrition, education disruption, and early marriage as households adopt negative coping strategies under climate stress. Governance challenges and ongoing transition further affect adaptive capacity, with vulnerable populations requiring enhanced institutional support (Loodin et al., 2024a)."). Understanding these interconnected dynamics is essential for developing climate responses that address not only environmental challenges but also the structural inequalities that determine who suffer most from climate impacts.

As one of the world's most climate-vulnerable nations, Afghanistan faces unprecedented challenges from climate change despite contributing minimally to global greenhouse gas emissions (UNEP, 2022). The country ranks among the top ten most vulnerable and least ready nations to adapt to climate change according to the Notre Dame Global Adaptation Initiative Index (ND-GAIN, 2022). Within this context of heightened vulnerability, women and children emerge as disproportionately affected populations, bearing the heaviest burdens of climate-induced disasters, resource scarcity, and socioeconomic disruption. This introduction examines the compounding impacts of climate change on these vulnerable groups in Afghanistan, exploring how environmental degradation intersects with existing patterns of gender-based challenges, conflict, and political instability to create a perfect storm of humanitarian challenges.

This research operates within an intersectional analytical framework that recognizes climate change impacts as mediated through pre-existing social inequalities and governance structures. In Afghanistan's context, four interconnected dimensions shape climate vulnerability: (1) Environmental degradation accelerates through drought cycles, flooding, and temperature extremes, disrupting traditional adaptation mechanisms; (2) Gender-based challenges manifest through restricted mobility, limited resource access, and limited participation in decision-making processes, amplifying women's exposure to climate risks; (3) Child vulnerability emerges from developmental sensitivity to environmental stressors, dependency on adult care systems, and limited adaptive capacity; and (4) Governance challenges include institutional capacity constraints, fragmented climate policy implementation, and limited integration of gender-responsive approaches in adaptation planning. These dimensions interact synergistically—governance challenges affect gender-based vulnerabilities, which in turn intensify child vulnerabilities during climate events. This framework guides our analysis of how climate impacts cascade through social structures to disproportionately affect women and children in Logar and Maidan Wardak provinces.

Afghanistan's geographical location and topography make it exceptionally susceptible to climate change impacts. The country has experienced a temperature increase of approximately 1.8°C since 1950, significantly higher than the global average, with projections indicating further warming of 2.5°C to 6°C by the end of the century (NEPA & UNEP, 2016). These rising temperatures have triggered cascading environmental consequences, including accelerated glacial melt in the Hindu Kush mountain range, altered precipitation patterns, increased frequency and intensity of droughts and floods, and degradation of agricultural land.

The World Bank (2021) reports that climate-related disasters have affected more than 7 million Afghans over the past decade, with droughts alone impacting nearly 80% of the population in various degrees. However, these statistics mask the gendered dimensions of climate vulnerability, as women and children face distinct and often more severe consequences due to their social, economic, and political marginalization within Afghan society.

Women in Afghanistan occupy a particularly precarious position in the face of climate change. Cultural norms and legal restrictions limit women's access to resources, education, employment, and decision-making power (Human Rights Watch, 2022). These pre-existing inequalities are amplified by climate change, creating what scholars' term "climate injustice" whereby those least responsible for environmental degradation suffer its most severe consequences (CARE International, 2020). When droughts devastate crops or floods destroy homes, women bear primary responsibility for water collection, food preparation, and family care with increasingly scarce resources. Studies indicate that during severe droughts in Afghanistan, women and girls may walk up to six hours daily to collect water, time diverted from education, income generation, or rest (UNICEF, 2019). Furthermore, climate-induced economic stress often forces families into negative coping mechanisms, including early marriage of daughters, withdrawal of girls from school, and reduced household expenditure on maternal and child health services. The intersection of climate vulnerability with Afghanistan's patriarchal social structures thus creates a multiplier effect, where environmental shocks exacerbate gender-based discrimination and violence.

Children, particularly girls, represent another critically vulnerable demographic in Afghanistan's climate crisis. With approximately 47% of Afghanistan's population under the age of 15 (UNICEF, 2023), climate change threatens the health, education, nutrition, and future prospects of an entire generation. Climate-related disasters disrupt educational access, damage school infrastructure, and force families to prioritize immediate survival over long-term educational investments. The effects are particularly acute for girls, who face additional barriers including early marriage during climate-induced economic hardship and cultural preferences for educating sons when resources are limited (Save the Children, 2021). Malnutrition rates among Afghan children have reached alarming levels, with climate-driven food insecurity contributing to stunting, wasting, and micronutrient deficiencies that have lifelong cognitive and physical impacts. The World Food Programme (2022) estimates that over 3 million Afghan children under five years suffer from acute malnutrition, a crisis significantly worsened by consecutive droughts and agricultural failures linked to changing climate patterns.

The compound crisis facing Afghan women and children is further complicated by decades of conflict, political instability, and the August 2021 political transition, which has affected women's access to education, employment, and healthcare (UN Women, 2022). Climate change does not occur in a vacuum; rather, it interacts with and intensifies existing vulnerabilities created by conflict, poverty, and governance challenges. Displacement driven by environmental degradation compounds the trauma of conflict-induced displacement, with women and children in internally displaced persons (IDPs) camps facing heightened risks of gender-based violence, trafficking, exploitation, and inadequate access to basic services (International Organization for Migration, 2021). The erosion of traditional livelihoods due to environmental change, particularly in agriculture and livestock herding, undermines family stability and food security, with women-headed households facing particularly severe economic vulnerabilities.

Understanding the differentiated impacts of climate change on women and children in Afghanistan requires moving beyond aggregate statistics to examine the lived experiences of these populations and the structural factors that shape their vulnerability. This examination must consider how climate change intersects with gender, age, socioeconomic status, ethnicity, and geography to create varied patterns of risk and resilience. It must also recognize that women and children are not merely passive victims but active agents who possess valuable knowledge, skills, and adaptive strategies that can inform effective climate responses. By centering the experiences and voices of Afghan women and children in climate discourse, we can develop more equitable, effective, and sustainable approaches to climate adaptation and mitigation that address both environmental and social justice concerns. Thus, this research aims to navigate the adverse effects of climate changes on women and Children with special focus on Logar and Maidan Wardak provinces, two of the under-served yet susceptible provinces to the rapid effects of climate changes in central-eastern of Afghanistan.

I Research Objectives

This study pursues four specific objectives:

1. To assess the differential impacts of climate change on women and children across six districts in Logar and Maidan Wardak provinces through quantitative household surveys and qualitative community assessments.
2. To identify gender-specific vulnerabilities and adaptive capacities within household and community structures using mixed-methods analysis.

3. To map climate hazard zones and vulnerability hotspots through GIS-based spatial analysis.
4. To develop evidence-based recommendations for gender-responsive climate adaptation interventions tailored to provincial contexts.

I Research Questions

The study addresses the following research questions:

Primary Research Questions: How do climate change impacts differentially affect women and children in Logar and Maidan Wardak provinces, and what factors mediate their vulnerability and adaptive capacity?

Specific Research Questions:

1. How do climate hazards—including heatwaves, cold spells, floods, droughts, erratic rainfall, landslides, and dust storms—differentially affect women and children compared to adult men in Logar and Wardak provinces?
2. In what ways do climate events disrupt women's and children's access to essential services, specifically water, healthcare, food security, education, and protection?
3. How do climate stresses affect household food security and women's economic participation in affected communities?
4. What traditional and contemporary coping strategies do women and children employ in response to climate hazards at household and community levels, and what factors enable or constrain their effectiveness?
5. What roles do women play in household and community climate adaptation decision-making within current cultural contexts?
6. What are the most effective entry points for climate resilience interventions that address the specific vulnerabilities of women and children to multiple climate hazards within Afghanistan's current governance framework?

I Research Contribution and Significance

Theoretical Contribution: This research advances understanding of climate-gender-vulnerability nexuses in conflict-affected contexts by providing empirical evidence from understudied Afghan provinces. It contributes to feminist political ecology literature by documenting how patriarchal structures mediate climate impacts in Islamic contexts.

Empirical Contribution: The study provides the first comprehensive mixed-methods assessment integrating GIS-AHP analysis for climate vulnerability mapping in Logar and Maidan Wardak provinces. It generates province-specific data on 400 households, establishing baseline indicators for future monitoring.

Practical Significance: Findings directly inform policy formulation for gender-responsive climate adaptation in Afghanistan. The research provides actionable recommendations for humanitarian organizations, government agencies, and development partners working in climate-vulnerable provinces. The GIS vulnerability maps offer practical tools for resource allocation and intervention targeting.

Methodological Innovation: The study pioneers the application of Analytic Hierarchy Process (AHP) integrated with remote sensing for multi-criteria climate hazard assessment in Afghanistan's context, creating a replicable framework for similar assessments in data-scarce environments.



Literature review

Afghanistan has emerged as one of the world's most vulnerable nations to climate change, ranking sixth among countries most susceptible to climate impacts and seventh least prepared to adapt (UNDP, 2023). Despite contributing minimally to global greenhouse gas emissions—approximately one tonne of CO₂ equivalent per person annually (Climate Change Tracker, 2025)—the country faces disproportionate consequences from climate change (Loodin 2024a). This literature review examines the rapid and accelerating impacts of climate change across Afghanistan, with particular emphasis on the central provinces of Logar and Wardak, which exemplify the humanitarian and environmental crises unfolding across the nation.

I National Climate Change Trends

Afghanistan has experienced a temperature increase of 1.8°C since 1950, significantly exceeding the global average warming of 1.5°C (Shokory et al., 2025). This rapid warming occurred through distinct phases: the mean annual temperature rose by 0.6°C between 1960 and 2008, followed by an additional 1.2°C increase between 2009 and 2016 (OCHA, 2023). These temperature increases have triggered cascading environmental consequences that fundamentally threaten the country's water resources, agricultural systems, and population stability. Projections indicate further warming of 1.4°C to 5.4°C by the 2080s and 2090s compared to the 1986-2005 baseline, with the range highlighting the uncertainty inherent in different emissions pathways (Chapman et al., 2020).

The accelerated warming has intensified glacier and snowmelt in the Hindu Kush mountain range, which provides critical water resources to Afghanistan's major river systems during summer months. The Kunduz River basin alone has experienced a 30% decrease in precipitation since the 1960s, compensated partially by increased glacier melt—a temporary solution that masks the long-term crisis of glacier depletion (Shokory & Lane, 2024). Between 1990 and 2015, Afghanistan lost almost 14% of its glacier coverage, and projections suggest the Hindu Kush Himalaya region could lose up to 60% of its glaciers by 2100 (Shokory et al., 2024).

I Drought: The Predominant Climate Hazard

Drought has become the most frequently reported climate shock experienced by Afghan households, with the proportion of affected households increasing dramatically from 39% in 2021 to 64% in 2022. Afghanistan has faced recurring droughts with increasing frequency; while droughts historically occurred once every three years between 1986 and 2012, they now occur once every other year during the 2013-2023 period (World Bank, 2024). The country endured its worst drought in 30 years during 2021-2022, followed by a third consecutive year of drought in 2023 (OCHA, 2023). As of late 2023, 25 out of 34 provinces experienced either severe or catastrophic drought conditions, affecting more than 50% of the population.

The agricultural impacts of these recurring droughts are devastating for a nation where approximately 60-80% of livelihoods depend on agriculture, and 60% of the population relies on rain-fed agricultural systems (SIPRI, 2022). The drought conditions of 2021-2022 resulted in wheat production deficits of 16-27%, necessitating increased imports from international suppliers (ReliefWeb, 2021). Drought-induced economic losses in Afghanistan amount to approximately \$550 million in normal years, escalating to more than \$3 billion during severe droughts—equivalent to between 3.2% and over 18% of the country's GDP (Climate Diplomacy, 2024). These figures are particularly staggering when compared against Afghanistan's national budget of just \$2.7 billion in 2023.

The human consequences of drought extend beyond economic metrics. Climate-induced displacement has reached unprecedented levels, with 2.3 million people forced to leave their homes due to drought since 2021 (UNDP, 2023). Wells across the country have been drying up, forcing residents to drill deeper—from 200 meters to 300 meters or more—often with limited success as underground water levels continue to decline (Dialogue Earth, 2024). In Kabul Province alone, 49% of assessed boreholes are completely dry, with remaining boreholes functioning at only 60% efficiency (Dialogue Earth, 2024).

The literature demonstrates that drought has evolved from a periodic environmental hazard to Afghanistan's most pervasive climate threat, with frequency doubling from once every three years (1986-2012) to once every other year (2013-2023) (World Bank, 2024). The economic toll is staggering, ranging from \$550 million annually in normal years to over \$3 billion during severe droughts—potentially exceeding 18% of GDP (Climate Diplomacy, 2024). This escalating drought crisis forms the backdrop for understanding how women and children in our study areas experience compounding vulnerabilities. Our current research reveals that the documented impacts—including 2.3 million people displaced since 2021 and 49% of Kabul Province's boreholes completely dry (UNDP, 2023; Dialogue Earth, 2024)—translate into specific gender-differentiated hardships, with women bearing increased water collection burdens and children facing heightened malnutrition risks as household coping capacity erodes.

I Flash Floods and Extreme Precipitation Events

Paradoxically, while Afghanistan suffers from chronic drought, the country simultaneously faces an increased frequency and intensity of flash floods. This apparent contradiction reflects the fundamental disruption of Afghanistan's water cycle caused by climate change (Mayar, 2022). Rising temperatures enable the atmosphere to retain approximately 7% more water for every degree Celsius increase, resulting in heavier clouds that produce localized heavy rains and catastrophic flooding (Sadid, cited in Dialogue Earth, 2024). Since 2021, floods, droughts, and other climate-driven environmental hazards have become the primary cause of displacement in Afghanistan, surpassing conflict-related displacement (IOM, 2025).

The pattern of extreme precipitation has intensified dramatically. The off-season rainfall of July 2022 caused Afghanistan's rivers to swell rapidly, triggering flash floods across multiple provinces within less than 24 hours (ARCS, 2022). Multiple waves of flooding struck in 2022—in July, mid-August, and late August—with cumulative impacts killing at least 141 people, injuring 124, and affecting approximately 249,900 people across 16 provinces. The 2023 flooding season, influenced by El Niño conditions, affected 18 provinces and resulted in 61 deaths, with 126,000 people impacted and over 13,023 hectares of agricultural land washed away. Most recently, flash floods in May 2024 in northern provinces killed over 315 people in Baghlan Province alone and destroyed more than 2,000 homes (Climate Diplomacy, 2024).

The infrastructure damage from these floods is equally severe. In August 2022, officials reported that 750 cisterns, 329 small dams, and 441 major water channels were damaged by flooding across the country (Al Jazeera, 2022).

Agricultural losses have been catastrophic, with nearly 600,000 acres of land remaining flooded and unusable following the 2022 events (Al-Jazeera, 2022). Afghan officials claimed in November 2022 that climate change was responsible for economic losses exceeding two billion U.S. dollars in that year alone (Al-Jazeera, 2022).

The paradox of simultaneous drought and intensifying flash floods reflects fundamental disruption of Afghanistan's water cycle, with atmospheric warming enabling 7% more water retention per degree Celsius increase (Sadid, cited in Dialogue Earth, 2024). The escalating severity is evident in casualty figures: 141 deaths in 2022's multiple flood waves, 61 deaths across 18 provinces in 2023, and over 315 deaths in Baghlan Province alone in May 2024 (ARCS, 2022; ARCS, 2023; Climate Diplomacy, 2024). Infrastructure losses compound human tragedy, with 750 cisterns, 329 small dams, and 441 major water channels damaged in August 2022 alone (Al Jazeera, 2022). Our study examines how these catastrophic events differentially impact women and children in affected communities, revealing that while aggregate statistics capture the scale of destruction, they obscure the gendered dimensions of displacement, loss of livelihood assets, and increased protection risks that emerge when families lose homes and community support structures.

I Climate Impacts in Logar and Wardak Provinces

The central-eastern provinces of Logar and Wardak exemplify the severe climate vulnerabilities affecting Afghanistan. These provinces have been identified as among the region's most disproportionately affected by climate change, where populations rely heavily on agricultural productivity while simultaneously facing multiple challenges including poverty and limited access to resources (IRC, 2023). Both provinces have experienced recurring devastation from flash floods, with particularly severe events in 2022 and 2023 demonstrating the intensifying nature of climate-related disasters.

In July 2022, Logar Province was among the hardest hit by off-seasonal rainfall and subsequent flash floods. The disaster resulted in at least 20 deaths and 30 injuries, with approximately 3,000 houses destroyed along with several hectares of crops (ReliefWeb, 2022; Al Jazeera, 2022). The August 2022 flooding wave proved even more deadly, with Logar recording 20 additional fatalities and four people missing (ARCS, 2022). The Khoshi district of Logar Province suffered particularly severe damage, with residents reporting unprecedented destruction. One resident described being at home having lunch when floodwater struck, highlighting the sudden and catastrophic nature of these events (Al Jazeera, 2022).

Maidan Wardak Province has experienced similarly devastating impacts. The July 2023 floods proved especially deadly for Wardak, accounting for 37 of the 61 lives lost across 18 affected provinces (ARCS, 2023). Over 1,200 families were displaced by flooding in Kabul, Maidan Wardak, and Logar provinces during the 2023 events (IRC, 2023). Community leaders in Maidan Wardak described the fundamental change in weather patterns they were witnessing. Mohammad Qasim, a community leader of several villages in central Maidan Wardak, stated that at 54 years old, he had never experienced problems of this magnitude before the flash floods that battered his communities in June 2024 (AFP, 2025). The floods left riverbeds full of boulders and cracked mud, destroyed homes beyond repair, and drowned livestock, forcing families to live in rudimentary tents with no means or plans to rebuild.

The climate challenges facing Logar and Wardak extend beyond flooding. Both provinces have been identified among the 25 provinces experiencing drought conditions, with water scarcity creating compound crises (Relief Web, 2021). In Jaghatu district of Wardak province, multiple wells have dried up, and water disputes have turned violent—one person was killed in a water dispute between two villages in the Chak district, presaging the resource conflicts expected to intensify across the country as climate change-induced droughts persist (Mayar, 2022). The International Rescue Committee reported providing water trucking services to drought-affected populations in Wardak province during September-October 2021 as a last resort option to prevent displacement (ReliefWeb, 2021).

The agricultural systems in both provinces face existential threats from the combined pressures of drought and flooding. The provinces' agricultural productivity—critical for local livelihoods—has been severely disrupted by changing weather patterns and increased frequency of extreme events (IRC, 2023). The 2022 floods alone destroyed crops and agricultural land across the region, with flooding reportedly cutting off access along several roads, including major highways connecting these provinces to other regions (Relief Web, 2022). These disruptions compound the economic hardships already facing communities in Logar and Wardak, where poverty and limited access to resources constrain adaptive capacity.



Study Context

Logar and Maidan Wardak provinces are situated in the central-eastern region of Afghanistan, forming a critical geographical corridor between the capital Kabul and the southern provinces (Loodin et al., 2024a; Loodin & Warner, 2022). Logar Province, located in eastern Afghanistan, shares borders with Kabul to the north, Nangarhar to the east, Paktia to the south, and Maidan Wardak and Ghazni to the west (NPS, n.d.).

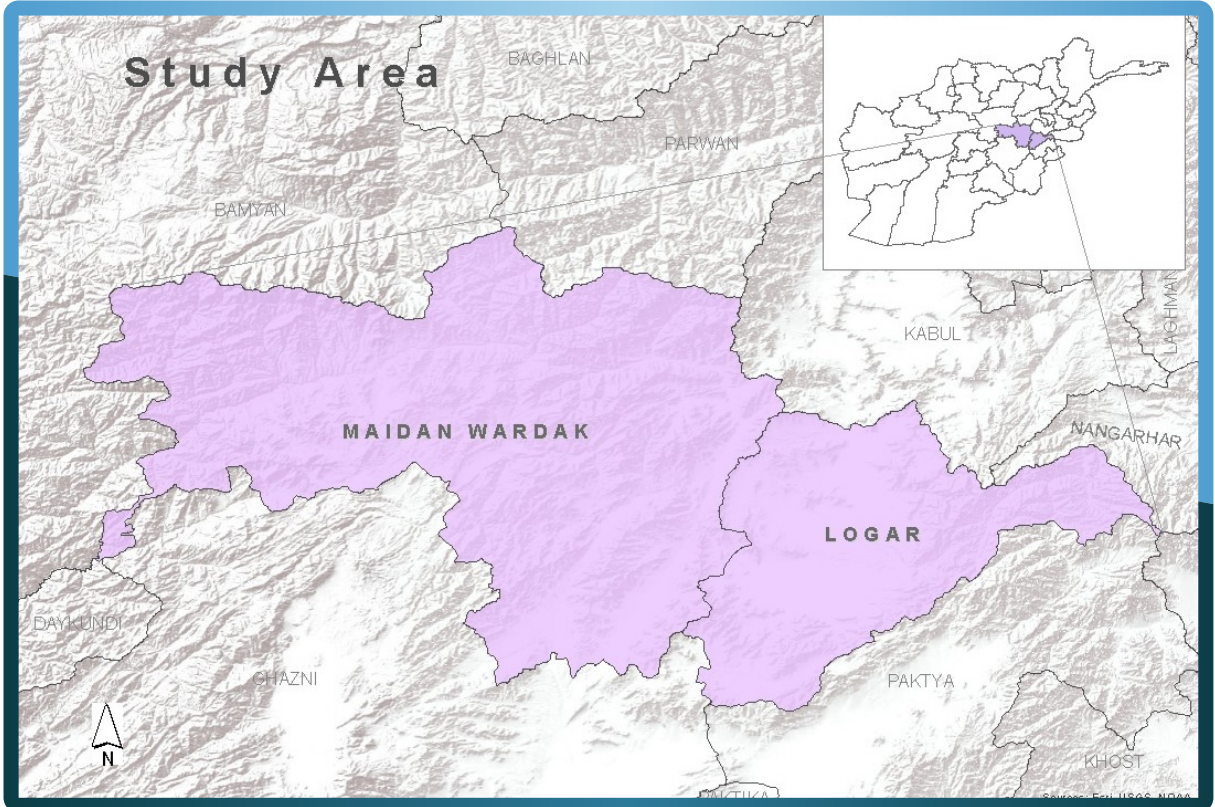


Figure 1: Study Area- Logar and Maidan Wardak Provinces

The two study provinces (highlighted) are located in central Afghanistan, directly south of Kabul Province. Logar Province (population 465,698; 97.3% rural) occupies the eastern position with river valley topography, while Wardak Province (population 707,486; 99.5% rural) lies to the west characterized by mountainous terrain (NSIA, 2024). Both provinces experience severe climate vulnerabilities from compound hazards including floods, droughts, extreme temperatures, and environmental degradation affecting predominantly rural, agriculture-dependent populations.

The province covers approximately 3,880 square kilometers and features a distinctive topography characterized by a relatively flat river valley in the north and central regions, surrounded by rugged mountains to the east, south, and southwest, including the Spin Range (Wikipedia, 2024). With an average elevation of 2,532 meters above sea level, Logar's landscape comprises a conglomeration of irrigated fields, gardens, rain-fed crops, and rock outcrops (Topographic Map, 2024). The Logar River, entering through the west and flowing northward, serves as the province's primary water source for approximately 442,000 residents, predominantly Pashtuns and Tajiks (Wikipedia, 2024).

Maidan Wardak Province, bordering Logar to the west, occupies 9,934 square kilometers in Afghanistan's central highlands (Wikipedia, 2024). The province borders Parwan to the northeast, Kabul and Logar to the east, Ghazni to the south, and Bamyan to the west. Maidan Wardak's capital, Maidan Shar, sits at 2,225 meters elevation, while the province's average elevation reaches 2,498 meters (ShunCulture, 2024). The province is characterized by extremely mountainous terrain, including the Koh-i-Baba Range in the north and the Paghman Range in the east, interspersed with valleys such as the Tangi Valley (NPS, n.d.). Famous high-altitude passes include the Hajigak Pass at 3,700 meters and the Unai Pass, which connect Maidan Wardak with neighboring provinces (ShunCulture, 2024). The majority of Maidan Wardak's approximately 672,000 residents—comprising Pashtuns, Hazaras, and Tajiks—inhabit rural areas concentrated along the strategic Kabul-Kandahar Highway and in locations with available irrigation and water sources (Wikipedia, 2024).

I Research Coverage: District Selection and Implementation

This research covered six districts across both provinces, selected based on climate vulnerability indicators, population characteristics, ecological diversity, and operational feasibility.

Maidan Wardak Province - Selection Rationale:

1. Maydan Shar District (Provincial Capital): As the administrative capital and business hub serving as the gateway to Kabul, Maydan Shar experiences prolonged drought and sand/dust storms. The district's position as market center makes it strategic for understanding climate impacts on urban-rural connections and economic activities.
2. Nerkh District: Nerkh experienced the deadliest flash flood in all of Maidan Wardak Province approximately three months prior to data collection (June 2025). Six people lost their lives, with the majority being children and women. The flood struck at 2 AM while families slept, leaving no warning and no time to evacuate. The research team documented devastating damage including massive boulders blocking farmland, destroyed apple harvests, and contaminated water sources. Besides floods, this area experiences exceptional and prolonged droughts.
3. Daymirdad District (Remote Mountainous Area): One of the farthest administrative territories of Maidan Wardak, taking 7.5 hours to reach from Maydan Shar. The team deployed with high difficulties. Each year this area experiences both floods and drought, with health issues due to drought increasing significantly among the population. This remote location represents the challenges facing isolated mountainous communities.

Logar Province - Selection Rationale:

1. Puli Alam District (Provincial Capital): As capital of Logar Province, Puli Alam has experienced flash floods and deforestation. Thousands of agricultural lands have been fully or partially damaged. Floods have become the most frequent climate disaster. Additionally, the district has experienced drought and tremendous groundwater depletion due to lack of surface water recharge.
2. Mohammad Agha District: This area has suffered from prolonged drought and agricultural destruction. Similar to Puli Alam, this location experiences low water resource management, with people increasingly dependent on groundwater resources due to surface water scarcity.
3. Azra District: This area experiences floods and cold waves. Furthermore, deforestation is a critical issue as Azra has the highest density of forest among all districts in Logar. Drought and declining precipitation trends have led to significant environmental challenges.



Methodology

This research employed a comprehensive mixed-methods approach integrating quantitative household surveys, qualitative key informant interviews and focus group discussions, and Geographic Information System (GIS) spatial analysis to investigate climate change impacts on women and children in Logar and Maidan Wardak provinces. The methodological design was specifically adapted for Afghanistan's challenging operational environment and cultural context.

Research Design

The study combined the explanatory power of quantitative data with the contextual depth of qualitative insights, enabling documentation of both the scale of climate impacts through statistical analysis and the lived experiences of affected communities. The research framework integrated climate vulnerability assessment, gender analysis examining differential impacts, and child rights-based approaches. GIS analysis using Multi-Criteria Decision Analysis and the Analytic Hierarchy Process provided spatial context for understanding where climate hazards concentrate and which communities face compound vulnerabilities.

The research addressed six core questions:

- 1. How do climate hazards differentially affect women and children compared to men?
- 2. How do climate events disrupt access to water, healthcare, food, education, and protection?
- 3. How do climate stresses affect household food security and women's economic participation?
- 4. What coping strategies do women and children employ?
- 5. What roles do women play in climate adaptation decision-making?
- 6. What are effective entry points for interventions within Afghanistan's current context?

I Sampling Strategy

Sample size was calculated using Cochran's formula (95% confidence, 5% margin of error), yielding a minimum requirement of 384 households, rounded to 400. Multi-stage cluster sampling was employed: Stage 1 selected six districts (three per province) based on climate vulnerability, population characteristics, and operational feasibility; Stage 2 randomly selected villages within districts; Stage 3 systematically selected households within communities. Field data collection during Oct-Nov 2025 completed 400 surveys (200 Maidan Wardak, 200 Logar), with analysis conducted on 400 surveys representing 3,474 individuals including 2,239 vulnerable persons (651 children under 5, 847 women aged 18-49, 741 children 5-18).

Survey Respondent Profile: This age distribution captures perspectives from women in their prime childbearing and child-rearing years (26-35 years forming the largest group at 38%), ensuring the sample reflects those most directly experiencing climate impacts on maternal and child health.

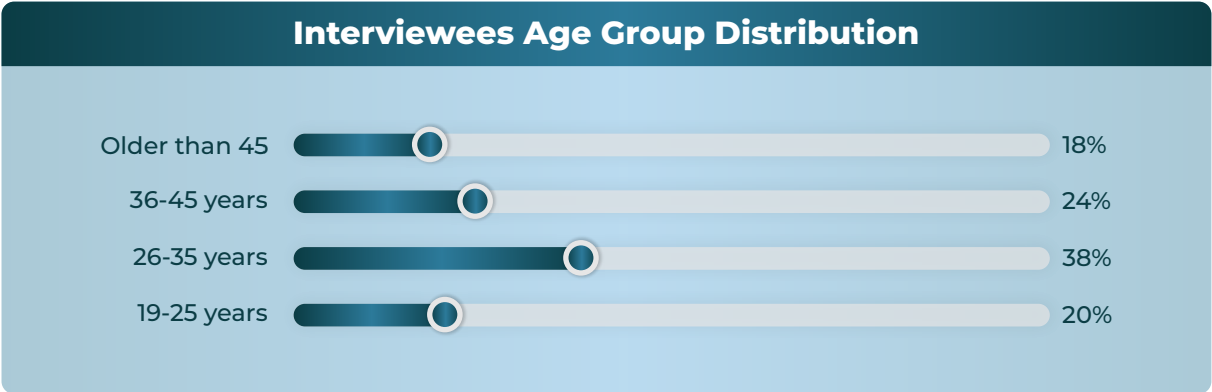


Figure 2: Interviewees Age Distribution

I Vulnerable Populations: 2,239 persons (64.4% of total)

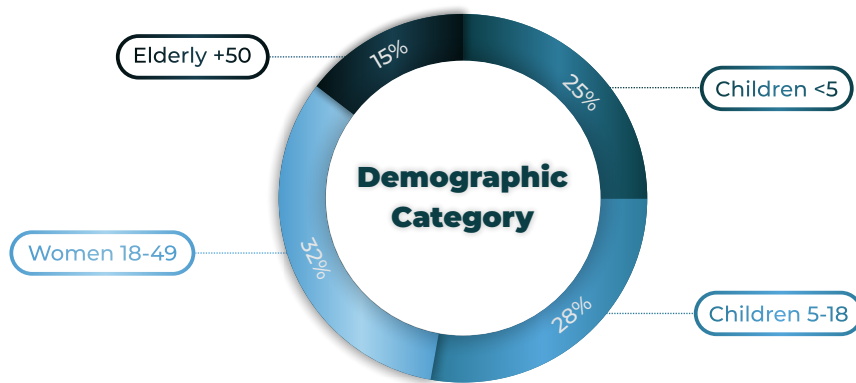


Figure 3: Demographic Category

This substantial vulnerable population provides robust evidence of climate impacts on those least able to cope with environmental stresses.

I Data Collection Methods

Household surveys employed structured questionnaires covering demographics, climate disaster exposure, health impacts, water access, food security, education disruption, coping mechanisms, decision-making patterns, and priority needs. Digital data collection using tablets enabled real-time validation and quality control.

Twenty-five key informant interviews were conducted with diverse stakeholders: environmental specialists (8), health workers (4), education representatives (3), government officials (3), community and religious leaders (4), and NGO staff (3). Interviews explored climate trends, impacts on vulnerable groups, institutional responses, and policy recommendations. Gender balance was maintained with 15 female and 10 male experts.

Focus group discussions involved gender-segregated groups of 8-12 participants. Women's groups discussed climate impacts on daily life, water collection, childcare, and coping strategies. Male community groups examined household decision-making, livelihood changes, and infrastructure needs. Sector-specific groups provided institutional perspectives. Sessions employed trained moderators using structured discussion guides.

Children's participation followed specialized protocols recognizing children as key stakeholders while protecting their wellbeing. Focus groups with adolescents (ages 13-17) employed age-appropriate facilitation techniques. Parental consent and child assent were obtained, with trauma-informed approaches ensuring immediate cessation if distress occurred.

Cultural Sensitivity and Ethical Protocols

All data collection followed strict cultural protocols essential for Afghanistan's context. Gender-segregated research teams were deployed, with female researchers facilitating engagement with women participants and male researchers supporting community liaison. Family members (Mahram) accompanied female researchers when accessing female respondents, respecting cultural norms while maintaining research quality. Community endorsement was obtained through formal meetings with provincial authorities, religious leader consultations, community shura approvals, and information sessions explaining research purpose and methods. This graduated engagement-built trust and ensured research served community interests.

I Data Analysis

Quantitative analysis employed descriptive statistics (frequency distributions, means, standard deviations) with systematic disaggregation by gender, age, province, and district. Inferential statistics included chi-square tests and t-tests ($p < 0.05$ significance threshold). Analysis used IBM SPSS Statistics 28 after comprehensive data cleaning and double-entry verification for 20% of surveys.

Qualitative analysis followed three-stage thematic coding. Verbatim transcription in original languages was followed by professional translation with back-translation verification. Open coding broke transcripts into meaningful units, axial coding grouped codes into broader categories, and selective coding integrated categories into overarching themes. Coding continued until saturation when no new themes emerged.

Mixed-methods integration employed triangulation across data sources, combining quantitative statistical patterns with qualitative narrative insights. Joint displays created matrices showing where findings converged, complemented, or diverged.

I Research Limitations

This study acknowledges limitations inherent to Afghanistan's complex operational environment. The cross-sectional design captures impact at a single time points rather than tracking changes over seasons or years. Self-reported data may be subject to recall bias. Cultural constraints limited direct access to some female respondents, requiring proxy reporting in certain contexts. Safety conditions restricted access to some high-risk areas, while the three-month timeline limited seasonal analysis depth.

Findings are specific to Logar and Maidan Wardak provinces and may not fully represent other Afghan provinces with different geographic, climatic, or demographic profiles. The predominantly rural sample limits applicability to urban contexts.

Statistical data on agricultural dependency, population figures, and economic indicators cited from literature sources represent published estimates. Official statistics are maintained by Afghanistan's National Statistics and Information Authority (NSIA), which readers may consult for the most current verified data.

Despite these limitations, the rigorous mixed-methods approach, substantial sample size (400 households, 3,474 individuals), comprehensive stakeholder engagement (25 key informant interviews, 4+ focus group discussions), systematic cultural sensitivity protocols, and advanced analytical techniques including GIS spatial analysis ensure findings provide robust, credible evidence for policy and programming decisions affecting women and children in climate-vulnerable Afghan communities.

I Multi-Criteria Climate Hazard Assessment

Remote Sensing and GIS Data

Remote sensing and GIS data were integrated into the research to complement primary data collection. These methods were chosen for their ability to provide spatially explicit information on environmental factors. We incorporated satellite imagery data including Normalized difference vegetation index (NDVI) for vegetation health mapping, Gravity Recovery and Climate Experiment (GRACE) satellite images for groundwater mapping, Climate Hazards Group InfraRed Precipitation with Station (CHIRPS) data for precipitation, The social flood risk probability by the NATO C3 Agency based on the updated AFG-FHM (Afghanistan Flood Hazard Model). The incorporation of satellite data enhanced the study's ability to assess environmental stressors at a regional scale. Standardized criteria maps and the AHP were used as data processing to evaluate the relative importance of environmental factors. As a result, a climate hazard hotspot map was generated, focusing solely on environmental factors. This map highlights areas with high to low environmental stressors.

Spatial Analysis:

GIS-Based Multi-Criteria Decision Analysis (MCDA) was applied to assess environmental variables such as dust storms, drought, groundwater storage, Flood, and precipitation.

The environmental layer processing involved creation of standardized maps for each environmental factor, implementation of the AHP to assign relative weights to criteria based on expert consultations, and integration of weighted environmental factors using the Weighted Linear Combination (WLC) model climate hazard map.

Analytic Hierarchy Process

In the present study, the AHP was adopted to establish the weight of each criterion based on a pairwise comparison matrix. The AHP is a well-known MCDA method that was proposed by Saaty (1980). It is a multi-objective, multi-criteria decision analysis approach that uses a pairwise comparison method to obtain values of preference among a set of parameters. It enables decision-makers to determine the weights of the criteria in the solution of a multi-criteria problem. The AHP consists of four steps (Mijani, 2022):

1. **Construction of decision hierarchy:** A hierarchy of the decision-making problem is drawn up in which the ultimate objective of the problem is at the top level, followed by criteria groups at the second level, individual criteria at subsequent levels, and alternatives at the lower levels.
2. **Pairwise comparisons:** A comparison matrix is formed by making a pairwise comparison between the criteria.
3. **Weights:** The weights for various criteria are determined based on pairwise comparisons. Values between 1 and 5 are assigned to different criteria, which are then compared in pairs to obtain a numerical weight for each criterion. Each of these numbers indicates the importance of criteria. In the modeling process, the greatest weight is assigned to the most effective criterion (Mijani, 2022).
4. **Verification of consistency:** The final step of the AHP is to check the consistency ratio (CR), defined as the consistency index (CI) divided by the random consistency index (RCI). The CI is calculated as follows: $CI = \frac{\lambda_{max} - m}{m - 1}$, where m is the number of criteria, and λ_{max} represents the principal eigenvalue of the pairwise comparison matrix. The CR should be less than 0.1.

Calculation Process and Results: The AHP analysis yielded precise weights for each environmental factor, supported by detailed classification ranges that reflect Climate Hazards. This quantitative framework provides a nuan



Figure 4: GIS-based Multi-Criteria Decision Analysis

Flood extent received the highest weight of 30%, with depth classifications ranging from 0 to 270 cm. Areas with flood depths of 112-270 cm received the highest risk score of 5, while areas with minimal flooding (0-5 cm) scored 1, reflecting the direct relationship between flood depth and climate hazard severity.

Vegetation status, measured through NDVI, also received a 30% weight, with classifications based on land cover types. Water bodies (-0.15 to 0.05) received the highest score of 5, indicating extreme vulnerability. Bare ground (0.05-0.09) received a high score of 4, indicating its strong correlation with environmental pressure. Crop and grasslands (0.09-0.14) scored 3, while agroforestry areas (0.14-0.21) scored 2. Forest areas (0.21-0.42) received the lowest score of 1, reflecting their critical role in environmental stability and climate resilience.

Precipitation patterns (CHIRPS) were weighted at 25%, with ranges from 127 to 771 mm. Areas with lowest precipitation (127-183 mm) received the highest score of 5, while regions with abundant rainfall (506-771 mm) scored 1, reflecting the inverse relationship between rainfall and climate hazard.

Groundwater Storage (GWS) received a 15% weight, with measurements in mm ranging from 383 to 848. Lower storage levels (383-492 mm) scored 5, reflecting critical water scarcity, while higher levels (737-848 mm) scored 1, indicating better water security.

These precisely defined ranges and their corresponding scores were integrated into the Weighted Linear Combination framework within GIS. The resulting spatial map effectively visualizes the combined impact of these environmental stressors, with each pixel's value representing the weighted sum of all factors.

The statistical validation of this framework through consistency checks ($CR = 0.039 < 0.1$) confirms that these weights and classifications provide a reliable basis for identifying areas at risk of environmental hazard. This comprehensive quantitative approach, grounded in precise measurements and carefully calibrated classification ranges, offers policymakers a robust tool for understanding and responding to climate hazards affecting women and children.

Assigned weights of different thematic layers and their corresponding sub-classes

Influencing Factor	Classes (range)		Material	Risk Score	Normalized Weight (W) %
Flood	112	270	cm	5	30%
	29	112	cm	3	
	5	29	cm	2	
	0	5	cm	1	
NDVI	-0.15	0.05	Water body	5	30%
	0.05	0.09	Bare Ground	4	
	0.09	0.14	Crop, Grass	3	
	0.14	0.21	Agroforestry	2	
	0.21	0.42	Forest	1	
Precipitation (CHRIPS)	127	183	mm	5	25%
	183	250	mm	4	
	250	352	mm	3	
	352	506	mm	2	
	506	771	mm	1	
GWS	383	492	mm	5	15%
	492	558	mm	4	
	558	638	mm	3	
	638	737	mm	2	
	737	848	mm	1	

Table 1: Assigned weights of different thematic layers and their corresponding sub-classes (As climate stressor)



Results and Discussion

| Climate-Related Disasters and Household Exposure

Types and Prevalence of Climate Disasters (Results)

Survey findings show that households in Logar and Maidan Wardak experience a wide range of climate-related hazards rather than a single dominant threat. Figure 5 summarizes the distribution of climate-related disasters reported by households.

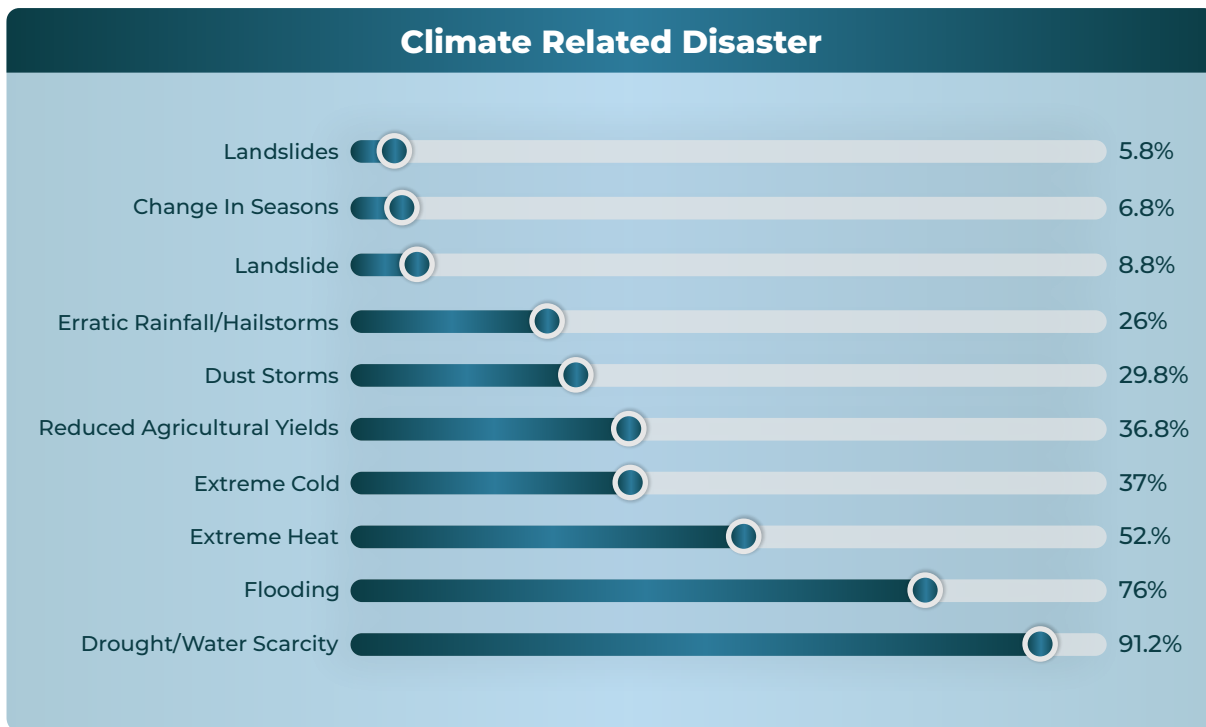


Figure 5: Reported climate-related disasters affecting households

Key informants described multi-year drought conditions from 2021–2023, including declining soil moisture, reduced groundwater recharge, weakening of irrigation systems, and successive harvest failures. Respondents also reported repeated flooding events, including a major incident in June 2025 that destroyed over 3,200 hectares of cropland and more than 270 houses, and caused at least six deaths (including three children). In several districts of Maidan Wardak (Jalrez, Nerkh, Day Mirdad, Sayed Abad), floods were described as particularly intense, destroying agricultural land, trees, forests and key bridges.

Extreme heat (52.2%) and extreme cold (37.0%) are both common, indicating exposure to temperature extremes in both directions. Households also reported dust storms (29.8%) and erratic rainfall/hailstorms (26.0%), which contribute to reduced agricultural yields (36.8%). Landslides, while affecting a smaller proportion of households (8.8%), were described as highly destructive when they occur, particularly in mountainous areas of Maidan Wardak.

Historical Disaster Context (Results)

According to OCHA Official disaster records for 2012–2025 provide historical context consistent with the survey.

In Logar Province:

- 31,077 people affected by disasters
- 27 deaths and 18 injuries

- 2,208 houses damaged and 1,880 destroyed
- Flooding was the primary disaster type (25,314 people affected), followed by heavy snowfall (5,623 people) and landslides (140 people)
- 4,758 families affected in total

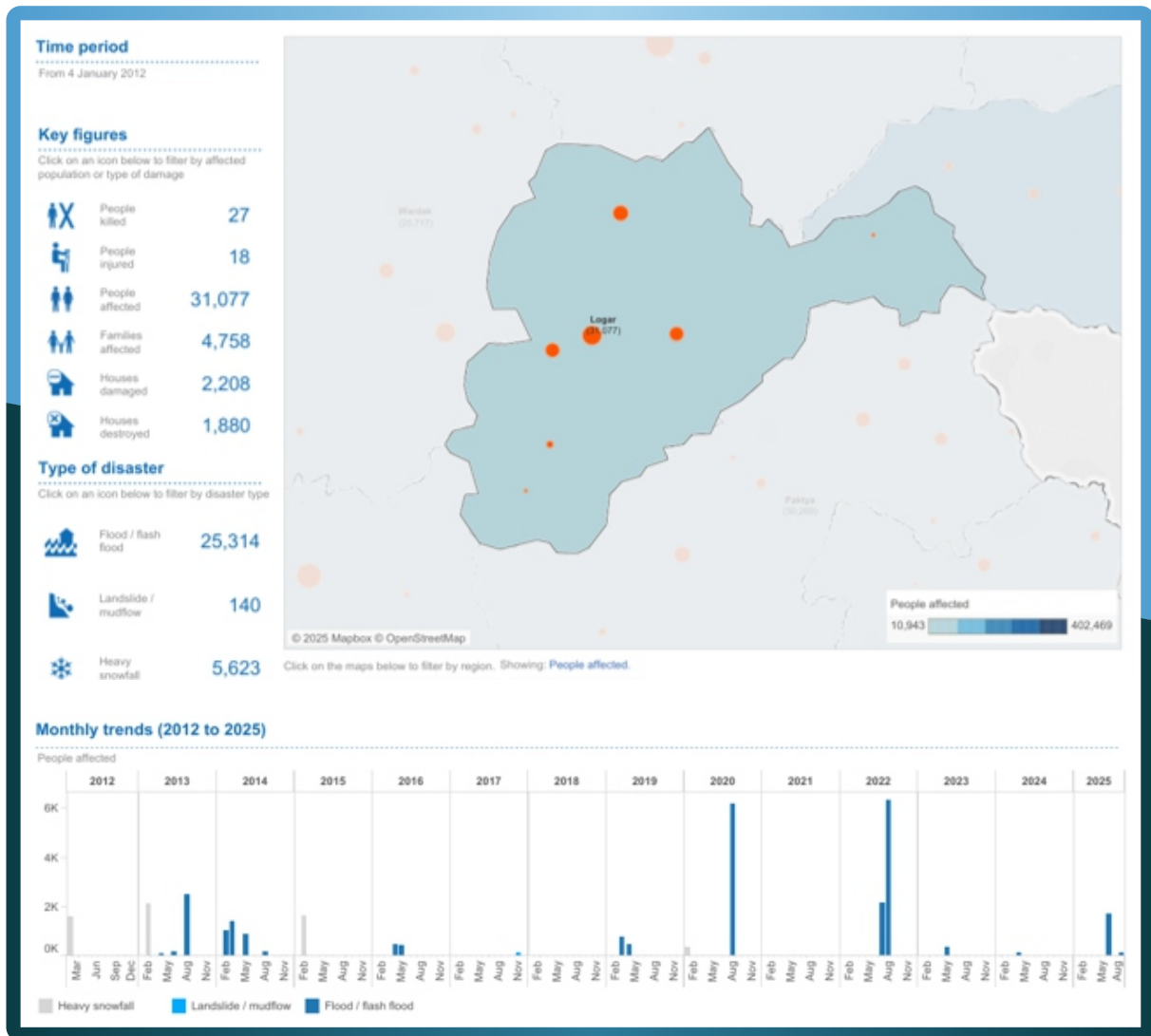


Figure 6: Historical natural disasters in Logar, 2012–2025, OCHA Afghanistan, December 2025.

In Maidan Wardak Province:

- 25,717 people affected
- 57 deaths and 24 injuries
- 1,985 houses damaged and 740 destroyed
- Flooding again the dominant hazard (25,711 people affected), with avalanches also reported (6 people affected)
- 4,013 families affected in total

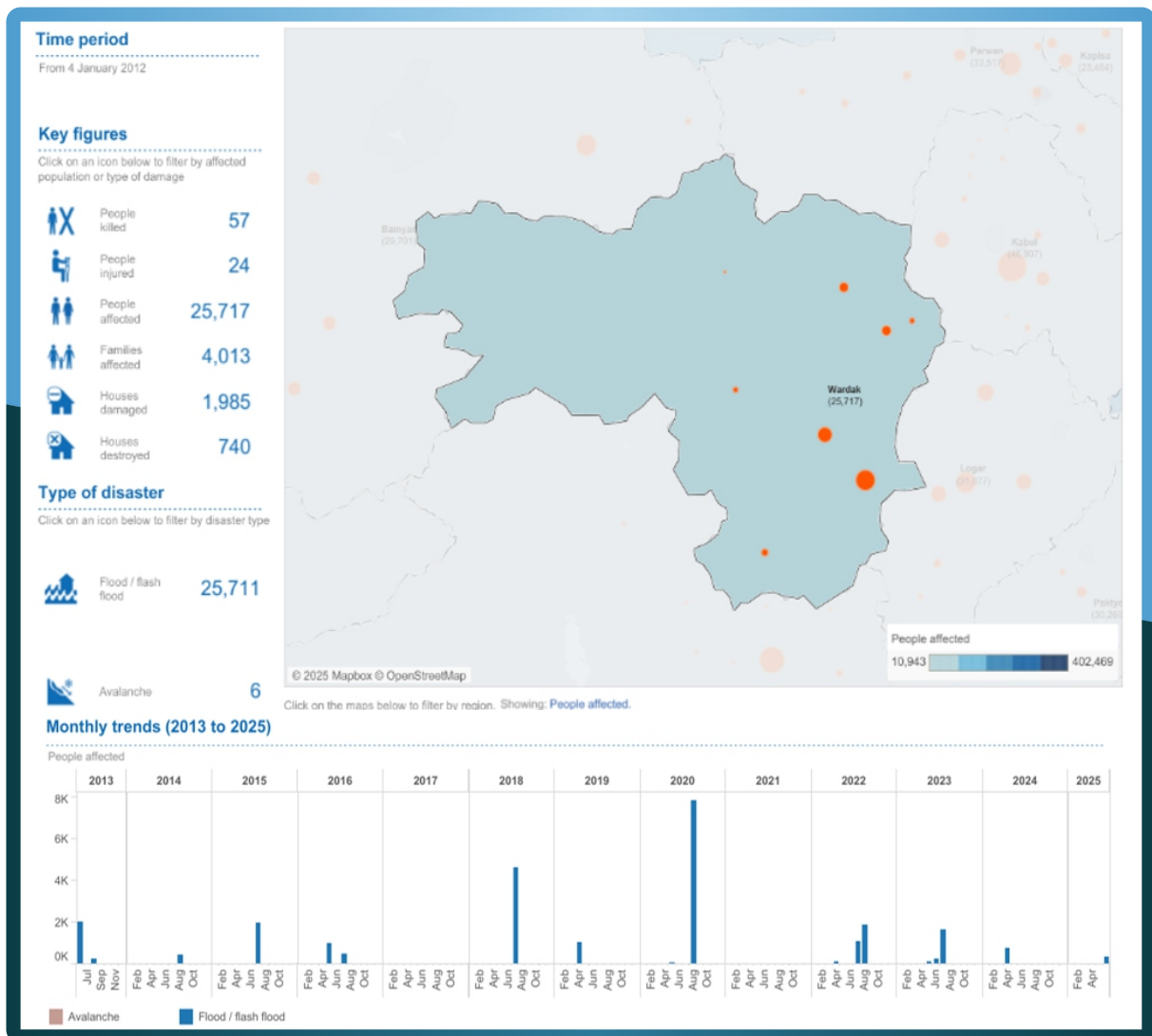


Figure 7: Historical natural disasters in Midan Wardak, 2012–2025, OCHA Afghanistan, December 2025.

Disaster trend data from 2012–2025 show repeated spikes in affected populations, particularly in 2020, 2022, 2023 and 2025. Combined, nearly 7,000 houses were damaged or destroyed across both provinces over 13 years.

Provincial Patterns of Hazard Exposure (Results)

Survey and key informant data indicate some geographic differentiation:

- **Logar Province** (97.3% rural, river valley topography)
 - Higher exposure to riverine flooding and bridge damage
 - Agricultural lands exposed to both drought and flood
- **Maidan Wardak Province** (99.5% rural, mountainous terrain)
 - Multiple hazard zones including flash floods in narrow valleys, landslides on steep slopes, harsh winter conditions, and dust in exposed areas
 - Greater isolation during disasters due to damaged or absent infrastructure

Health Impacts on Women

Prevalent Health Problems among Women (Results)

Household respondents reported multiple health problems affecting women (more than one could be named per household). The most commonly reported conditions are shown in Figure 8:

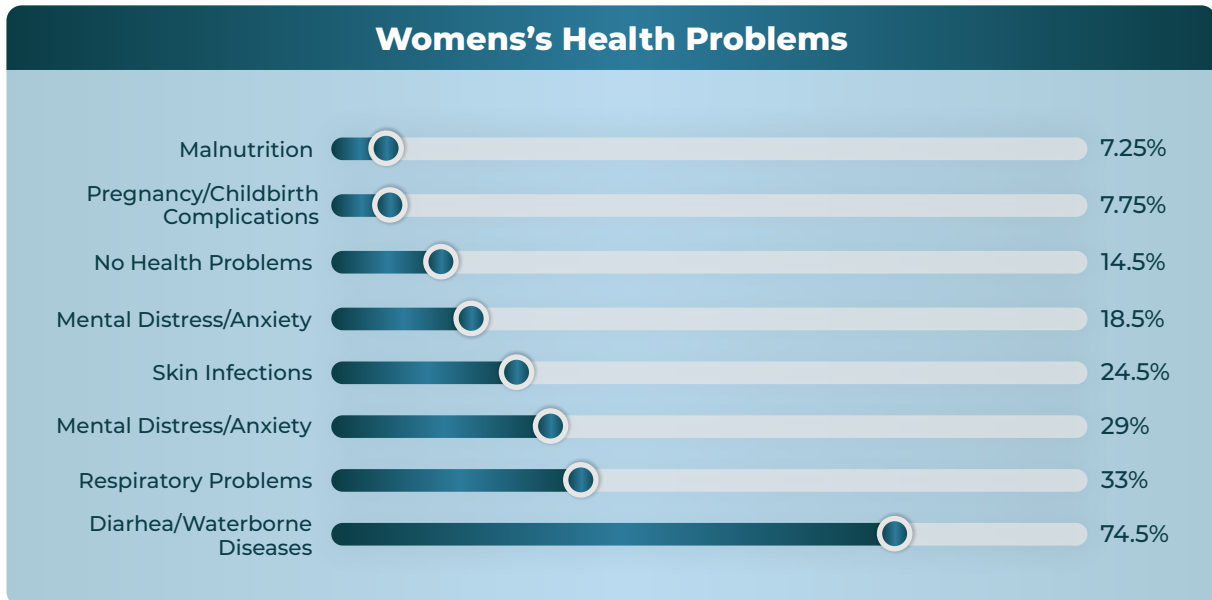


Figure 8: Reported climate-related health problems among women

These conditions were consistently linked by respondents to climate impacts such as drought, floods, dust storms, and food insecurity.

Maternal and Mortality Context (Results)

The survey identified 2,239 vulnerable persons, including 847 women aged 18–49 (primary childbearing age). In parallel, previous WHO data (2021) indicated that, at national level in Afghanistan:

- Maternal conditions were the 3rd leading cause of female death
- Preterm birth complications were the 5th
- Lower respiratory infections were the 7th

In the survey area, 7.75% of households reported pregnancy or childbirth complications, while 33.0% reported respiratory problems among women and 7.25% reported malnutrition, all in the context of high food insecurity (95.8%) and significant health access barriers (43.0%).

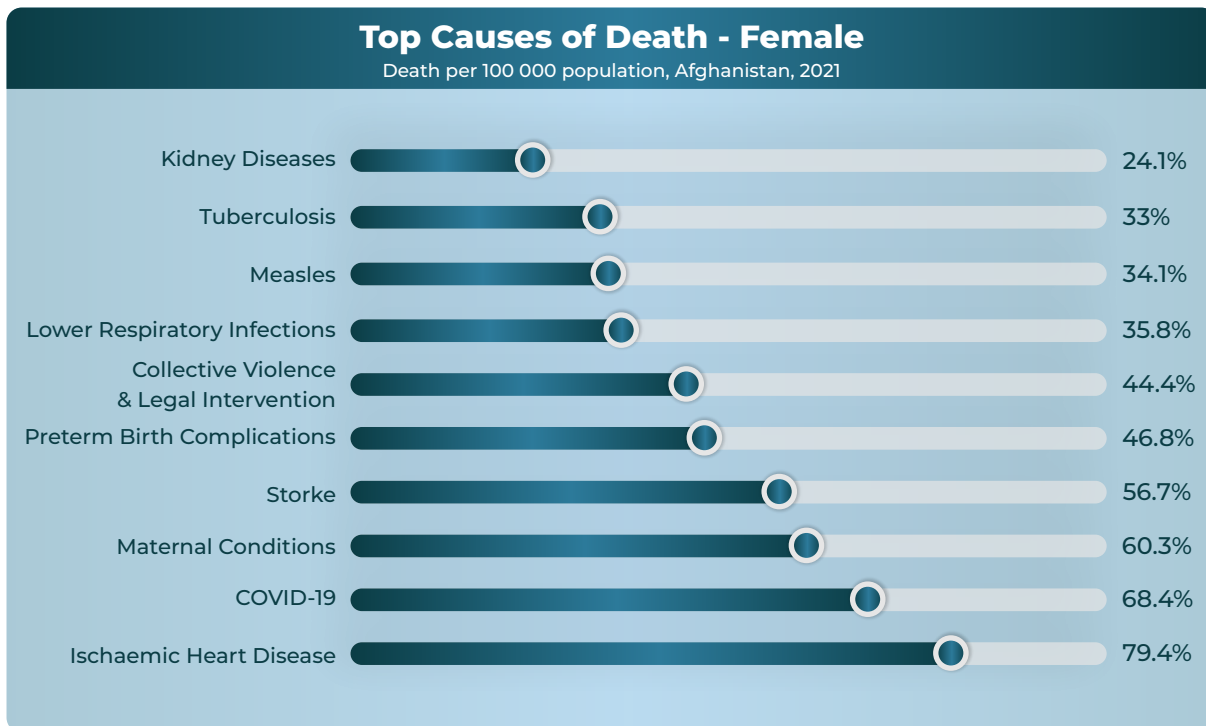


Figure 9: Top Causes of Female Mortality in Afghanistan ([WHO 2021](#))

Children's Health

Reported Health Problems in Children (Results)

Among 1,392 children (651 under age 5, 741 aged 5–18) in surveyed households, 90.5% of households reported at least one child health problem; only 9.5% reported none.

Most frequently reported were:

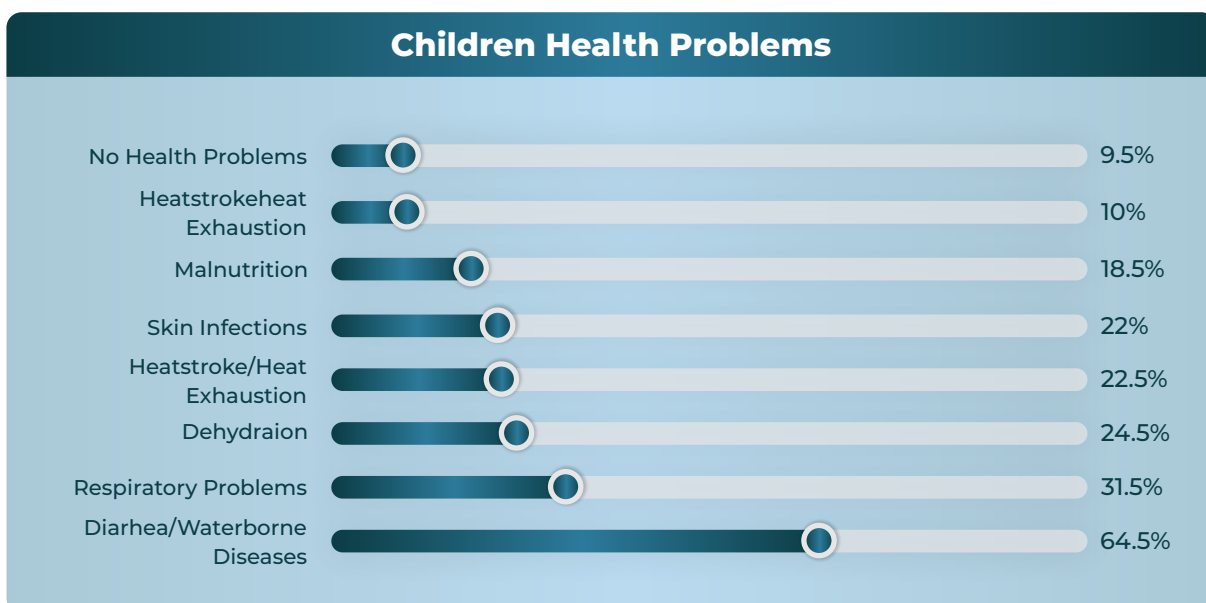


Figure 10: Reported health problems among children

These conditions were commonly linked to drought, flooding, poor water quality, extreme heat, and food insecurity.

Access to Healthcare

Healthcare Access Patterns (Results)

Out of 400 households:

- 44% reported women could access healthcare easily
- 30% reported access only with difficulty
- 14–16% reported no access to healthcare at all

This means around 43% of households face significant barriers to care.

Provincial differences are pronounced:

- Logar: 68.2% easy access, 27.9% difficult, 3.9% no access
- Maidan Wardak: 35.9% easy access, 40.1% difficult, 24.0% no access

Of the households without access, the vast majority are in Maidan Wardak.

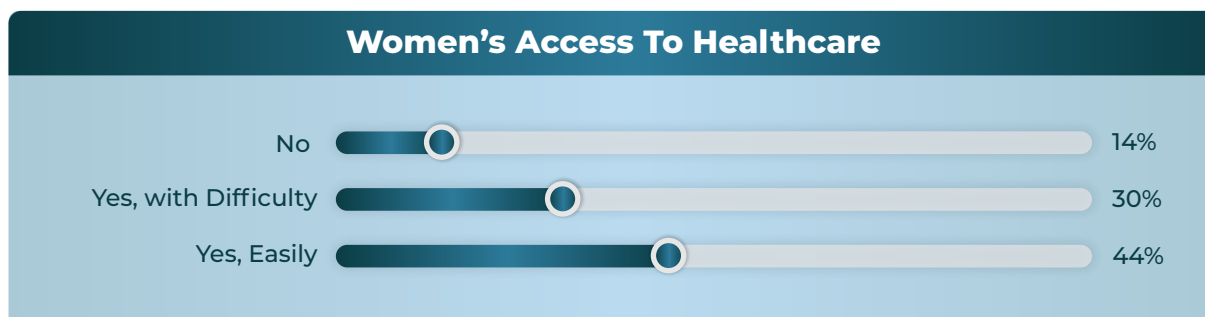


Figure 11: Women's access to healthcare

Reported barriers include long distance, transport problems, economic constraints, cultural and gender norms, and facility limitations (including lack of female staff).

Disruption of Essential Services and Food Security

Education Disruption (Results)

Education disruption affected 87.0% of households:

- Rarely (<10 days per year): 45.0% of households
- Sometimes (10–30 days): 19.8%
- Frequently (>30 days): 2.8%
- Children not attending school at all: 10.2%

Only 13.0% reported no disruption

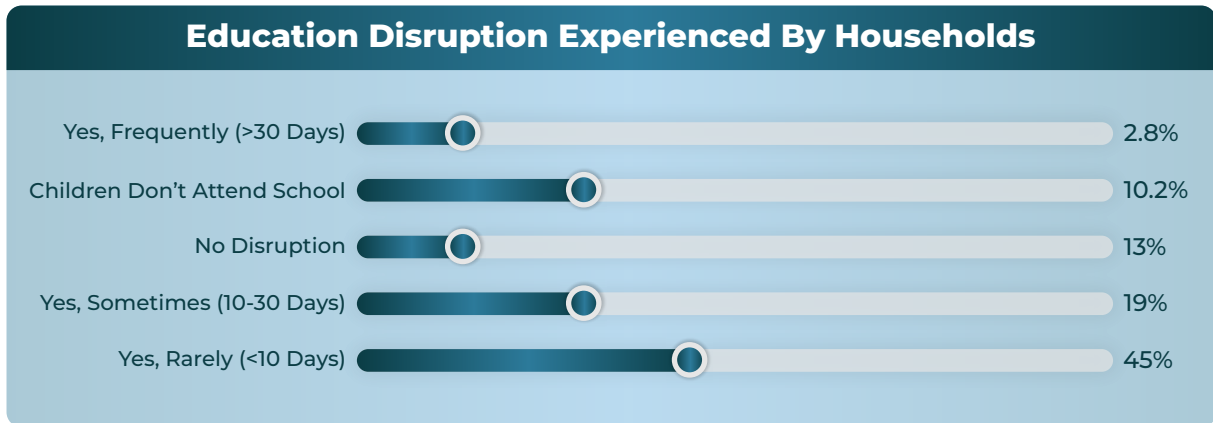


Figure 12: Education disruption experienced by households

Reported causes include school building damage (e.g. during the June 2025 floods), impassable roads and bridges, displacement, and economic pressures requiring children's labor.

Food Insecurity (Results)

Food insecurity is nearly universal:

- 95.8% of households (383/400) reported food shortages in the prior 12 months
- 4.2% (17/400) reported no shortages

By frequency:

- Rarely (1–2 times/year): 39.0% of households
- Sometimes (3–6 times): 23.8%
- Often (7–11 times): 4.0%
- Always (every month): 13.0%

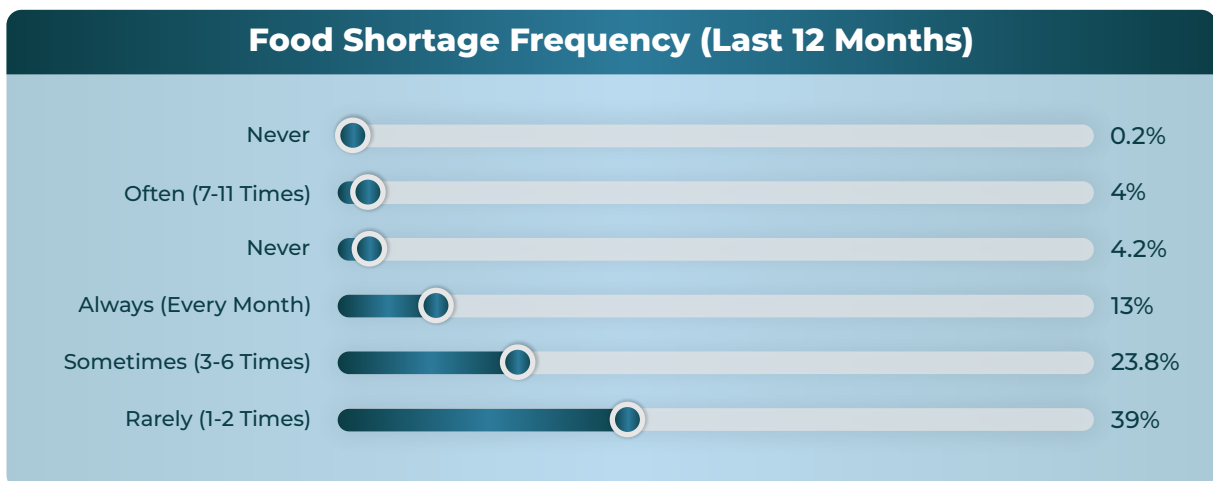


Figure 13: Frequency of food shortages in the last 12 months

Water Resources and Access

Water Sources Before and After Disasters (Results)

Before recent disasters, households relied on a mix of sources:

- Private wells: 44%
- Community wells: 20%
- Rivers/streams: 17%
- Piped water: 12%
- Other sources: 7%

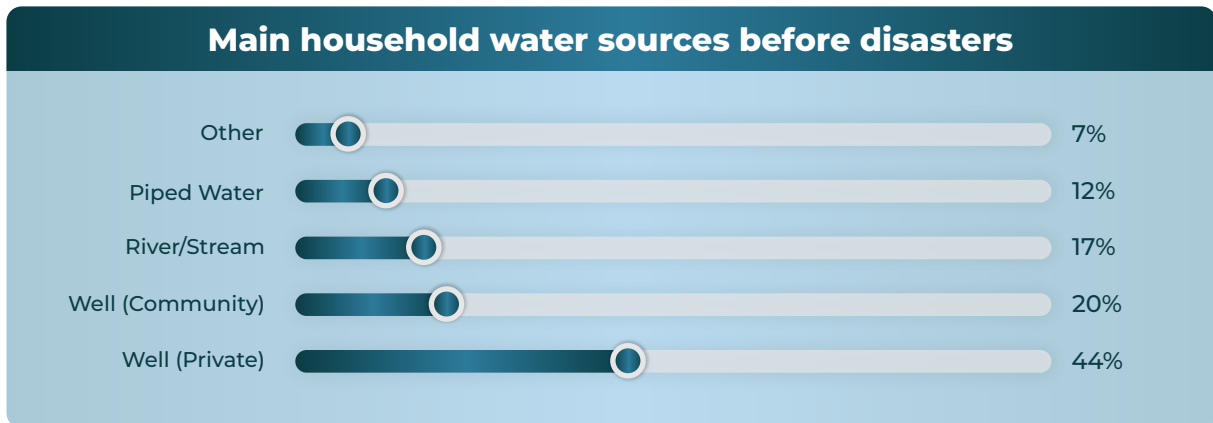


Figure 14: Main household water sources before disasters

After the last disaster:

- 49% used the same source
- 28.5–30% obtained water from neighboring villages
- 16% used other sources
- 3% received water tankers
- 3% received emergency relief water

Thus, roughly half of households had to change water source after disasters, with almost a third depending on neighboring villages

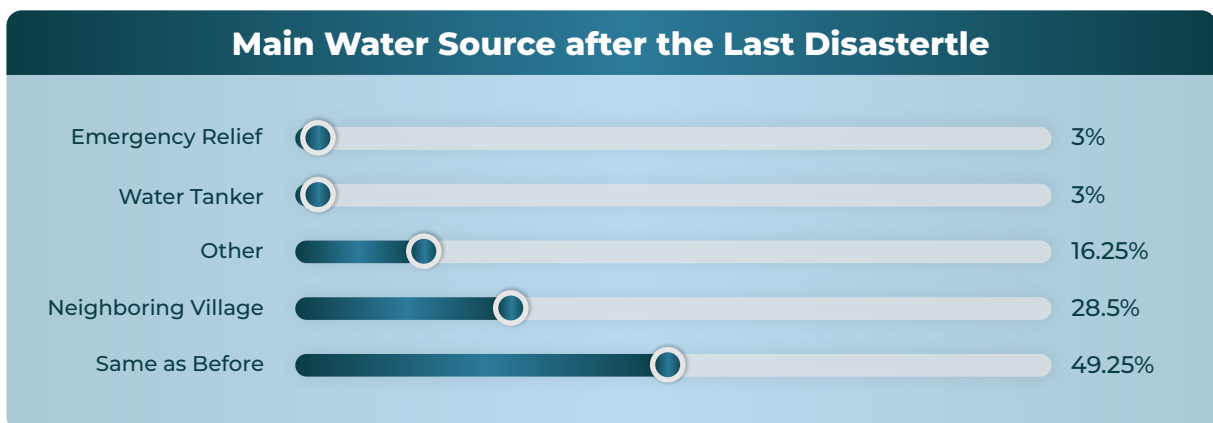


Figure 15: Main household water sources after the last disaster

Duration of Water Disruption (Results)

Households reported the following durations of lacking safe drinking water after the last disaster:

- 1–3 days: 44%
- 4–7 days: 19%
- 1–4 weeks: 5%
- More than 1 month: 5%
- Not affected: 15%

In total, 85% experienced at least some disruption and 29% reported disruption of 4 days or longer.

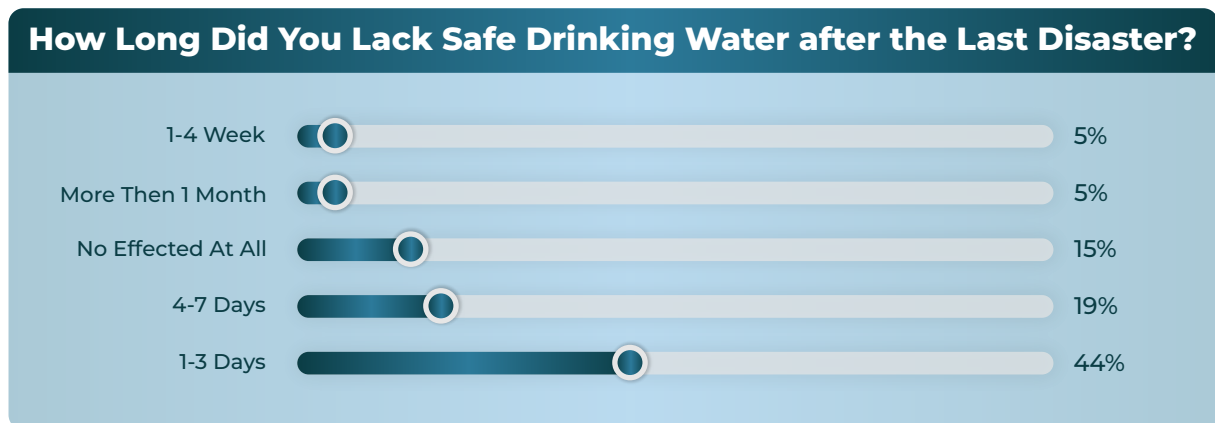


Figure 16: Duration of lack of safe drinking water after the last disaster

Key informants reported groundwater levels dropping from about 2 m to 12 m in central areas, and up to 20 m in some elevated zones. Springs and traditional kariz systems were reported to have ceased flowing in some localities during the 2021–2023 drought, and the Logar River was reported to run dry for significant parts of the year.

I Livelihoods and Food Security Collapse

Primary Livelihood Sources (Results)

Before the intensified climate impacts, the main reported primary livelihoods were:

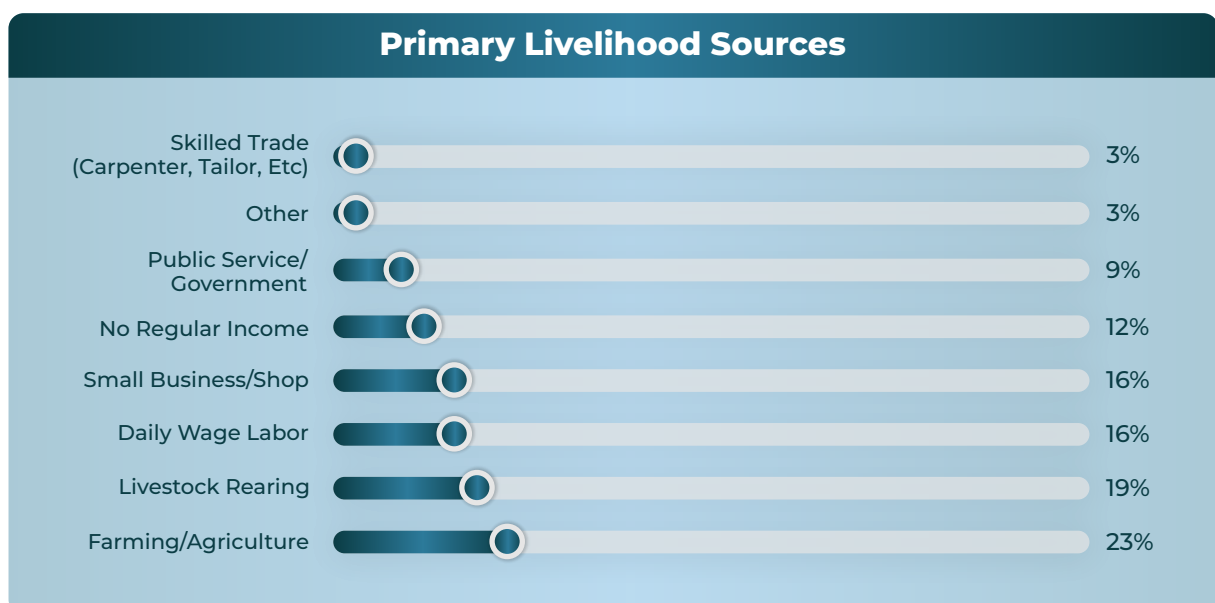


Figure 17: Primary livelihood sources reported by households

Combining agriculture and livestock shows that at least 42% of households depended directly on primary production; if agriculture-linked daily wage labor is included, this rises to about 58%.

Sequence of Drought and Flood Losses (Results)

Key informants described three consecutive years of drought (2021–2023), leading to:

- Progressive soil moisture depletion
- Reduced groundwater recharge
- Weakening of irrigation systems
- Successive harvest failures
- Consumption of seed stocks in many households
- Distress sales of livestock at reduced prices

The June 2025 floods then destroyed over 3,200 hectares of cropland and damaged or destroyed more than 270 houses across both provinces (TolowNews, 2025), eliminating crops just as communities hoped for recovery and destroying remaining seed stock in many cases.

Sanitation and Hygiene (Results)

Climate-related displacement revealed significant sanitation challenges that disproportionately affected women and girls. Among displaced households, many reported lacks of separate toilet facilities for women, privacy concerns, and difficulty maintaining adequate hygiene and cleanliness in temporary shelters. Safety and security concerns were prevalent in shelter settings, with some women reporting harassment and verbal abuse where inadequate facilities and lack of female-only spaces created protection risks. Water scarcity directly impacted hygiene practices, as households experienced water shortages ranging from several days to over one-month post-disaster, making it nearly impossible to maintain basic hygiene standards. These sanitation deficits, combined with compromised water access, contributed to elevated waterborne disease prevalence among women and children, while creating particular hardships for women of reproductive age managing menstruation without privacy or adequate facilities.

Women's Knowledge, Capacity and Participation

Disaster training: 69% of households report that women have received no disaster training, 18% report informal information, and 13% report formal training.

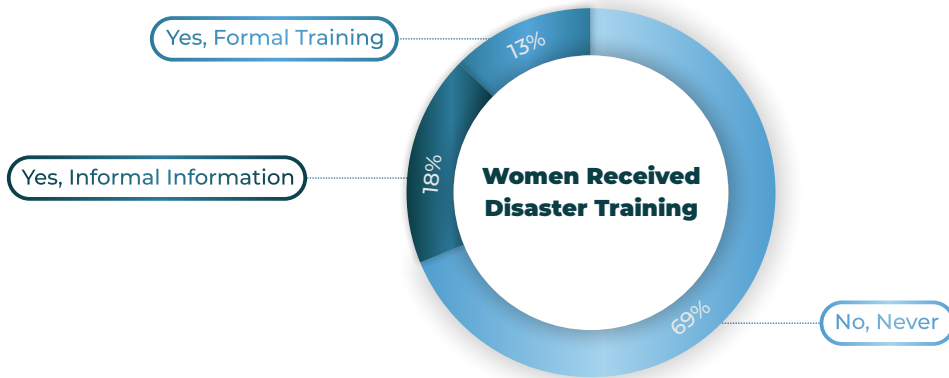


Figure 18: Community Early Warning System Access

Early warning access: 41.0% of households report no early warning system in the community, 19.5% rely on informal information (phone calls, mosque announcements), 8.0% report an official system (government/NGO), and 31.5% stated “don't know” about early warning availability

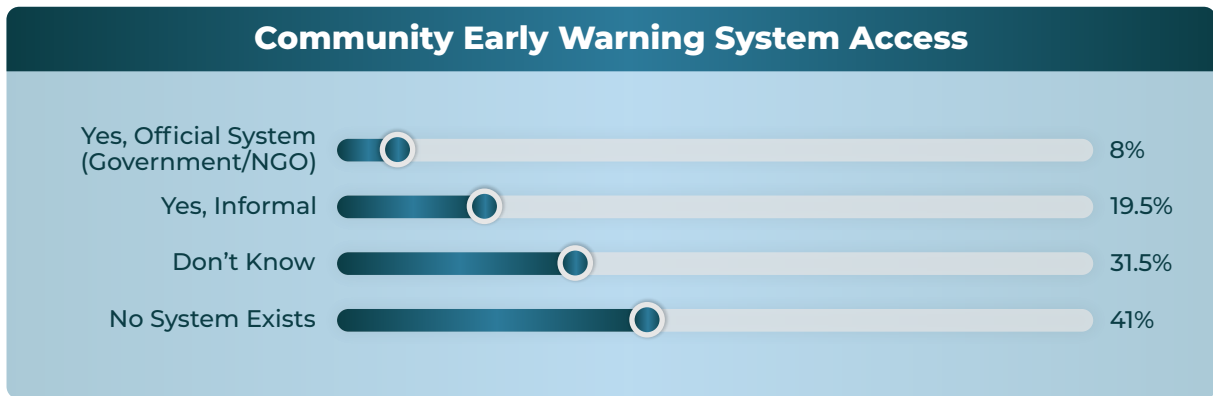


Figure 19: Community Early Warning System Access

Evacuation decision-making: Decisions are predominantly male-led. Combined, 72.75% of households report evacuation decisions are made by male household heads (42.75% after consulting women; 30.00% without consultation).

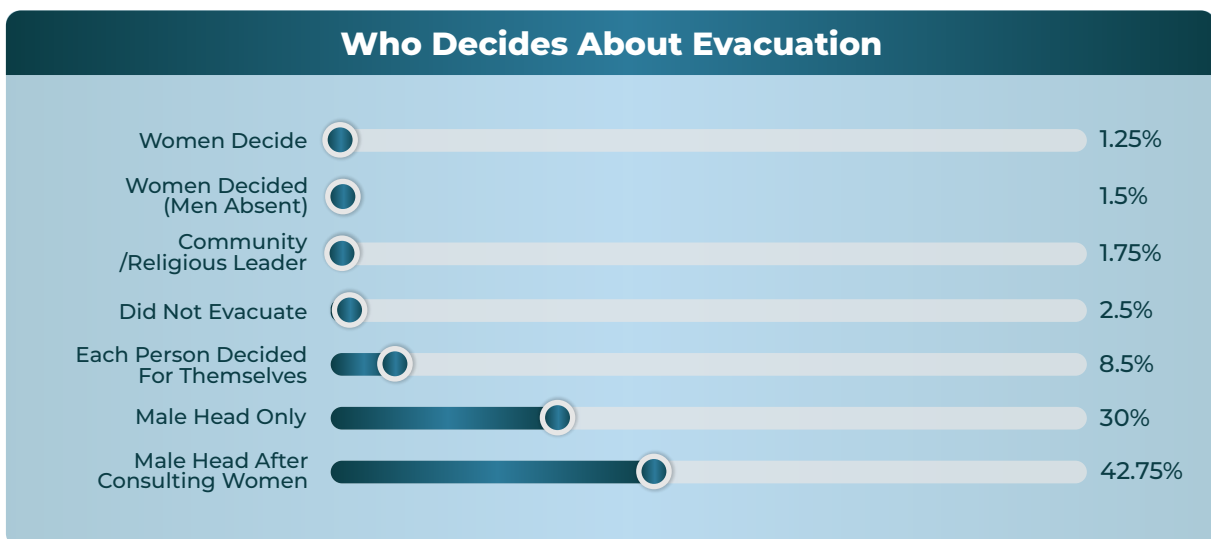


Figure 20: Who Decides About Evacuation

Only 2.75% of decisions are reported as made by women (1.25% women decide; 1.50% women decide when men are absent). Other patterns include 8.50% where each person decided for themselves and 2.50% where households reported they did not evacuate.

Community participation: Only 10% of households report any women's participation in community disaster planning (8% regularly; 2% a few times). A substantial share (38%) said “don't know” whether women participate, while 35% reported women were not invited or informed; 4% said participation was not culturally appropriate

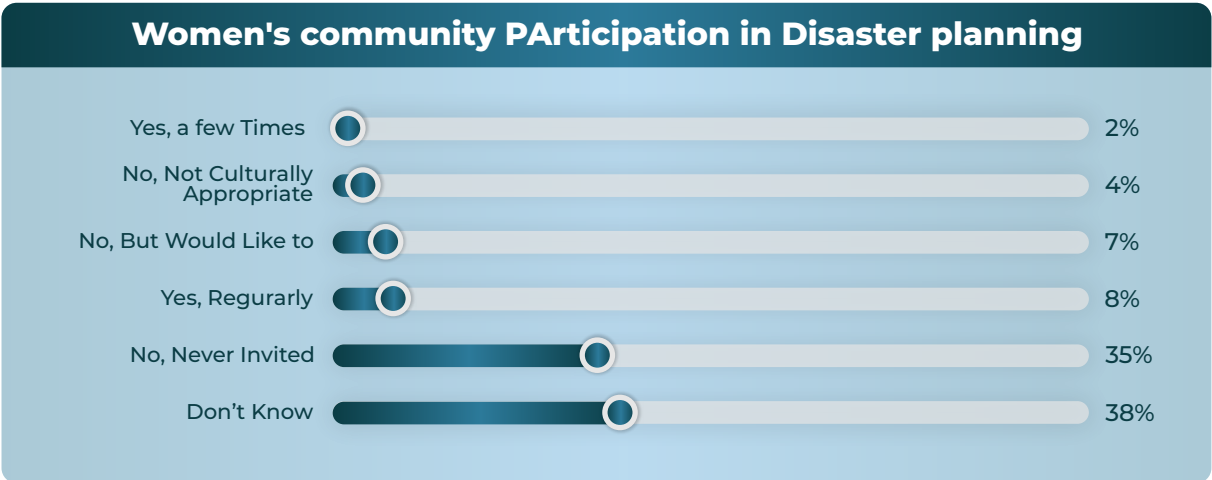


Figure 21: Women's community Participation in Disaster planning

Barriers to participation: 41% of households report that women did not attempt participation, 28.7% report women are not invited/informed, 6.5% cite cultural restrictions, 6.5% cite multiple barriers (cultural + no facilitators), and 5.0% report that men do not permit women to participate.

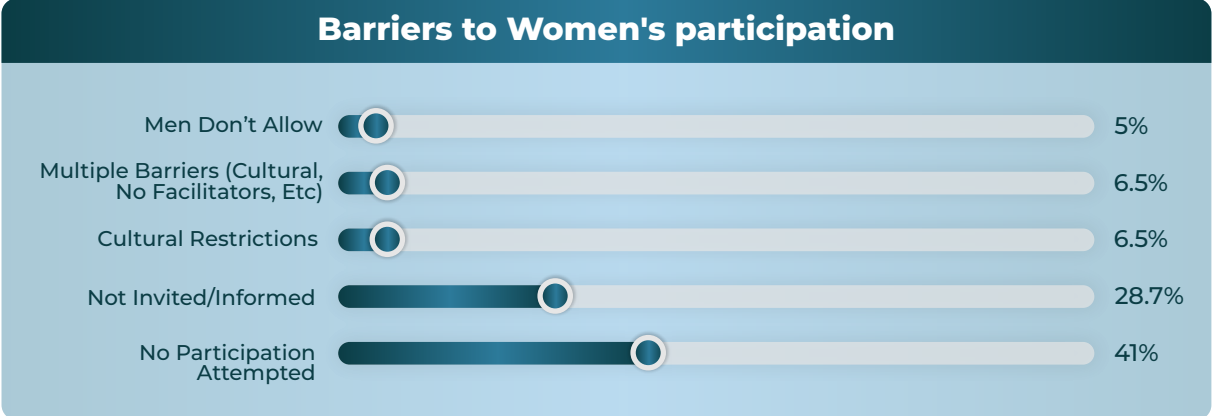


Figure 22: Barriers to Women's participation

Informal influence and operational knowledge: The qualitative findings and household responses indicate women routinely perform operational tasks (water collection, food management, child care) and have detailed local knowledge (reliable water sources, signs of child malnutrition, household coping effectiveness), yet this operational knowledge rarely appears in formal community planning structures.

I Discussion

From Single Hazards to Multiple, Compounding Risks

The results show that households rarely face isolated hazards. Very high prevalence of drought (91.2%), flooding (76.0%), and extreme heat (52.2%), combined with significant exposure to dust storms, erratic rainfall, and landslides, illustrates a “multiple threat environment.” This aligns with historical OCHA data showing repeated disaster spikes over 2012–2025 rather than one-off events. In practice, drought reduces reserves and coping capacity, while subsequent floods destroy remaining assets and infrastructure, creating a cycle where each event worsens vulnerability to the next.

Climate Disasters as the “New Normal”

Both household survey data and OCHA statistics support the idea that climate hazards have shifted from rare emergencies to a persistent backdrop of risk. Very high exposure rates to drought and floods, combined with repeated historical events, mean that households must now organize daily life—livelihood choices, schooling, water collection, health seeking—within a context of frequent and severe climate stress, not exceptional crises.

Provincial Vulnerability Patterns

While both provinces are heavily affected, Maidan Wardak appears more lethal and less accessible. Historical data show higher disaster mortality in Maidan Wardak despite fewer total people affected, consistent with survey findings of worse healthcare access and more severe isolation. The combination of mountainous terrain, dispersed settlements and frequent infrastructure damage helps explain this pattern and suggests that provincial hazard profiles and geography must shape risk reduction and service delivery strategies.

Water as a Cross-Cutting Driver of Vulnerability

The data repeatedly link water scarcity and water system disruption to other domains of vulnerability:

- Very high drought exposure (91.2%) and reported groundwater declines (10–20 m drop)
- High prevalence of diarrheal and waterborne disease among women (74.5%) and children (64.5%)
- Long water disruptions (29% of households without safe water for ≥ 4 days after last disaster)
- Dramatic increases in women's water collection time (from 30–45 minutes to 2–6 hours per day)

These findings show that water is central to health (through contamination and reduced hygiene), food production (through irrigation failure), gendered labor burdens, and economic stress. Addressing water management—including recharge, sustainable extraction, and emergency water provision—appears foundational to any broader climate resilience strategy.

Health Impacts: Intensification of Existing Mortality Risks

The survey does not reveal new disease categories but shows heightened exposure to conditions already known to be leading causes of female and child mortality in Afghanistan:

- High rates of waterborne disease and respiratory problems map onto WHO's national ranking of diarrheal and respiratory diseases as leading killers.
- Pregnancy and childbirth complications (7.75% of households) occur in a setting of severe food insecurity (95.8%), widespread waterborne disease, and serious healthcare access barriers (43.0%), amplifying already high national maternal mortality risks.
- For children, overlapping diarrhea, respiratory illness, dehydration, and malnutrition in the context of poor healthcare access create a convergence of risk that is consistent with global evidence on child mortality drivers.

The pattern of multiple, overlapping conditions in the same individual (e.g. a woman experiencing diarrhea, respiratory problems and mental distress) means that single-issue interventions are unlikely to be sufficient.

Food Security Collapse and Livelihood Erosion

The combination of three drought years followed by destructive floods has undermined the agricultural base that supports most livelihoods:

- At least 42% of households depended directly on farming or livestock, with many others indirectly linked through daily wage labor.
- Near-universal food insecurity (95.8%) and frequent food shortages indicate that climate shocks have moved households from relative self-sufficiency toward dependence on markets they struggle to afford.
- Loss of livestock and seed stocks has removed traditional buffers and reduced the capacity for autonomous recovery.

The contraction of diets to mainly bread and tea, documented in the qualitative data, explains in part the reported rates of malnutrition among women and children and the general weakening of resilience against disease.

Disruption of Essential Services and Long-Term Human Capital

Frequent education disruption (87.0% of households) and barriers to healthcare access (43.0% of households) show that climate hazards are eroding human capital over time. Interrupted schooling, particularly when repeated over years, undermines literacy and learning, while repeated illness and malnutrition in early childhood have irreversible consequences for growth and cognitive development. These patterns suggest that climate impacts are not only acute shocks but also drivers of long-term developmental setbacks.

Gendered Dimensions: Burden, Exclusion and Underused Capacity

The data highlight a strong gender dimension:

- Women bear much of the physical and emotional burden of climate impacts (extended water collection, managing food scarcity, high prevalence of mental distress and anxiety).
- At the same time, women's participation in formal disaster planning and evacuation decision-making is minimal. Most evacuation decisions are made by male household heads; only a very small share of decisions is taken by women.
- Despite this, women have developed significant coping strategies around water and food management, and possess detailed knowledge of household-level impacts, but this knowledge is rarely integrated into community-level planning.

The combination of heavy burdens, limited formal voice, and under-recognized expertise represents a major constraint but also a potential entry point: improving resilience will likely require not only technical solutions but also a shift toward including women's operational experience in planning and decision-making.

Implications for Response and Policy

Drawing directly from the survey and qualitative findings, several implications emerge:

- **Multiple hazard planning** is required; single-hazard approaches (e.g. focusing only on floods) will be inadequate in areas where drought, floods, extreme temperatures, and dust storms intersect.
- **Chronic stress and compounding crises** mean that strategies must go beyond episodic emergency response to sustained support for adaptation, particularly in water management, agriculture and health systems.
- **Area-wide interventions** are needed where exposure is nearly universal (e.g. drought and waterborne disease), alongside geographically targeted measures for hazards like landslides.

- **Infrastructure resilience** is a priority in view of repeated flood damage to roads, bridges and schools, especially in more isolated areas such as Maidan Wardak.
- **Health and nutrition services** must account for overlapping burdens (waterborne disease, respiratory problems, malnutrition, mental distress) and systematic barriers to access, particularly for women and young children.
- **Water governance and recharge** are central to breaking the current trajectory of groundwater depletion and to reducing the cascading impacts observed across sectors.
- **Women's participation and capacity building** in disaster preparedness, early warning, and community decision-making appear essential to align formal responses with actual household-level realities.

I AHP Analysis and Result

AHP serves as the core methodological framework for this research, enabling a systematic approach to multi-criteria decision-making and environmental analysis. This method allows for the structured quantification of complex environmental interactions by decomposing the research problem into a hierarchical structure of goals, criteria, and alternatives. In our study, four primary environmental layers were carefully selected and weighted: Precipitation (CHIRPS), Normalized Difference Vegetation Index (NDVI), Flood, and Groundwater Storage (GWS).

Flood Risk Assessment

The social flood risk probability map was prepared by the NATO C3 Agency based on the updated AFG-FHM (Afghanistan Flood Hazard Model) data. The fundamental basis for the flood risk classification is based on the level of exposure of infrastructure in flood-prone zones and has been compiled using a geographic approach.

The flood-prone areas have been classified with high-risk areas having an elevation of 29cm, moderate risk areas having an elevation of 1.12m, and low risk areas having an elevation of 2.7m relative to sea level. These classifications have been reviewed and validated.

The occurrence of these floods has the potential to occur within a timeframe of one year to one hundred years in areas under flood risk. Natural occurrences of floods happen at intervals of 5, 10, 15, and 20 years. For more information, please refer to the AFG-FHM document.

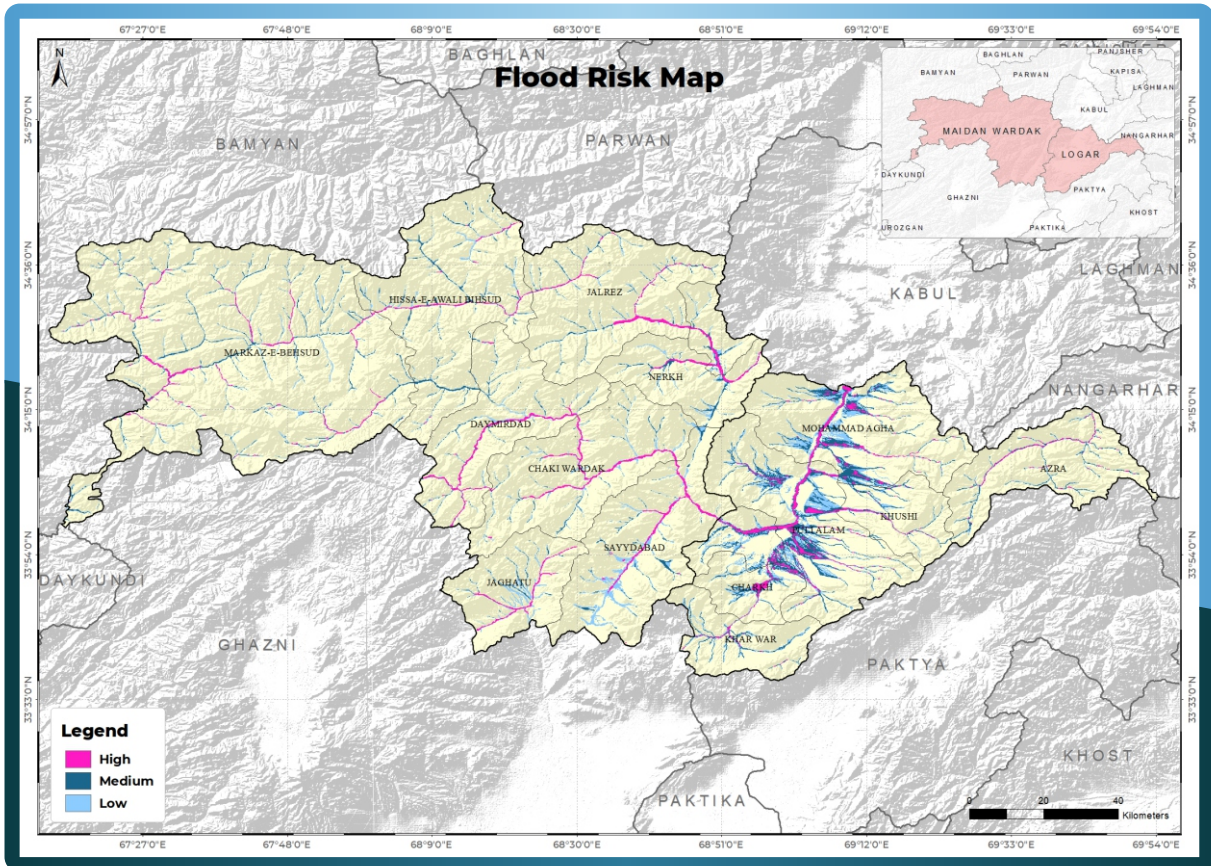


Figure 23: Flood Risk Map, Study Area, Authors, (Source: Research Team, 2025)

Logar Province

Provincial Overview: Based on provided map and layers Logar Province demonstrates a high to medium flood risk profile with approximately 25-30% high risk areas, 35-40% medium risk, and 30-40% low risk zones.

Logar Province District-Level Analysis

District	Flood Risk Profile
Mohammad Agha	High Risk (Critical): 35-40% high risk, 45-50% medium risk. Multiple waterway convergences create compounded flood hazards.
Baraki Barak	High to Medium Risk: 30-35% high risk, 40% medium risk. Tributary system convergence creates vulnerability.
Pul-e-Alam	High to Medium Risk: 15-20% high risk along Logar River, 40% medium risk. Capital city location creates significant exposure.
Charkh	Medium to High Risk: 20-25% high risk in river corridors, 45-50% medium risk in adjacent areas.
Azra	Low to Medium Risk: 60-70% low risk due to elevation, 25-30% medium risk in valleys, 5-10% high risk in confined sections.

Maidan Wardak Province

Provincial Overview: Maidan Wardak demonstrates moderate flood risk with 20-25% high risk, 30-35% medium risk, and 40-50% low risk areas, showing distinct east-west gradient.

Maidan Wardak Province District-Level Analysis

District	Flood Risk Profile
Nerkh	High Risk (Critical): 30-35% high risk, 40-45% medium risk. Multiple waterway convergences in northeastern sections.
Maidan Shahr	High to Medium Risk: 25-30% high risk along river corridor, 35-40% medium risk. Provincial capital exposure.
Behsud Districts	Low to Medium Risk: 60-70% low risk, 20-30% medium risk. Western mountainous terrain with forest protection.

NDVI Land Cover Analysis

The maps provided show the Normalized Difference Vegetation Index (NDVI) data for Afghanistan. NDVI is a widely used remote sensing-based index that measures the density of green vegetation. It is calculated as the normalized difference between the near-infrared (NIR) and red (RED) spectral bands, and it ranges from -1 to 1, with higher values indicating more vigorous vegetation.

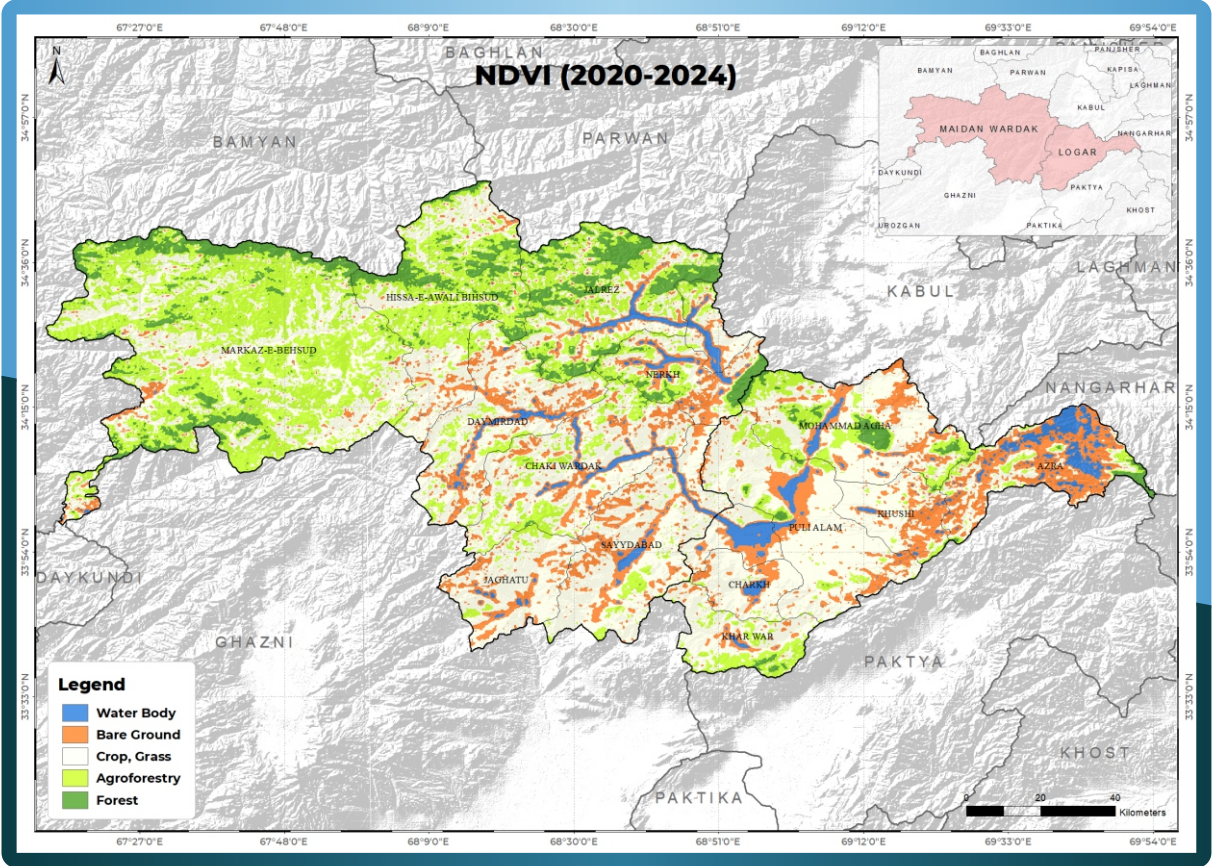


Figure 24: NDVI, Study Area, (Source: Research Team, 2025)

Logar Province

Logar exhibits predominantly agricultural and fallow landscape: 50-60% fallow/wasteland, 25-30% crop/grass, 10-15% agroforestry, 5-8% forest, and 2-3% water bodies. Limited forest cover indicates higher flood exposure.

Maidan Wardak Province

Maidan Wardak demonstrates greater vegetation diversity: 30-35% agroforestry, 25-30% fallow/wasteland, 20-25% forest, 15-20% crop/grass, and 2-3% water. Western districts show significant forest coverage (35-45%) providing natural flood protection.

Key Findings

- Logar's extensive fallow/wasteland (50-60%) near water bodies correlates with higher flood vulnerability
- Maidan Wardak's forest cover (20-25%) in western districts demonstrates natural hazard mitigation
- Water channel density (dark blue in NDVI) directly corresponds to high flood risk zones
- Agricultural areas adjacent to water channels represent economic exposure to seasonal flooding

Rainfall Analysis (CHIRPS)

The spatial distribution of mean rainfall across study area from 2020 to 2024 was analyzed using CHIRPS annual rainfall data.

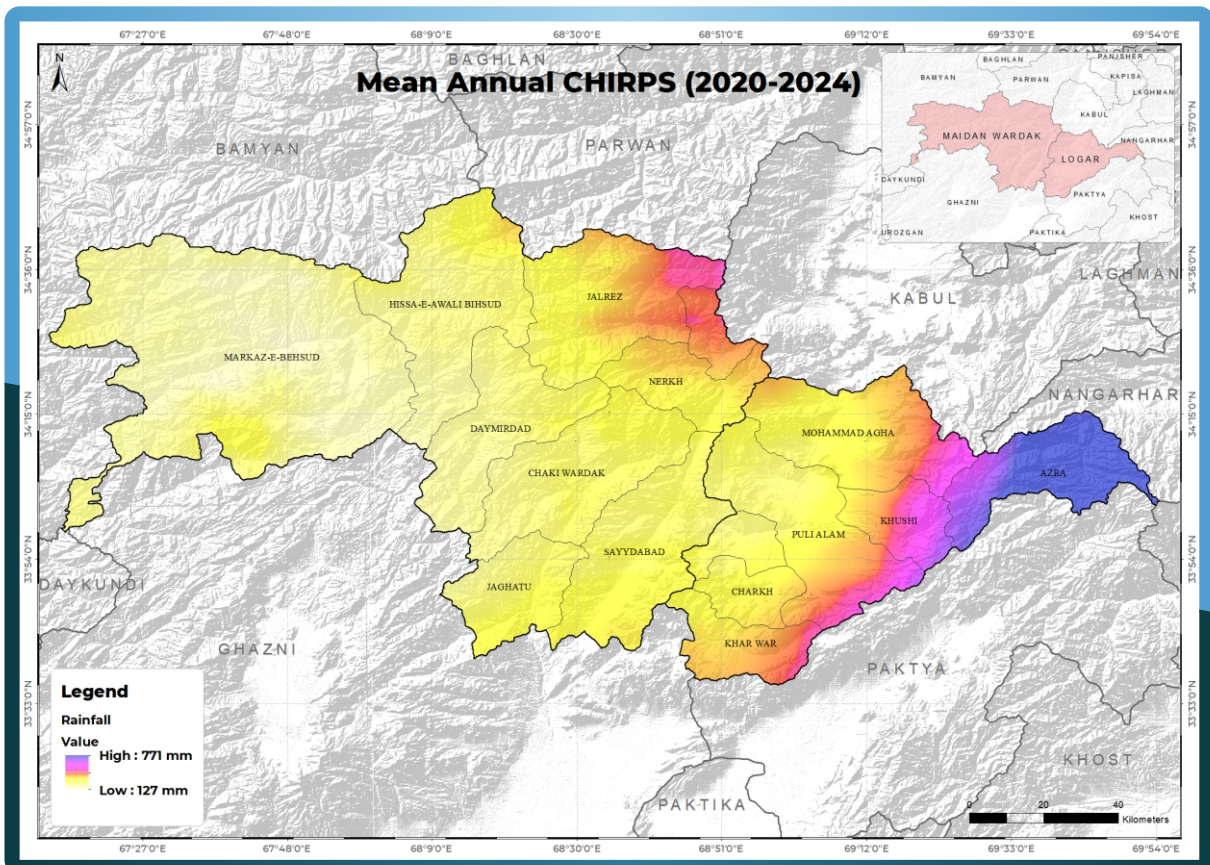


Figure 25: Mean Annual Rainfall 2020-2024, Study Area, (Source: Research Team, 2025)

The Climate Hazards Group Infra Red Precipitation with Station data (CHIRPS) is a 35+ year quasi-global rainfall dataset designed to address gaps in precipitation monitoring. Spanning latitudes 50°S to 50°N and covering the period from 1981 to the near-present, CHIRPS combines high-resolution (0.05°) satellite imagery, in-situ rain gauge data, and climatological models to produce reliable, gridded rainfall time series. Developed collaboratively by USGS, CHC scientists, and partners like NASA and NOAA, CHIRPS supports early warning systems for drought and environmental monitoring, particularly in regions with sparse surface data.

Logar Province

Rainfall Pattern: Dramatic east-to-west gradient with eastern districts receiving 5-6 times more precipitation than western areas

District	Rainfall (mm)	Significance
Azra	700-771	Highest in both provinces; primary water source
Khushi	550-700	Very high; transitional zone
Mohammad Agha	300-400	Moderate but high flood risk from upstream
Pul-e-Alam	250-350	Low-moderate local rainfall

Maidan Wardak Province

Rainfall Pattern: Relatively uniform moderate rainfall (200-350 mm) across most districts. Flood risk driven by topography rather than precipitation extremes.

Critical Correlation

- Catchment-Based Flooding (Logar): Eastern districts (Azra: 771 mm) generate runoff accumulating in downstream districts with only 250-350 mm local rainfall
- Topography-Driven Risk (Maidan Wardak): Uniform rainfall means flood patterns follow drainage networks rather than precipitation
- Early Warning Implication: High-rainfall upstream districts require enhanced monitoring to warn downstream communities

Groundwater Availability Analysis

This analysis utilizes the Groundwater Storage (GWS) dataset, which is derived from the Global Land Data Assimilation System (GLDAS) Catchment Land Surface Model (CLSM). The GLDAS dataset provides a comprehensive set of land surface parameters, including the GWS variable, which represents the water stored below the root zone and above the bedrock.

The GWS data is particularly useful for understanding the groundwater dynamics in Afghanistan, as it offers a spatial and temporal perspective on the subsurface water resources in the region. This information can provide valuable insights into the availability and distribution of groundwater, which is a critical resource for various sectors, including agriculture, domestic use, and industrial activities.

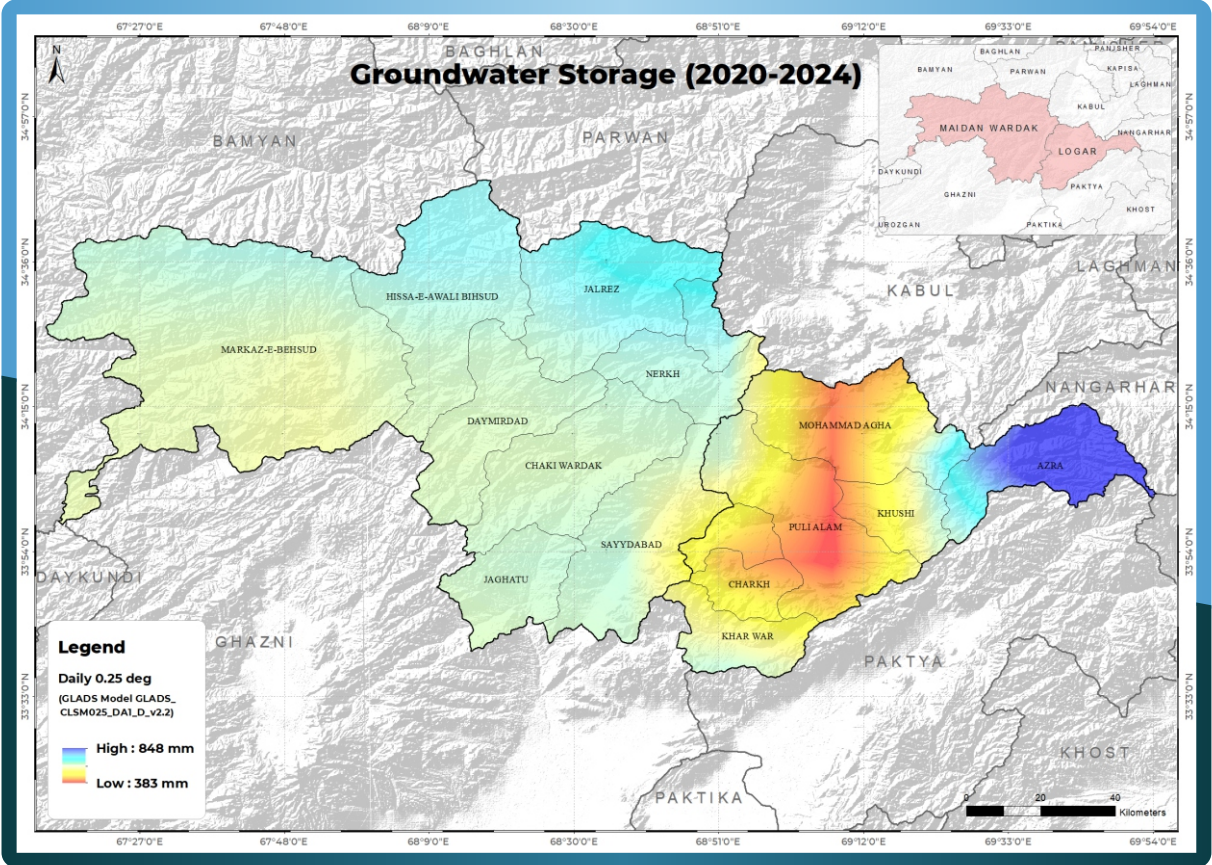


Figure 26: Ground Water Storage, 2020-2024, Study Area, (Source: Research Team, 2025)

Provincial Patterns

Logar Province: Highly variable availability with Azra showing highest levels (750-848 mm) and central districts moderate-high (500-700 mm). Maidan Wardak Province demonstrates uniform low-moderate availability (450-550 mm) reflecting mountainous topography.

LOGAR		MAIDAN WARDAK	
District	GW (mm)	District	GW (mm)
Azra	750-848	Nerkh	450-550
Mohammad Agha	550-700	Maidan Shahr	450-550
Baraki Barak	500-600	Behsud Districts	450-600

Groundwater-Flood Risk Correlation

Critical Finding: Districts with 500-700 mm groundwater (Mohammad Agha, Baraki Barak, Pul-e-Alam) face 'double vulnerability'—shallow water tables reduce soil infiltration during floods, causing more runoff to remain above ground and intensifying flooding.

- **High groundwater + high surface water:** Flooding from both river overflow AND saturated soil conditions (Mohammad Agha, Baraki Barak)
- **Low groundwater + high surface water:** Flooding primarily from surface accumulation with better infiltration (Nerkh, Maidan Shahr)
- **Management implication:** Districts with shallow groundwater require both surface drainage AND groundwater management

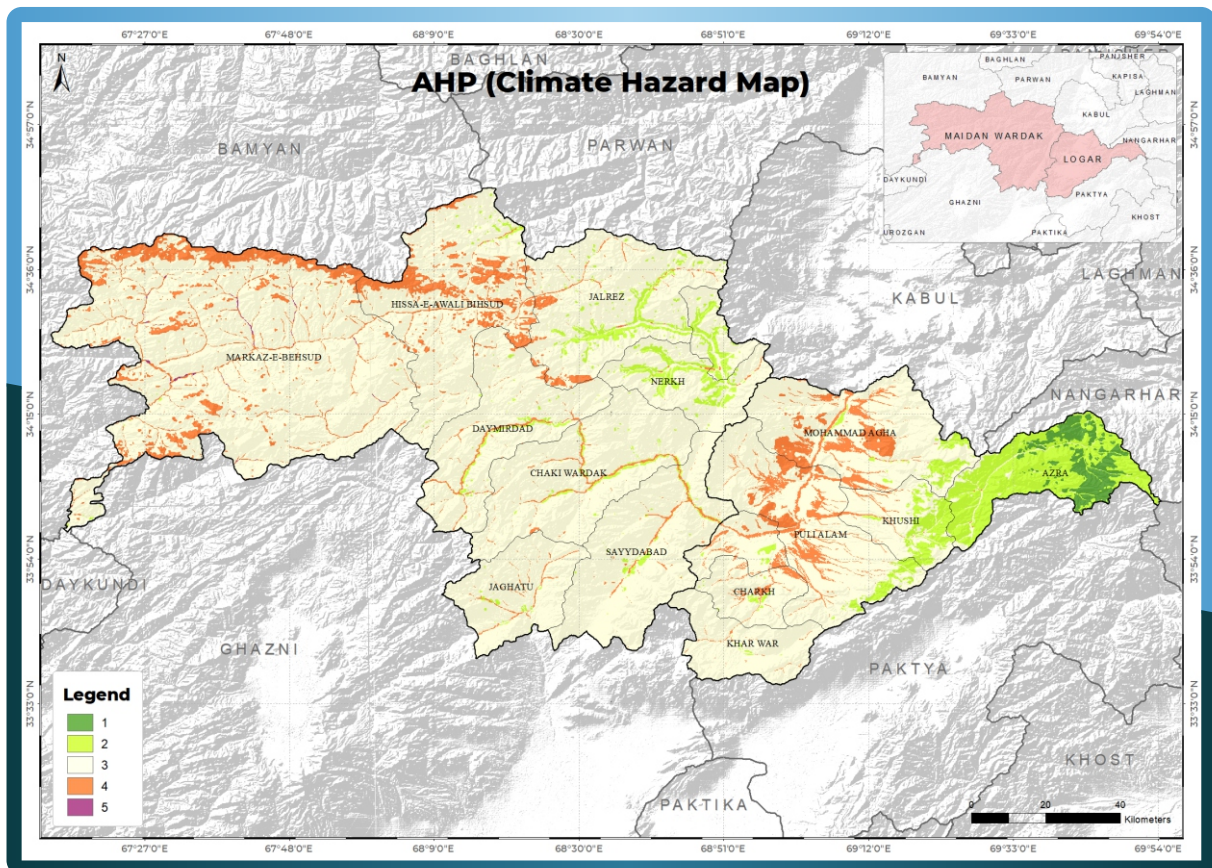


Figure 27: AHP, Climate Hazard Map, Study Area, (Source: Research Team, 2025)

AHP Multi-Criteria Climate Hazard Assessment

The Analytical Hierarchy Process integrates all four parameters to produce comprehensive climate hazard classification where higher numbers indicate higher threat (Class 1 = Very Low, Class 5 = Very High).

Hazard Classification Summary

Class	Hazard	Area (units)	Color	Priority
1	Very Low	1,837,929	Dark Green	Conservation
2	Low	10,986,923	Light Green	Maintenance
3	Moderate	12,203,346	Gray	Medium
4	High	13,053,985	Orange	Immediate
5	Very High	82,798	Magenta	Emergency

District Hazard Classification

Logar Province		
District	AHP Class	Key Risk Factors
Mohammad Agha	4-5	River confluence + shallow GW (550-700mm) + 50-60% fallow land + high exposure
Baraki Barak	4	Multiple channels + shallow GW (500-600mm) + 50-60% fallow
Pul-e-Alam	4	Capital exposure + river location + shallow GW (500-600mm)
Charkh	3-4	Moderate parameters with localized high zones
Azra	1	Highest rainfall (771mm) BUT low population + forest (15-20%)
Khushi, Kharwar	2-3	High rainfall but low exposure; source zones

Maidan Wardak Province		
District	AHP Class	Key Risk Factors
Nerkh	3	River convergence + agroforestry (40-45%) vulnerable to damage
Maidan Shahr, Saydabad	3	Moderate across parameters; capital/infrastructure exposure
Jalrez	3	Valley channeling + agroforestry exposure
Behsud	1	Forest protection (35-45%) + low exposure = lowest hazard
Daymirdad, Chak Wardak	2-3	Low to moderate across all parameters

Community Priorities and Recommendations

Priority Support Needs

The survey asked households to identify priority support needs, allowing multiple responses. The overwhelming priority for protection infrastructure (91.75%) reflects communities' experience with floods destroying homes, cropland, and livelihoods. The 76% flood exposure documented earlier drives this urgent need for physical protection against recurring disasters. Cash assistance (55%) and water infrastructure (51.25%) form the second tier of priorities, addressing immediate survival needs (cash for food, medical care, temporary shelter) and the fundamental water crisis affecting 91.2% of households. The 38.75% prioritizing disaster training specifically for women directly addresses the 69% of women without any disaster training documented in Section F. The 24% prioritizing better early warning systems addresses the 41% lacking any early warning access.

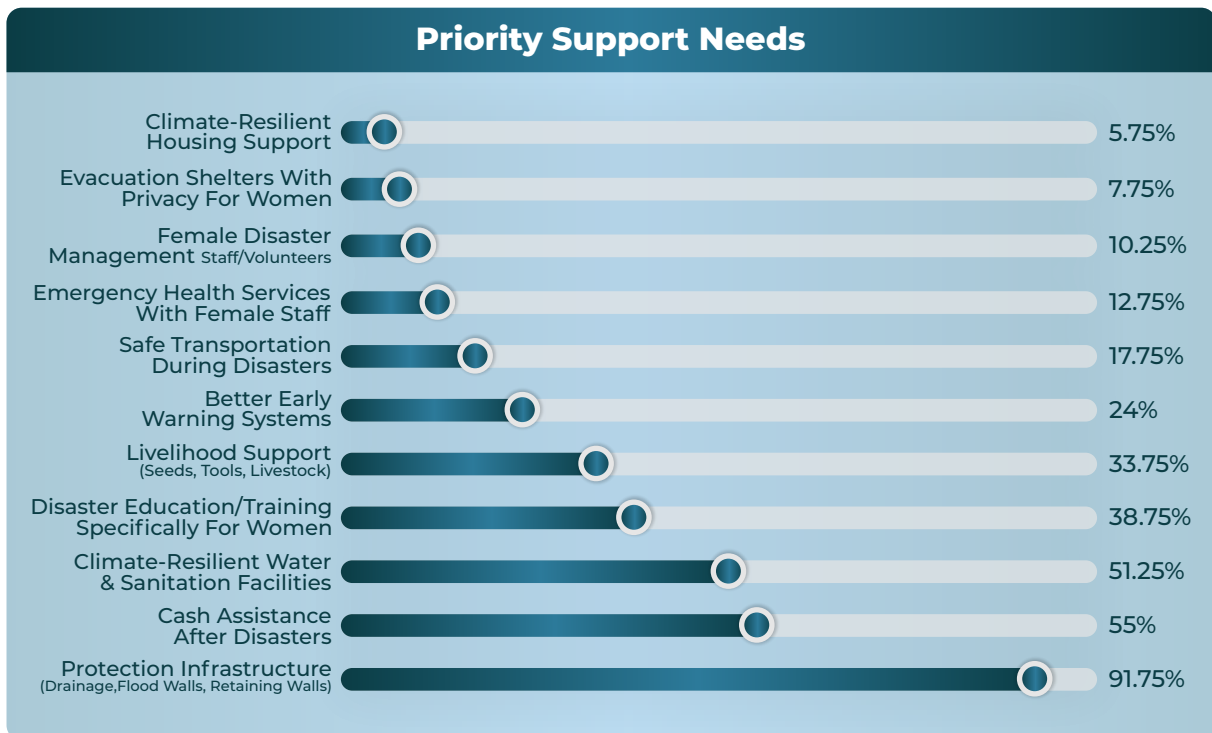


Figure 28: Priority Support Needs, (Source: Household Survey Data, 2025)

Household Adaptation Measures Already Taken

The survey documents what adaptation measures households have already implemented. The striking finding is that 41.75% have taken no adaptation measures at all. This likely reflects lack of resources rather than lack of awareness—adaptation requires investment (time, labor, materials, money) that severely stressed households cannot afford. Among those who have adapted, relocation (28.75%) represents the most drastic measure, indicating conditions have become unlivable in original locations.

The 24.25% who changed crops/planting times show agricultural adaptation, while 18.50% planted trees for erosion control indicating environmental management efforts. The low percentages for water-related adaptations (8.50% rainwater harvesting, 8.50% improved drainage) despite water being the #1 crisis suggests these measures require resources beyond household capacity—explaining why 51.25% prioritize water infrastructure support.

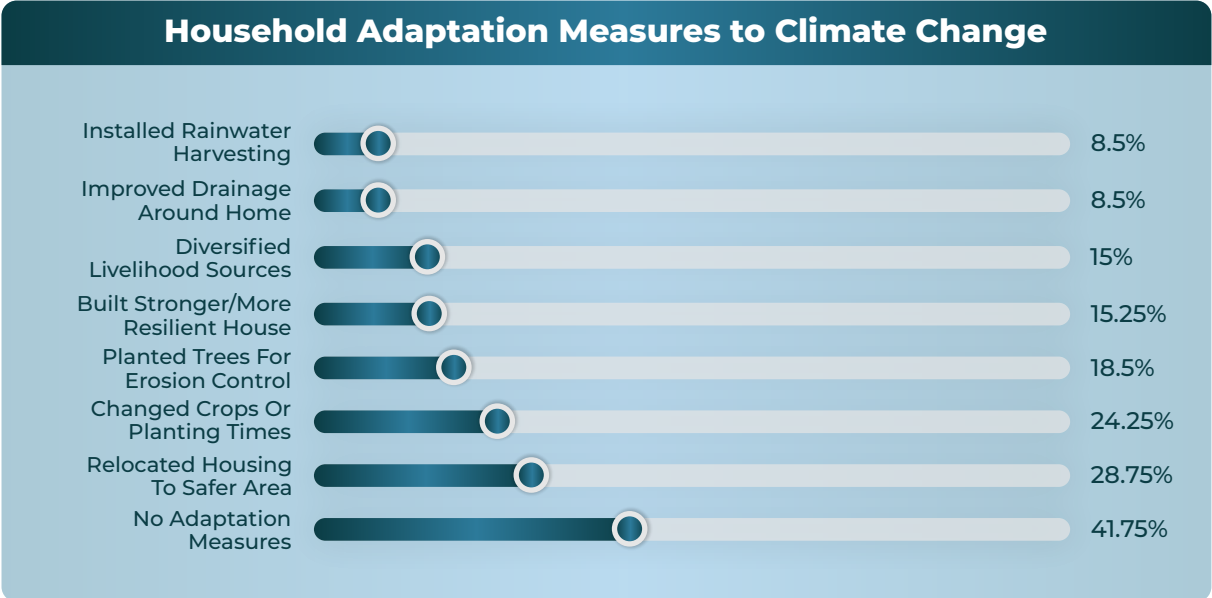


Figure 29: Household Adaptation Measures to Climate Change, (Source: Household Survey Data, 2025)

Water Infrastructure as Highest Priority

The 51.25% prioritizing water infrastructure, combined with 91.2% experiencing drought/water scarcity, indicates water access improvements could create cascading positive effects across health (reducing 74.5% women's and 64.5% children's waterborne disease), nutrition (supporting food production), education (reducing time burden preventing school attendance), and women's wellbeing (reducing 2–6-hour daily collection burden).

Research findings document community emphasis: "Everything depends on water. Without water, we cannot grow food. Without water, children get sick. Without water, women spend all their time just collecting enough for basic needs. Fix the water problem, and you fix half our other problems."

Women's Participation in Infrastructure Design

Research findings emphasize involving women in planning water infrastructure projects. Women possess detailed knowledge of collection routes, source reliability, seasonal variations, and household needs that would strengthen project design. A male shura member acknowledged: "When NGOs discuss water projects, they talk to us men. But the women who actually collect water every day know things we don't—which sources dry up first, which routes are safest, what volumes households truly need."

If projects involved women's knowledge from the start, they would be more effective."

Agricultural Recovery Needs

The 33.75% prioritizing livelihood support (seeds, tools, livestock) addresses the June 2025 floods that destroyed over 3,200 hectares of cropland and eliminated seed stocks farmers had preserved through three drought years. Research findings emphasize this as time-sensitive: "We have land. We have knowledge. We have willingness to work. What we don't have is seed. If someone provides seed now, we can plant. If they wait, we miss another season, and the crisis deepens."

The 24.25% who already changed crops/planting times show communities are attempting agricultural adaptation, but need support with appropriate seeds, technical guidance on climate-resilient varieties, and tools to implement new practices.

Early Warning Systems: Addressing the 41% Gap

The 24% prioritizing better early warning systems addresses the 41% documented in Section F who lack any early warning access. Given women's limited mobility and exclusion from male-dominated information networks, early warning systems require women-specific communication chains using multiple channels (radio, SMS, mosque announcements, female health workers) ensuring information reaches women directly with sufficient lead time for protective preparations.

Gender-Specific Priorities

Several priorities specifically address women's needs:

- 38.75% prioritize disaster training for women (vs 69% currently lacking training)
- 12.75% prioritize emergency health services with female staff
- 10.25% prioritize female disaster management staff/volunteers
- 7.75% prioritize evacuation shelters with privacy for women

These gender-specific priorities reflect both practical needs (female staff for maternal/child health, privacy during evacuation) and capacity gaps (training deficit, lack of female disaster workers). The relatively lower percentages compared to infrastructure needs likely reflect that these are additional needs layered atop urgent survival priorities rather than being less important.

The Resource Constraint: Why 41.75% Have Not Adapted

The 41.75% who have taken no adaptation measures represents the resource constraint facing severely stressed households. Adaptation requires investment that households experiencing 95.8% food insecurity, 84.8% water disruption, and 42% agricultural dependence cannot afford.

This underscores why external support priorities focus on infrastructure and resource provision (91.75% protection infrastructure, 51.25% water systems, 33.75% livelihood inputs, 55% cash assistance) rather than information or training alone. Communities know what adaptations would help but lack means to implement them.



Conclusion

This mixed-methods study of 400 households (3,474 individuals) in Logar and Maidan Wardak provinces documents climate change as an immediate, pervasive crisis disproportionately affecting women and children. The convergence of near-universal drought exposure (91.2%), widespread flooding (76.0%), and cascading service failures has created compounding vulnerabilities that exceed household coping capacities.

Core Findings Synthesis

The research reveals a critical cascade mechanism: drought-induced water scarcity (91.2% exposure) drives agricultural collapse among the 42% agriculture-dependent households, generating near-universal food insecurity (95.8%), which produces alarming health outcomes—74.5% of women and 64.5% of children under five experiencing waterborne diseases, and 18.5% of children visibly malnourished. This cascade is amplified by healthcare access barriers affecting 43% of households and educational disruption affecting 87%.

Women bear disproportionate burdens through dramatically expanded water collection time (from 30-45 minutes to 2-6 hours daily), meal-skipping to prioritize children's nutrition, and managing crises with minimal formal participation.

Only 10% of women participate regularly in disaster planning, while 86.7% of household climate decisions remain male-dominated. Critically, women possess detailed operational knowledge of water sources, food management, and child health that remains systematically excluded from community-level adaptation planning.

I Cross-Cutting Gender Dimensions

Climate impacts cascade through three interconnected pathways that disproportionately affect women and children. First, the water-agriculture-food security nexus (detailed in Sections 5.5-5.7) shows how 91.2% drought exposure drives 42% agricultural collapse, producing 95.8% food insecurity that manifests in elevated malnutrition rates (74.5% women, 64.5% children). Second, health service disruptions (Section 5.8) compound pre-existing access barriers, with 43% reporting climate-damaged health facilities and 89% facing transportation obstacles, critically impacting maternal and child health outcomes. Third, the limited participation of women in disaster planning processes (with 90% reporting they were never consulted, Section 5.9) contributes to response strategies that do not fully address gender-specific vulnerabilities. These findings highlight the need for climate adaptation efforts in Afghanistan to integrate gender-responsive approaches across all sectors.

I Geographic Vulnerability Patterns

AHP spatial analysis integrating flood risk (30% weight), NDVI vegetation stress (30%), CHIRPS precipitation (25%), and GRACE groundwater data (15%)—with consistency ratio of 0.039 validating analytical reliability—identifies high-risk zones aligning with districts reporting severe household impacts. Districts facing “double vulnerability” (shallow groundwater tables combined with high flood probability) experience multiplicative rather than additive risks, requiring integrated adaptation strategies.

I Priority Interventions

Community-identified priorities align with analytically-assessed vulnerabilities: protection infrastructure (91.75%), cash assistance (55%), climate-resilient water systems (51.25%), women's disaster training (38.75%), and livelihood recovery support (33.75%). The 41.75% who have implemented no adaptation measures reflects resource constraints rather than awareness gaps, underscoring the need for external investment enabling community-driven adaptation.

| Research Contribution

This study advances climate vulnerability assessment methodology by integrating household survey data with GIS-based Multi-Criteria Decision Analysis in a data-scarce, conflict-affected context. The gender-disaggregated evidence base, geographic precision for targeting interventions, and demonstration of culturally-adapted research protocols provide a replicable framework for similar complex operational environments. Climate change in these provinces is not a future projection but a present emergency demanding responses matching the scale, urgency, and complexity communities face.

| Linking Findings to Gender-Responsive Climate Adaptation Framework

This research aligns with and contributes empirical evidence to several international gender-responsive climate adaptation frameworks, strengthening the case for gender-transformative approaches in humanitarian and development programming.

UNFCCC Enhanced Lima Work Programme on Gender & Gender Action Plan

The UNFCCC Lima Work Programme on Gender, established in 2014 and enhanced at COP 25 in 2019, aims to advance gender balance and integrate gender considerations into climate policy and action (UNFCCC, 2019). The Gender Action Plan sets out five priority areas: capacity-building, gender balance and leadership, coherence, gender-responsive implementation, and monitoring and reporting. This study directly supports the GAP objectives. The documented exclusion of women from disaster planning (only 10% regular participation) and decision-making (86.7% male-dominated) represents a significant implementation gap requiring structural interventions.

Sendai Framework for Disaster Risk Reduction 2015-2030

The Sendai Framework Guiding Principle 19(d) states that disaster risk reduction requires empowerment and inclusive, accessible and non-discriminatory participation, with a gender perspective integrated in all policies and practices, and women and youth leadership promoted (UNDRR, 2015). The research findings reveal significant gaps: 69% of women lacking disaster training, 41% without early warning access, and minimal participation in evacuation decisions. The Sendai Framework Gender Action Plan (Sendai GAP), launched in March 2024, identifies nine key objectives and 33 recommended actions. This study provides baseline data against which implementation progress can be measured.

IPCC Sixth Assessment Report (AR6) Working Group II

The IPCC AR6 Working Group II report *Climate Change 2022: Impacts, Adaptation and Vulnerability* (IPCC, 2022) identify vulnerability as shaped by socioeconomic factors including gender. This research provides localized empirical validation: women's increased time poverty (water collection expanding from 30-45 minutes to 2-6 hours), health burden differentials (74.5% waterborne disease among women aged 18-49), and systematic exclusion from adaptation planning exemplify how gender mediates climate vulnerability.

Contribution to Framework Implementation

This research contributes to the evidence base for implementing gender-responsive climate adaptation in fragile and conflict-affected states, demonstrating that: (1) gender analysis is feasible even in restrictive contexts through culturally-adapted protocols; (2) women's knowledge represents substantial underutilized adaptive capacity; (3) exclusion is systematic rather than incidental, requiring structural interventions; and (4) framework principles translate to concrete, measurable indicators. The alignment between community-identified priorities (38.75% prioritizing women's disaster training; explicit requests for women's participation in water infrastructure design) and international framework commitments suggests that gender-responsive approaches serve both rights-based imperatives and effectiveness objectives.



Recommendations

Based on priority needs identified through household surveys and qualitative research, the following recommendations are grounded in international gender-responsive climate adaptation frameworks, including the UNFCCC Enhanced Lima Work Programme on Gender (2019), the Sendai Framework for Disaster Risk Reduction 2015-2030, and IPCC AR6 guidance on climate vulnerability. This section presents sector-specific climate adaptation and mitigation measures. Adaptation measures reduce vulnerability to climate impacts; mitigation measures reduce greenhouse gas emissions. Priorities are based on household vulnerability data from 400 surveyed households across Logar and Wardak provinces.

| WATER INFRASTRUCTURE

Priority: 91.2% drought-affected households

Adaptation Measures:

- Install climate-resilient piped water distribution systems to reduce collection burden
- Construct community and household-level rainwater harvesting systems
- Rehabilitate and protect natural springs with improved infrastructure

- Improve access to water sources in neighboring villages (currently 1–3-day delays reported)
- Ensure women meaningful participation (minimum 30%) in water point location decisions

Rationale: Addresses drought impacts affecting 91.2% of households. Currently, water collection creates significant burden particularly on women and children, with 74.5% of women reporting waterborne diseases and 64.5% of children affected by diarrhea.

I AGRICULTURE & LIVELIHOODS

42% agriculture-dependent households

Adaptation Measures:

- Distribute drought-resistant crop varieties to vulnerable households
- Install water-efficient irrigation systems to reduce water consumption
- Provide agricultural training and extension services for women
- Support livelihood diversification to reduce agricultural dependency
- Develop small-scale income generation opportunities for women

Mitigation Measures:

- Promote climate-smart agriculture practices (reduced tillage, crop rotation)
- Implement soil conservation techniques to enhance carbon storage

Rationale: Agricultural collapse affects households significantly, with reduced yields reported by 36.8% of households. Food shortage occurs for 80.25% of households who reduced food consumption during disasters.

I HEALTH SERVICES

43% facing healthcare access barriers

Adaptation Measures:

- Deploy mobile health clinics with female staff to reach remote areas
- Climate-proof health facilities with flood barriers and backup infrastructure
- Pre-position emergency medical supplies in vulnerable districts
- Strengthen maternal health services for climate-displaced populations
- Establish nutrition programs targeting malnourished women and children
- Ensure female health workers available (currently reported as barrier)

Rationale: Healthcare access drops significantly during flood events.

Women face multiple barriers: no transportation, roads damaged/blocked, no female health workers available. Health impacts: 74.5% women report diarrhea/waterborne diseases, 33% respiratory problems, 29% mental distress/anxiety.

I PROTECTION INFRASTRUCTURE

Priority: 76% flood-affected households

Adaptation Measures:

- Construct flood protection walls and gabion structures in high-risk zones
- Improve drainage channels to prevent waterlogging and crop damage
- Reinforce river embankments in flood-prone areas
- Build retaining walls on unstable slopes
- Install community-based early warning systems with notification protocols

Rationale: June 2025 floods destroyed over 270 houses and eliminated more than 3,200 hectares of cropland, claiming 4 lives including 3 children. Flooding affects 76% of households.

I EDUCATION

Adaptation Measures:

- Construct climate-resilient school buildings
- Provide educational support for children during displacement /disasters
- Address school attendance disruptions
- Integrate climate change education into school curriculum
- Establish distance learning infrastructure for extended disruptions

Rationale: Children miss school due to: household displacement, child fell ill, child needed to work/help family. Girls particularly withdrawn from school first during economic crisis.

I DISASTER PREPAREDNESS

Adaptation Measures:

- Establish community-based early warning systems
- Develop gender-inclusive evacuation plans with women input
- Build emergency shelters with separate facilities and privacy for women
- Deliver disaster response training specifically for women through female trainers
- Address evacuation barriers including limited mobility and permission requirements

Rationale: Women face evacuation barriers: limited mobility/movement restrictions, wait for permission from men, responsible for children, lack disaster knowledge. Shelter problems reported: no privacy, harassment/verbal abuse, no separate sleeping areas.

I FORESTRY & LAND USE

Adaptation Measures:

- Establish watershed protection zones
- Construct erosion control structures
- Promote community forest management

Mitigation Measures:

- Implement reforestation programs for carbon sequestration
- Develop sustainable fuelwood alternatives
- Restore degraded rangelands

Rationale: Erosion and environmental degradation compound climate vulnerabilities. Current adaptation limited: only 18.5% planted trees for erosion control.

I GOVERNANCE & CAPACITY

Adaptation Measures:

- Mandate women participation in climate planning (minimum 30% quota)
- Establish inter-agency coordination mechanisms (NEPA, line ministries, NGOs)
- Create community-based adaptation committees with women leadership roles
- Integrate gender-responsive approaches into all climate policies
- Address women exclusion from decision-making processes

Rationale: Currently decision-making dominated by male head only or male head after consulting women. Ensures sustainability and addresses systematic exclusion of women from disaster planning and climate decision-making.

I IMPLEMENTATION PRIORITIES

Water infrastructure and protection infrastructure receive highest priority based on household impact data (91.2% drought-affected, 76% flood-affected). Food security interventions critical given 80.25% of households reduced food consumption during disasters. All measures integrate women meaningful participation and address both immediate humanitarian needs and long-term climate resilience.



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