SIGRA

Strengthening Investments in Gender-Responsive Climate Adaptation

CLIMATE RISK AND VULNERABILITY ASSESSMENT

KUMBUNGU DISTRICT

SUMMARY VERSION

Plate 1: *Botanga Dam, a vital water source in Ghana's Northern Region*
Credit: *Boafo YA, 2024*

Cowater Ghana

In partnership with Canada

epa

NATIONAL ADAPTATION PLAN GHANA

FORESIGHT PLANNERS & RESEARCH africa

KEY TAKEAWAYS

The Kumbungu District is facing intensifying climate variability, marked by erratic rainfall, dry spells, and flooding, which are threatening agriculture, water security, and livelihoods. The district is projected to experience hotter and drier conditions with more frequent flash floods and heatwaves by 2050 under high-emission scenarios. Vulnerable groups, including women, youth, children, and the elderly, face the greatest burden of these impacts. While local coping strategies exist, they are often fragmented and under-supported. The key messages highlight the urgent need for a tailored, community-level adaptation approach, prioritizing gender equity and strengthening institutional capacity to integrate climate data into development planning and budgeting.

HOW TO CITE THIS DOCUMENT:

Cowater International, Foresight Planners & Research Africa, & Environmental Protection Authority (EPA). (2025). Climate risk and vulnerability assessment: Kumbungu District (Summary version). Strengthening Investments in Gender-Responsive Climate Adaptation (SIGRA), Accra, Ghana.

01 **Flooding is the most recurrent and disruptive climate hazard,** especially in Nawuni, Zugu, and Dalun, where low-lying topography and poor drainage amplify exposure. Floods damage homes, cut off communities, and trigger disease outbreaks, disproportionately affecting women caregivers and school-aged children.

02 **Droughts and prolonged dry spells are intensifying,** leading to repeated crop failures, water shortages, and livestock deaths. Communities like Sakuba and Bognaayili report planting multiple times in a season due to erratic rains—undermining food security and household income.

03 **Extreme heat is emerging as a silent stressor—** school children, elderly persons, and pregnant women suffer from heat exhaustion and poor indoor ventilation. Women farmers now adjust their farming hours due to unbearable midday temperatures.

04 **Bushfires during harmattan months devastate farmland and biodiversity.**
Communities like Bagon and Gupanarigu urgently need fire belts, public education, and community fire brigades to prevent recurring loss of crops and assets.

05 **The future climate will be hotter, drier, and more erratic.**
By 2050, temperatures in Kumbungu are projected to rise by up to 2.8°C under high-emission scenarios, with more frequent flash floods and heatwaves.

06 **Water scarcity is a chronic issue, worsened by erratic rainfall and population growth.**
In places like Kpalsogun and Bagon, households walk long distances for water, especially during dry seasons—impacting girls' schooling and women's livelihoods.

07 **Livelihoods are increasingly precarious due to climate shocks.**
With 90% of the population engaged in rain-fed farming, communities face mounting risks to income, food production, and rural employment. Youth and women are particularly affected by the lack of diversification.

08 **Gendered inequalities shape climate vulnerability.**
Women face unequal access to land, finance, and extension services. PWDs and migrants are often excluded from adaptation discussions. Youth express disillusionment due to limited climate-responsive jobs and voice.

09 **Local adaptation knowledge exists but remains unsupported.**
Communities have begun adopting strategies like staggered planting, home water treatment, and savings groups—but lack external support to scale or sustain these innovations.

10 **Community-level adaptation must be tailored.**
Each community in Kumbungu faces unique risks—floods in Nawuni, bushfires in Zugu, heat stress in Zangballung, and drought in Bagon. Localized interventions—such as raised-bed gardening or solar irrigation—are essential.

11 **Institutions need strengthened capacity and gender-responsive tools.**
MMDA officers and Area Councils require technical support to integrate climate data, gender analysis, and early warning systems into development planning and budgeting.

12 **The district must co-develop a costed Climate Adaption Plan aligned with the NAP and MTDP,** with clear prioritization of vulnerable groups, financing options, and monitoring frameworks to drive inclusive, sustainable climate adaptation

A INTRODUCTION

A1. Background

This summary report presents key findings and recommendations from the Climate Risk and Vulnerability Assessment (CRVA) conducted in Kumbungu under the Strengthening Investments in Gender-Responsive Climate Adaptation (SIGRA) project. Funded by Global Affairs Canada and implemented by Cowater International, SIGRA supports Ghana's **National Adaptation Plan (NAP)** by helping local governments strengthen their systems, plan for climate risks, and promote inclusive adaptation strategies.

The project is aligned with Ghana's National Adaptation Plan (NAP), coordinated by the Environmental Protection Authority (EPA), which emphasizes inclusive, locally led adaptation planning to build climate resilience. In this spirit, SIGRA equips District Assemblies like Kumbungu with participatory tools, technical data, and stakeholder-driven approaches to identify climate hazards, assess vulnerabilities, and co-design adaptation strategies rooted in community realities.

Plate 2: *Fall armyworm infestation impacting a maize farm in Kpalsogun community.*
Credit: *Boafo YA, 2025*

A2. Scope and Objectives of the Assessment

The Kumbungu District CRVA aimed to generate actionable insights into how climate change is affecting lives, livelihoods, and ecosystems, with a focus on informing inclusive local planning. The assessment aimed to:

- Identify the major climate hazards impacting the district and their seasonal dynamics;
- Examine economic, physical, and social vulnerabilities across communities;
- Analyze how climate risks intersect with gender, age, and disability status;
- Recommend adaptation actions that are inclusive, practical, and aligned with local development goals.

The assessment employed a mixed-methods and participatory approach, including stakeholder workshops, focus group discussions (FGDs), household surveys, key informant interviews, community mapping, and future climate scenario analysis (using IPCC-aligned models: SSP2-4.5 and SSP5-8.5).

A3. Prioritizing Gender and Vulnerable Groups

A central focus of this assessment is its equity-centered approach. **Climate change does not impact all people equally**. In Kumbungu, as elsewhere, women, youth, persons with disabilities (PWDs), migrants, and the elderly face unique climate-related challenges—from restricted land access to increased caregiving burdens and exclusion from decision-making spaces.

This CRVA intentionally elevates the experiences and perspectives of these groups, ensuring that their insights inform both the findings and the recommended actions. The result is a more inclusive understanding of vulnerability in the district—and a stronger foundation for building a just and resilient future for all residents of Kumbungu.

A4. Kumbungu District Profile

A4.1. Geography and Climate Profile

Kumbungu District, located in Ghana's Northern Region, covers approximately 1,599 km^2 and lies between latitude 9°33′ 32″ N and longitude -5°65′ 5″ W. It is bordered by Mamprugu/Moagduri, Tolon, North Gonja, Sagnarigu, and Savelugu districts (**Figure 1**).

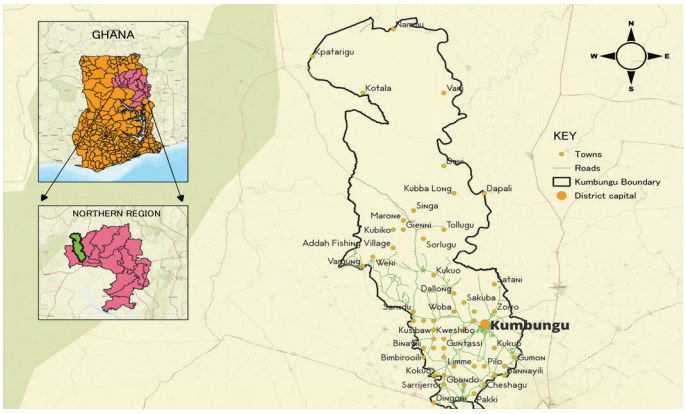

Figure 1: *Map of Kumbungu district showing the location of major towns and in relation to other districts in the Northern Region. Source: Kumbungu District Planning Office*

The landscape is predominantly flat to gently undulating, typical of the Guinea Savannah zone, with sandy loam soils and scattered depressions. **This flat topography contributes to seasonal flooding and poor natural drainage**, especially during peak rainfall months. Vegetation includes drought-resistant species such as shea, dawadawa, neem, and mango trees.
The climate is tropical, marked by a rainy season from May to October and a dry season from November to April, dominated by Harmattan winds (seasonal, dusty wind that blows from the Sahara Desert). Annual rainfall averages around 1,000mm, peaking between July and September, often causing floods from the White Volta.

In recent years, **climate variability has increased, with dry spells starting earlier and rainfall becoming more erratic. Temperatures range from 20°C to 39°C, with the hottest months between February and April**. Soils are prone to erosion and degradation due to vegetation burning, runoff, and unsustainable land practices such as sand mining, which accelerates environmental decline.

A4.2. Demographics and Gender Characteristics

Kumbungu District **has a population of 110,586, nearly evenly split between males and females, with a 3% annual growth rate and a density of 50 persons/km^2**. The population is predominantly Dagomba (95%), with minority groups like Gonjas and Fulanis near the White Volta. Most households follow extended family structures. About 62% of individuals aged 12+ are married, while educational attainment remains low—74.6% have no formal education. Islam is the dominant religion, with fertility and survival rates slightly below regional averages. **Vulnerabilities include high out-migration, school dropouts, early marriage, and flood risks**. Disability affects 1.5% of residents, with sight and physical impairments most commonly. Women are increasingly involved in family decisions but remain disadvantaged due to deep-rooted gender roles.

A4.3. Economic Activities

Agriculture employs about 90% of Kumbungu District's labor force, with key crops like maize, rice, yam, and pepper.

Plate 3: *Women Sorting and Cleaning Shea Nuts in Kumbungu District.*
Credit: *Boafo, YA (2024)*

Irrigation around the Botanga Dam supports year-round vegetable farming in communities like Kpalsogun and Botanga, Shea and groundnut processing—mainly by women—are vital income sources.

Plate 4. *View of the Botanga Irrigation Scheme.* ***Credit:*** *Boafo, YA (2024)*

Despite this, 45% of the population faces multidimensional poverty, driven by unemployment, poor housing, health, and education. **Fishing and sand winning also contribute to livelihoods but pose environmental challenges**. Other activities include poultry farming, smock weaving, and small trades.

A4.4 Critical Climate-Related Hazards

Kumbungu District faces multiple climate-related hazards—**drought, flooding, water scarcity, bushfires, and pest outbreaks—that threaten livelihoods, infrastructure, and food security**. The district's flat terrain, poor drainage, and high dependence on natural resources exacerbate its vulnerability. These hazards disproportionately affect women, youth, and smallholder farmers. **Droughts are becoming more frequent and prolonged**, reducing yields and water availability. Women, who dominate subsistence farming, are especially affected due to limited irrigation access.

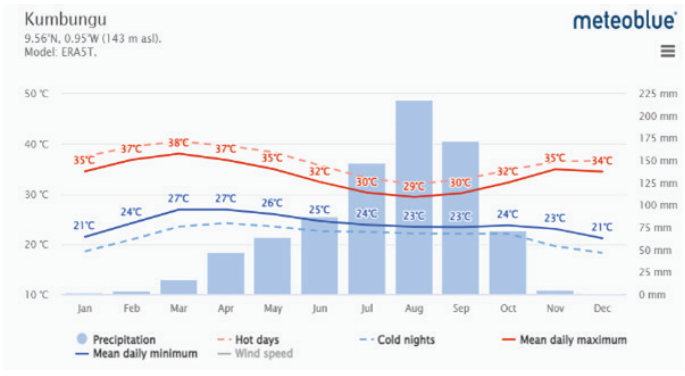

Figure 2: *Annual rainfall regime in Kumbungu District*
Source: www.meteoblue.com (2024)

B METHODOLOGICAL APPROACH

Plate 5: *Women FGD by the research team in Zugu.*
Credit: *Boafo YA, 2025*

B1. Introduction

The CRVA for Kumbungu District applied a participatory, mixed-methods design grounded in the Intergovernmental Panel on Climate Change (IPCC) AR5/AR6 frameworks. These frameworks, widely recognized as the global scientific standard for climate change assessment, define climate risk as a function of the interaction between climate-related hazards (such as extreme weather events), exposure (people and assets in harm's way), and vulnerability (the propensity to be adversely affected).

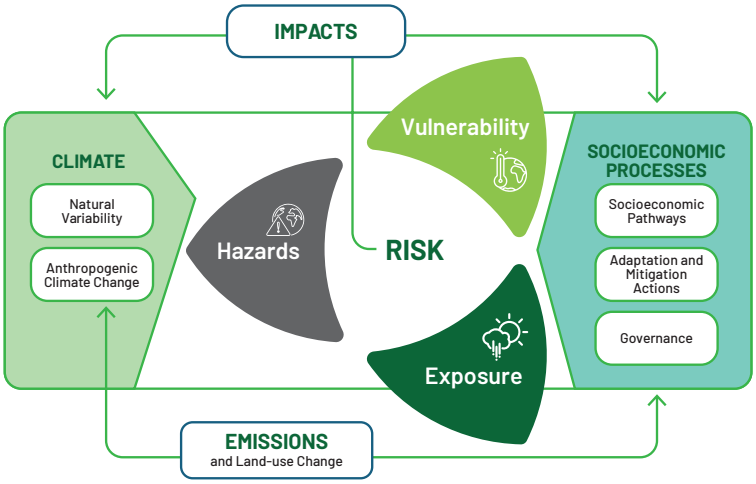

Figure 3*: The IPCC Risk and Vulnerability Framework illustrating the interaction of hazards, exposure, and vulnerability in shaping climate risks, with socio-economic processes influencing overall resilience.*

This approach (**Figure 3**), provides a robust basis for understanding how climate change, socioeconomic factors, and adaptation efforts influence the resilience of the district.

Twelve communities were purposively selected in consultation with district officials to reflect geographic diversity and developmental contrasts. **Two communities were chosen from each of the six Area Councils**—one more developed and one less developed. This ensured varied data on infrastructure, exposure, and coping capacities.

No.	Town/Area Councils	Selected Community (Site 1)	Selected Community (Site 1)
1	Kumbungu	Kumbungu	Zugu
2	Dalun	Dalun	Nawuni
3	Zangballung	Zangballung	Sakuba
4	Voggu	Voggu	Kpalsogun
5	Guppanarigu	Guppanarigu	Bognayili
6	Gbullung	Gbullung	Bagon

Table 1*: Selected communities for quantitative and qualitative data collection*

B2. Three-Stage Assessment Process

The methodology unfolded across three stages:

B2.1. Risk Identification

A desktop review of national reports, district development plans, and climate data was conducted to establish a baseline understanding of hazards and vulnerable groups. The review highlighted floods, droughts, water scarcity, and extreme heat as major threats, and identified women's unequal access to land and services as a key vulnerability factor.

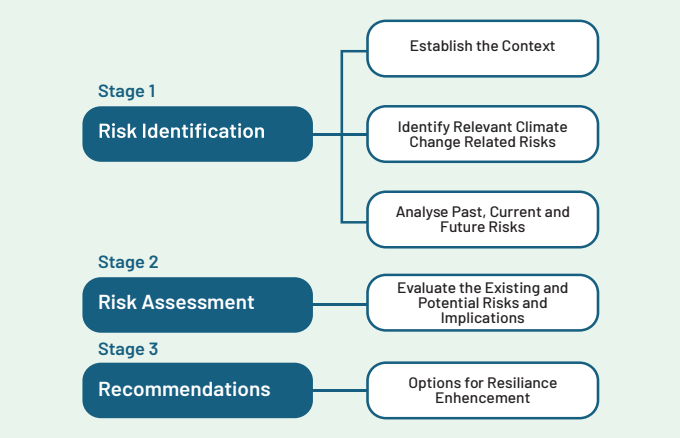

Figure 4: Methodology for climate change risk assessment in Kumbungu District

Stakeholder Workshops: A district-level stakeholder engagement workshop was organized at the Kumbungu District Assembly on 28th August 2024. It convened district officials, traditional leaders, sector actors (agriculture, water, health, infrastructure), and women-led CSOs. The workshop focused on climate awareness, participatory resource and **hazard mapping, seasonal calendars, and identification of vulnerable sectors**.

Plate 6: Photocall after a stakeholder workshop at Kumbungu District.
Credit: Abdul-Rauf M, 2025

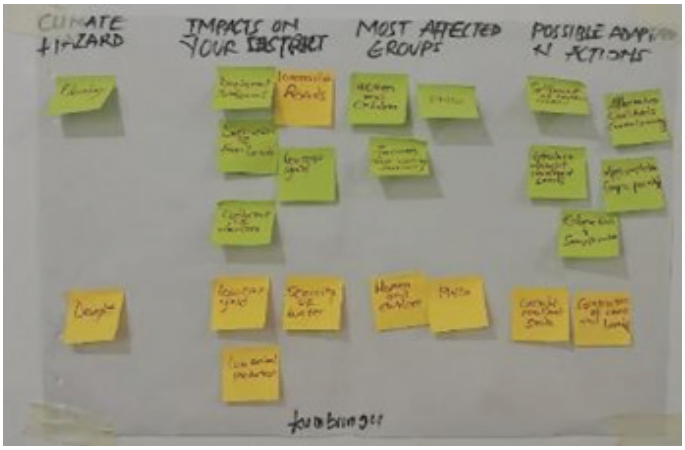

Plate 7: Gendered hazards mapping and vulnerability activity during the stakeholder workshop. Credit: Boafo, YA, 2025

B2.2. Risk Assessment

Participatory tools and fieldwork deepened the findings: Household Questionnaire Surveys: A total of 348 households across 12 communities in the Kumbungu District were surveyed using structured questionnaires. These surveys assessed socio-economic profiles, adaptive capacities, and resource access patterns of households. Trained enumerators administered face-to-face interviews, ensuring the inclusion of less literate participants.

Stratified random sampling was used to ensure representativeness, with variables including gender, occupation, and vulnerability status. The data collected offered insights into household-level decision-making, climate impacts, and adaptation strategies

Focus Group Discussions (FGDs): Twenty-four (24) FGDs were conducted across the selected communities (12 male and 12 female groups), each consisting of 8–12 participants. The FGDs were designed to uncover localized, gender-specific vulnerabilities and coping strategies in response to climate risks.

Trained facilitators employed semi-structured guides to explore livelihood strategies, access to climate information, adaptive behaviour, and gendered roles during extreme climate events. These discussions revealed how traditional norms and access inequalities shape climate resilience.

Plate 8: Men FGD discussion at Guppanarigu community
Credit: Doreen Lartey, 2025

Key Informant Interviews (KIIs): Key Informant Interviews were conducted with community leaders, local authorities, agricultural extension officers, health professionals, and representatives from CSOs and NGOs. These semi-structured interviews provided deep insights into institutional capacity, ongoing adaptation initiatives, and barriers to inclusive climate governance. Interviewees offered perspectives on historical hazard patterns, resource distribution, and the role of gender in shaping adaptive capacity. Cultural sensitivity and confidentiality were upheld throughout the process.

Climate Modeling and Scenario Analysis: To assess future climate risks, the study integrated three datasets:

- CHIRPS for rainfall,
- ERA5 for temperature extremes,
- CMIP6 for long-term projections under SSP1-2.6, SSP2-4.5, and SSP5-8.5.

Projected trends were analyzed for near-term (2021–2040), mid-century (2041–2060), and end-century (2081–2100) periods. Climate indices such as Rx1day, CDD, and TXx were used to quantify extreme events. The results were overlaid with participatory data (e.g., seasonal calendars, hazard maps) to contextualize risks for community planning.

Data triangulation was central to the assessment. Household survey results were cross-analyzed with FGDs and KIIs to enrich interpretation. Participatory tools like hazard maps and seasonal calendars complemented numerical projections, ensuring a rich, locally validated evidence base to inform gender-responsive adaptation planning.

Category	Metric	Description	Interpretation	Units
Precipitation	Rx1day	Maximum 1-day precipitation. The highest amount of precipitation recorded in a single day during a given year or season.	Indicates the intensity of the most extreme daily rainfall event, highlighting potential for flash floods and extreme weather.	mm
	Rx5day	Maximum 5-day precipitation. The highest accumulated precipitation over any consecutive 5-day period within a given year or season.	Captures the intensity of extended heavy rainfall periods, which could lead to river flooding or waterlogging issues.	mm
	CDD	Consecutive dry days: The maximum number of consecutive days with less than 1 mm of rainfall.	Reflects drought conditions by showing prolonged periods without significant rainfall.	days
	CWD	Consecutive wet days: The maximum number of consecutive days with at least 1 mm of rainfall.	Represents extended wet spells, which may increase the risk of flooding, landslides, or crop saturation.	days
	R95p	Very wet days: Total precipitation from days when rainfall exceeded the 95th percentile of daily precipitation during a reference period.	Indicates the frequency and volume of extremely wet days, showing potential for extreme weather events driven by climate variability or change.	mm
	R95pTOT	Total precipitation from very wet days: The total amount of precipitation occurring on days with rainfall above the 95th percentile.	Illustrates the contribution of extreme rainfall events to the total annual precipitation.	mm
	SDII	Simple daily intensity index: The ratio of total precipitation to the number of wet days (days with 1 mm precipitation or more).	Measures the average precipitation intensity on wet days, reflecting the nature of rainfall events.	mm/ day
Temperature	TXx	Maximum daily maximum temperature: The highest daytime temperature observed in a given year or season.	Reflects the intensity of heatwaves and extreme hot days, which can impact health, agriculture, and energy demand.	°C
	TNx	Maximum daily minimum temperature: The highest nighttime temperature observed in a given year or season.	Tracks warm nighttime temperatures, which can influence heat stress, particularly in urban areas, and impact human health and agricultural productivity.	°C
	TXn	Minimum daily maximum temperature: The lowest daytime high temperature recorded in a given year or season	Captures cooler days, which are potentially beneficial during extreme heat periods but also indicate cold snaps or unseasonal weather.	°C

Table 2: Summary of Climate Change Detection and Indices (ETCCDI) used in analysis.

B2.3. Adaptation Planning and Validation

The final stage synthesized all findings into a draft CRVA, which **was validated in a multi-stakeholder session on March 5, 2025.** The validation process included a diverse group of participants, such as local government officials, community representatives, and non-governmental organizations. During the session, participants reviewed strategic recommendations and proposed actions to address the **district's highest-priority climate risks**, particularly those faced by vulnerable groups.

C

KEY ASSESSMENT FINDINGS

Plate 9: *Fishing boats moored on the banks of the White Volta in the Nawuni community.*
Credit: *Boafo YA, 2025*

C1. Climate Hazards and Exposure

The Kumbungu District faces intensifying climate hazards—floods, droughts, bushfires, and extreme heat—that are disrupting livelihoods and deepening vulnerabilities, especially in low-lying and farming communities with limited adaptive capacity.

The climate landscape of Kumbungu District is shifting rapidly, with hazards that once followed familiar rhythms now becoming erratic, severe, and increasingly difficult to predict. The findings from community consultations, focus group discussions, household surveys, and seasonal calendar exercises reveal a district under rising climate stress.

Four primary hazards dominate the local climate risk profile: **flooding, droughts and prolonged dry spells, bushfires, and extreme heat**. These hazards have become more intense and disruptive, with wide-ranging implications for agriculture, health, infrastructure, and overall livelihoods.

C1.1 Flooding

Flooding poses a recurring and disruptive threat to daily life and essential services in Kumbungu, particularly for communities in low-lying, poorly drained areas: Floods are the most frequently cited hazard across communities in Kumbungu, occurring annually and peaking in August and September. Low-lying areas such as Nawuni, Zugu, and Kpalsogun are particularly vulnerable due to poor drainage and proximity to rivers and wetlands.
Even moderate rainfall leads to inundation of homes, damage to feeder roads, and blocked access to markets, health centres, and schools.

Focus group participants described instances where heavy rainfall cut off entire communities for days. The lack of culverts and flood barriers exacerbates the situation, especially in Nawuni and Dalun.

> *"In Nawuni, once the river rises, our only road becomes a river too. Children cannot go to school, and sick people are trapped."*
> *– Youth, Nawuni*

Floodwaters also often contaminate wells and open water sources, leading to outbreaks of diarrhoea, typhoid, and other waterborne diseases.

C1.2. Droughts and Prolonged Dry Spells

Prolonged and unpredictable droughts are undermining agricultural stability in Kumbungu, driving food insecurity, income loss, and increased migration among the youth.

Droughts are increasingly frequent and prolonged, severely affecting agricultural productivity. These dry periods are often felt most between November and March, with sporadic dry spells also occurring during the main planting season in June–July. Farmers report that early rains now end abruptly or start late, leading to seed losses and repeated replanting. Communities such as Bognaayili and Sakuba report crop failures, drying streams, and livestock deaths due to lack of pasture and water. These conditions increase food insecurity and reduce household incomes, pushing more young men and women into migration to urban areas.

> *"We planted three times this year. Each time the rain teased us and disappeared. Now we are tired and broke."*
> *– Elderly male farmer, Sakuba*

C1.3. Bushfires

Seasonal bushfires are intensifying land degradation and food insecurity in Kumbungu, with limited local capacity for prevention or response. Bushfires are common during the harmattan season (December to February) and are exacerbated by the dry winds, vegetation drying, and human activities such as land clearing and hunting.

These fires:

- Destroy farmlands and stored food, especially in fringe farming communities like Bagon and Zangballung.
- Disrupt the regeneration of natural vegetation and contribute to land degradation and soil infertility.

There is limited community capacity to manage or prevent these fires, with many respondents expressing the need for fire belts and sensitization campaigns.

> *"Last harmattan, a fire jumped from the bush to our millet farm. We lost everything in one night."*
> *– Woman farmer, Bagon*

C.1.4. Extreme Heat

Rising extreme heat is disrupting farming, endangering vulnerable groups, and compounding water stress across Kumbungu communities. Heatwaves—though not officially tracked—are increasingly cited as a major concern. Peak heat periods between March–May and again in October–November result in:

- Withering of young crops and reduced yields.
- Heat stress among schoolchildren and the elderly.
- Increased need for water at a time when access is lowest.

In communities like **Dalun and Voggu**, residents shared how they delay work to early mornings or late evenings to cope with the heat.

> *"We now fear both rain and sun. The rain floods our roads and farms, and the sun burns the crops before they grow."*
> *– Female farmer, Zangballung*

C2. Vulnerability Analysis

C2.1. Economic Vulnerability

Heavy reliance on rain-fed farming, limited access to productive assets, and gendered inequalities in income and land ownership significantly heighten the economic vulnerability of women and youth in Kumbungu: The district's economy is highly dependent on rain-fed agriculture, making livelihoods extremely sensitive to rainfall fluctuations and temperature extremes. Households in Zangballung, Saakuba, and Bagon reported repeated crop failures due to delayed rains and early cessation of the rainy season.

The high cost of agricultural inputs—fertilizer, improved seeds, and irrigation equipment—limits resilience-building, particularly for women and youth.

From the Assessment findings, women earn less, with 100% reporting incomes below GHS 500, and have limited access to productive assets like land and livestock.

Men dominate crop farming and own more income-generating resources, while women rely on informal activities like shea processing. Fewer women engage in additional income streams, constraining their adaptive capacity. These disparities expose women and youth to greater climate-related economic risks and must be addressed through inclusive adaptation planning.

Many women are unable to access farmland independently due to patrilineal land tenure systems, forcing them to farm marginal lands or depend on male relatives.
Youth often migrate seasonally to urban centres in search of precarious work when farming fails.

> *"Even when we get land, we don't get money for fertilizer. We plant, but the ground gives us nothing back."*
> *— Woman farmer, Kpalsogun*

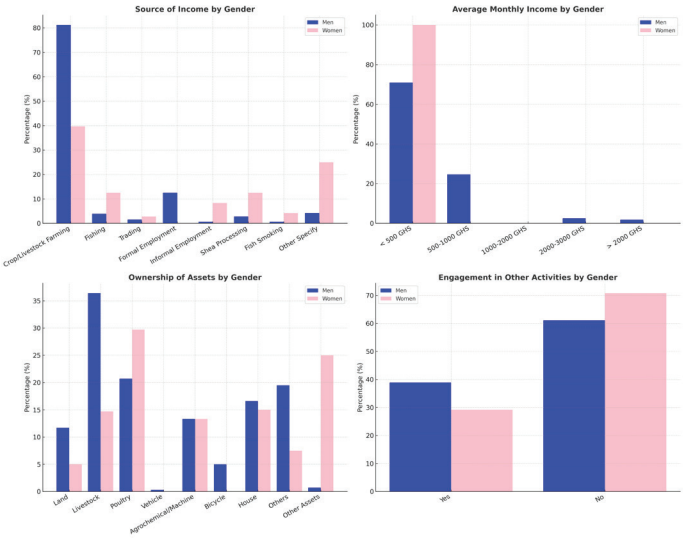

Figure 7: Gendered economic vulnerability

C.2.2. Physical Vulnerability

Gendered physical vulnerability in Kumbungu is stark, with women consistently reporting higher exposure and more severe impacts from all major climate hazards—floods, droughts, heat, and windstorms—due to their socio-economic roles, caregiving burdens, and limited access to land, finance, and infrastructure, especially across sectors like agriculture, health, and water:

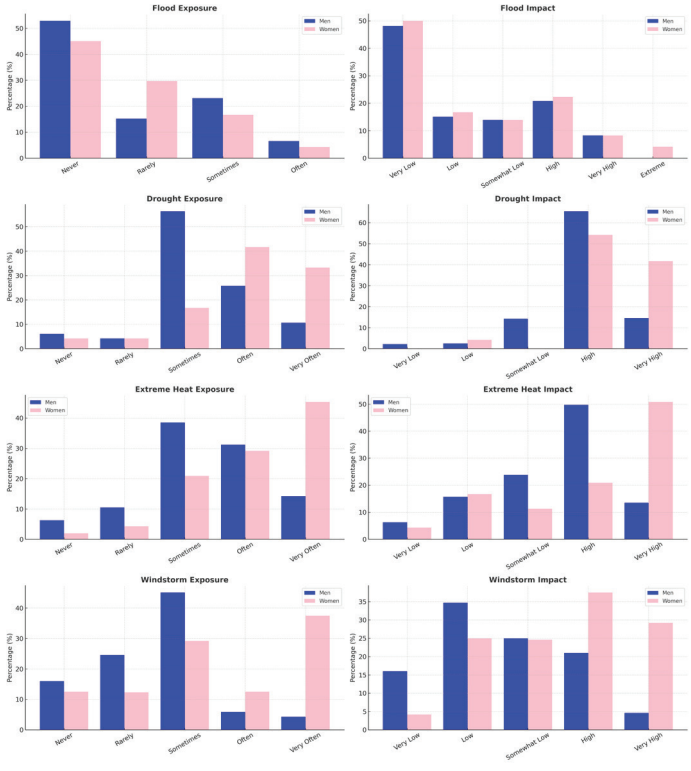

Figure 8: Gendered exposure to climate hazards

Sectoral Vulnerability (**Figure 9**):

- **Agriculture:** This sector is highly vulnerable. Droughts disproportionately affect women, the elderly, and PWDs due to their reliance on small-scale farming. Floods severely impact men (financial losses on large farms) and the elderly/PWDs (mobility issues), while windstorms affect youth, elderly, and PWDs through job losses.
- **Infrastructure:** The district's infrastructure is highly susceptible to floods and erosion, leading to damaged roads, bridges, and homes, thereby restricting access to essential services. Windstorms pose a moderate threat to poorly constructed buildings, often resulting in displacement.
- **Health:** Floods contribute to waterborne diseases, and extreme heat leads to heat-related illnesses and malnutrition. Women, as primary caregivers, face increased burdens from waterborne diseases, while vulnerable groups like children, the elderly, and migrants are highly susceptible to the effects of extreme heat.
- **Water Resources:** Water resources are highly vulnerable to both floods (contamination) and droughts (scarcity). These impact women disproportionately due to their primary role in water collection, and PWDs due to access challenges.

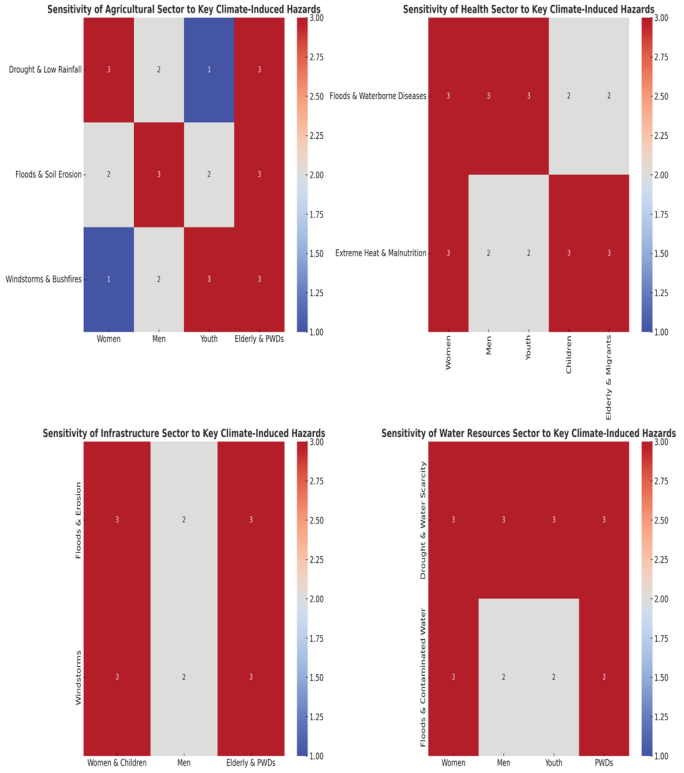

Figure 9: Sensitivity of key sectors

C2.3. Social Vulnerability

Kumbungu District exhibits high social vulnerability to climate change, primarily due to entrenched gender inequalities in roles, decision-making, and access to resources.

C2.3.1. Gender Roles & Decision-Making:

Men dominate household financial decisions and income-related activities, while women, though central to daily survival, especially through water collection and caregiving, have limited influence in both household and community-level decisions on climate adaptation.

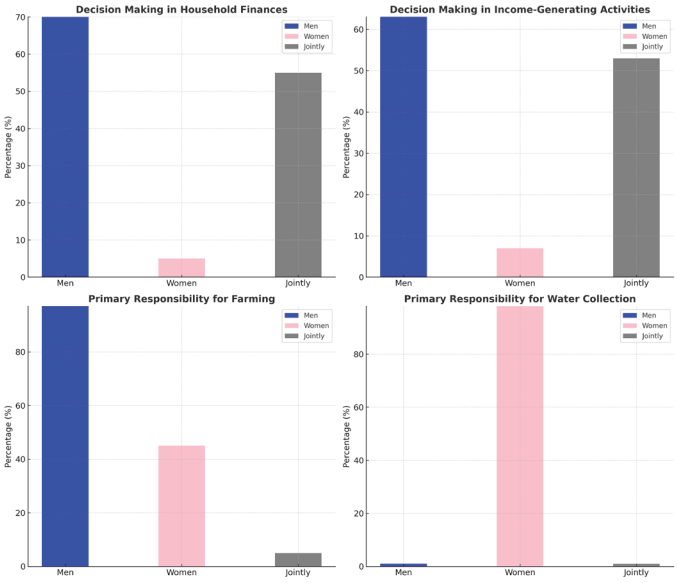

Figure 10: Gender Roles in Household Decision-Making and Resource Management

C2.3.2. Impacts on Women:

Women face increased workloads, reduced incomes, and health risks due to climate stressors. They also bear heightened safety concerns and caregiving duties during crises. Most community members agree that women lack meaningful participation in adaptation planning, constrained by traditional norms and limited legal protections.

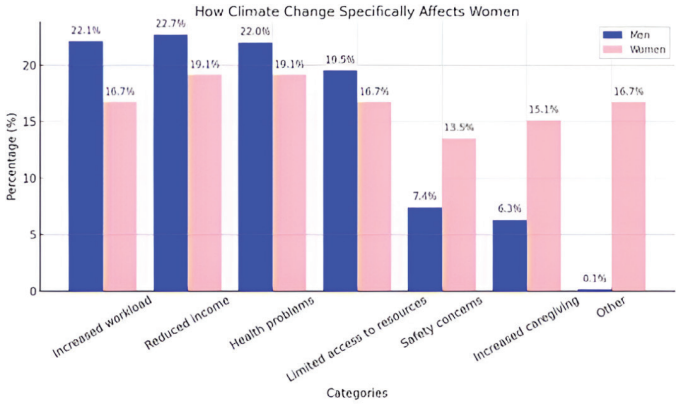

Figure 11: How climate change affects women

C2.3.3. Barriers to Resources:

Cultural practices restrict women's land rights, while widespread financial constraints and low education levels further limit their ability to invest in or access adaptation strategies.

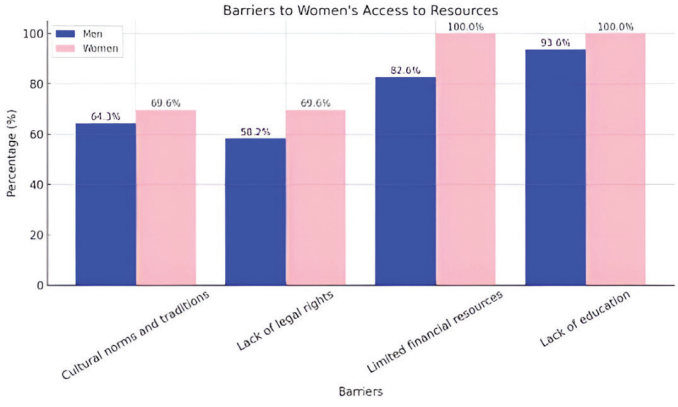

Figure 12: Barriers to Women's access to resources for climate change adaptation

C2.3.4 Adaptive Capacity and Support Gaps:

Women primarily depend on informal networks for support, whereas men benefit more from formal services. **Local organizations supporting women in adaptation are notably lacking, and existing assistance focuses more on credit** and leadership for women, while men receive climate-smart agricultural training and information access.

C2.4. Gendered Vulnerability and Intersectionality

Intersecting social, cultural, and structural barriers deepen the climate vulnerability of marginalized groups in Kumbungu, limiting their participation, protection, and access to resources.

Persons with disabilities reported being excluded from early warning systems and community meetings. **Youth, particularly in Dalun and Voggu**, feel disempowered due to lack of employment and voice in governance structures.

The assessment also revealed cultural and structural constraints that affect migrants and the elderly. Migrant households often rent farmland under insecure conditions and are rarely included in resource allocation discussions. Older adults are more susceptible to heat-related illnesses and struggle to access distant health centres during floods.

"We talk about development, but nobody calls the disabled to speak. How will they know what we need?"
— Youth with disability, Dalun

"At my age, I can't run from flood. I just sit and pray."
— Elderly man, Zangbalung

C3. Projected Climate Trends

Projected climate extremes in Kumbungu—rising heat and erratic rainfall—pose escalating risks for vulnerable groups, especially women, youth, and persons with disabilities, who face compounding challenges in adapting to these changes:

The future climate outlook for Kumbungu District reveals a stark trajectory of intensifying risks. Analysis from CHIRPS, ERA5, and CMIP6 model projections under SSP2-4.5 **(moderate emissions)** and SSP5-8.5 **(high emissions)** points to significant warming, erratic rainfall, and heightened frequency of extreme events. These trends compound existing vulnerabilities and disproportionately affect groups with limited adaptive capacity—particularly women, youth, and persons with disabilities.

C3.1. Temperature Projections: Rising Heat Stress

By 2050, average annual temperatures in Kumbungu are expected to rise by 1.6–2.8°C, with a sharper increase under the SSP5-8.5 scenario.

- Extreme heat days (TXx) and warm nights (TNx) will become more frequent, especially during March–May and October–December.
- Communities like Dalun, Sakuba, and Voggu, which already report oppressive midday heat, are expected to experience longer and more intense heatwaves.

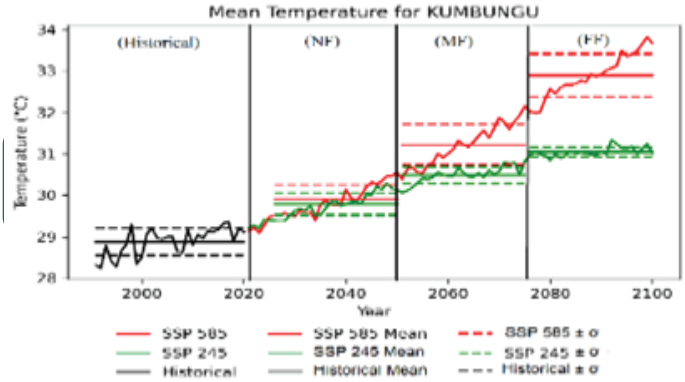

Figure 13: Projected Mean Temperature Trends for Kumbungu District Under SSP5-8.5 and SSP2-4.5 Scenarios

Gendered Implications: Women who farm midday, caregivers managing children indoors, and PWDs with mobility or health constraints are at higher risk of heat-related illnesses.

"During the heat, I can't stay in the kitchen long. But the children still need food."
— Woman caregiver, Nawuni

C3.2. Rainfall Projections: A Pattern of Extremes

Rainfall in Kumbungu is projected **to remain relatively stable in total volume**, but its distribution will become more erratic.

This includes:

- More intense but short-lived rainfall events—increasing flash flood risks, especially in Zugu and Nawuni (already flood hotspots).
- Longer dry spells (CDD) during the lean season, reducing groundwater recharge and depleting surface water bodies.

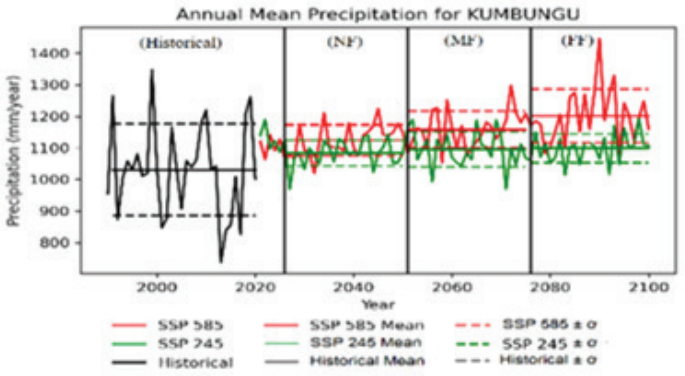

Figure 14: Historical and projected mean precipitation patterns under SSP 5-8.5 and SSP 2-4.5 scenarios for Kumbungu

The projections suggest that Rx1day and Rx5day indices will intensify under both scenarios, leading to localized flooding after brief torrential rains.

Gendered Implications: Erratic rains affect planting and harvesting cycles. Women who often sow crops manually without access to machinery are more vulnerable to sudden dry-outs or waterlogging. Children's schooling is also interrupted when roads flood.

"The rain doesn't warn anymore. It comes like a war and washes everything."
— Male farmer, Kumbungu.

Climate Variable	Key Findings	Implications
Rainfall Patterns	• Unimodal pattern with rainfall peaking in June-August. • Increased intensity under SSP5-8.5, particularly in Mid- and Far-Future.	• Increased risk of flooding and infrastructure damage. • Potential disruptions to agricultural and water management practices.
Annual Precipitation	• Annual precipitation increases under SSP5-8.5 with higher variability. • SSP2-4.5 shows stable trends with marginal increases.	• Greater rainfall variability demands enhanced water storage, flood management, and soil conservation strategies.
Rainfall Extremes	• Moderate rainfall days (R10mm) and very wet days (R95pTOT) increase. • Fewer extreme events (Rx1, Rx5). • Consecutive wet days higher under SSP5-8.5, raising flooding risks.	• Increased risk of waterlogging and flooding • Potential challenges for agriculture and infrastructure resilience.
Mean Temperature	• Temperatures rise steadily under both scenarios, with SSP5-8.5 reaching ~34Â°C by 2100, while SSP2-4.5 stabilizes at ~32Â°C.	• Intensified heat stress under SSP5-8.5 impacts agriculture, water resources, and human health • Underscores the need for emission reductions.

Table 3: Summary of projected climate trends in Kumbungu district

Community	Projected Climate Trend	Key Vulnerabilities
Dalun	• Flooding • Soil erosion	• Disrupted livelihoods. • Damaged infrastructure. • Long-term soil degradation. • Severe damage to farmlands and infrastructure. • Displacement. • Prolonged recovery needs. • Reduced agricultural productivity due to extended wet conditions
Nawuni	• Flooding • Soil erosion	
Voggu	• Flooding • Waterlogging	
Kumbungu	• Erratic rainfall • Flooding	• Disruption of transportation and market access. • Reduced farming efficiency.
Zugu	• Droughts • Water scarcity	• Declining soil fertility. • Reduced water availability for agriculture and domestic use.
Saakuba	• Droughts • Water scarcity	• Drying of seasonal water sources. • Increased competition for scarce resources. • Declining shea production. • Vegetation loss • Reduced options for livestock farming
Zangbalung	• Droughts • Soil erosion	
Gbulling	• Droughts • Moderate flooding	• Reduced water table levels. • Disruption of shallow well systems for domestic and farm use.
Bognaayili	• Rising temperatures	• Reduced crop yields. • Increased water evaporation from communal sources.
Kpalsogun	• Rising temperatures • Pests	• Heat stress on livestock. • Increased pest outbreaks roducing crop yields. • Water scarcity. • Increased competition for irrigation resources. • Topsoil loss reducing agricultural productivity.
Bagon	• Rising temperatures • Droughts	
Guppanarigu	• Rising temperatures • Erosion	

Table 4: Summary of projected Community Vulnerabilities to Climate Trends

D ADAPTATION PRIORITIES AND RECOMMENDATIONS

Plate 10: *Maize harvested from a farm in Dalun is spread out on the ground to dry.*
Credit: *Boafo YA, 2025*

D1. Strategic Adaptation Options

Strengthening climate resilience in Kumbungu requires inclusive, gender-responsive, and locally grounded adaptation strategies that empower vulnerable groups and integrate social, economic, physical, and institutional solutions. Building climate resilience in Kumbungu demands inclusive, gender-responsive strategies that empower vulnerable groups and deliver tangible improvements across social, economic, physical, and institutional systems.

These recommendations cut across social, economic, physical, and institutional domains and are grounded in both scientific evidence and community consultations. Special emphasis is placed on these recommendations are grounded in scientific evidence and community consultations, with a strong focus on equity and local relevance. The following adaptation options are designed to be practical, inclusive, and aligned with Kumbungu's development priorities

D1.1. Social Adaptation Priorities

a. Promote Inclusive Governance Mechanisms

Create platforms where women, youth, PWDs, and migrants are meaningfully represented in climate planning and implementation. This could include dedicated seats in Area Council climate task forces or community monitoring groups.

> *"When meetings happen, we [women] hear of them only later. But we are the ones fetching water when there's drought."*
> *– Woman from Kpalsogun*

b. Strengthen Health Systems and Heat Stress Response

Equip health facilities with early-warning systems, heatwave response protocols, and community education on extreme heat health risks, especially for children and the elderly. Mobile health outreach can be scaled during peak heat months (March–May).

c. Invest in Climate and Environmental Education

Leverage schools, CSOs, and faith-based organizations to teach climate awareness, environmental protection, and adaptation strategies. Special programs for girls and out-of-school youth can embed knowledge on water conservation, nutrition, and land care.

d. Support Caregiving Systems and Social Protection

Women shoulder caregiving burdens during shocks. Support is needed through cash-for-care schemes, distribution of caregiving kits during disasters, and linking vulnerable households with social protection services such as Livelihood Empowerment Against Poverty (LEAP).

D1.2. Economic Adaptation Priorities

a. Scale Up Climate-Smart Agriculture (CSA)

Promote drought-tolerant crops (e.g., cowpea, early-maturing maize), conservation farming, and agroforestry. Leverage women's farmer groups to scale CSA practices through training and demonstration plots.

b. Support Livelihood Diversification and Green Skills

Create training hubs for alternative livelihoods (e.g., soap-making, agro-processing, sustainable shea collection). Prioritize women, youth, and PWDs in these programs, including startup capital access and cooperative formation.

c. Improve Access to Finance and Extension Services

Promote gender-sensitive rural finance schemes tailored to the needs of women and youth. Increase the number of female agricultural extension officers and deploy ICT-based platforms to reach remote areas with climate advisories.

D1.3: Physical Adaptation Priorities

a. Upgrade Water and Sanitation Infrastructure

Rehabilitate and expand boreholes, rainwater harvesting systems, and small dams in water-scarce communities like Nawuni, Zugu, and Bagon. Install water purification stations to reduce waterborne disease outbreaks after floods.

b. Invest in Community-Scale Irrigation Systems

Introduce low-cost solar-powered drip irrigation systems to reduce dependence on erratic rainfall. Target women farmers who lack land tenure and rely on communal farmlands.

c. Strengthen Erosion Control and Bushfire Prevention

Construct check-dams, plant native grasses, and set up community fire volunteer brigades. Local fire bylaws should be enforced alongside public education campaigns during the harmattan season.

d. Upgrade Climate-Resilient Roads and Market Access

Rehabilitate feeder roads and culverts prone to flood damage to maintain market connectivity during the rainy season. Markets in Kumbungu and Dalun should be prioritized for drainage improvements.

D1.4. Institutional and Governance Adaptation Priorities

a. Build MMDA and Area Council Capacity on Gender-Responsive Planning

Train planning staff and sub-district structures on integrating gender into climate risk mapping, budgeting, and project design. Develop planning checklists aligned with Ghana's National Adaptation Plan (NAP).

b. Implement Gender-Responsive Budgeting for Climate Funds

Ensure that at least 40% of climate adaptation budgets are earmarked for actions targeting women, youth, and PWDs. Establish tracking systems for climate spending and its gender distribution.

c. Strengthen Multi-Sectoral Coordination and Data Sharing

Convene quarterly climate coordination platforms involving NADMO, agriculture, water, health, and civil society. Foster collaboration with the University for Development Studies (UDS) to support data analytics, research, and monitoring.

D2. Community-Specific Recommendations

Tailored, community-driven adaptation strategies in Kumbungu District are essential to address diverse climate risks and ensure that no vulnerable group is left behind in building local resilience.

Climate change does not strike evenly—it finds the cracks in systems, magnifies pre-existing inequalities, and reshapes everyday life differently across place and population. In Kumbungu District, each community wears its vulnerabilities and resilience potentials uniquely.

In response, tailored adaptation priorities were proposed to align with local realities and support integration into the District's Medium-Term Development Plan. These include climate-smart agriculture, solar-powered water systems, early warning mechanisms, fire prevention measures, and livelihood diversification pathways such as agro-processing, poultry rearing, and cooperative formation. The recommendations emphasize gender responsiveness, skills development, and inclusive governance to ensure no group is left behind in building resilience to climate change.

Table 5 presents customized adaptation pathways for selected high-risk communities, anchored in local voices, geographic realities, and community aspirations. These recommendations aim to turn vulnerability into opportunity—especially for women, youth, and persons with disabilities.

Community	Key Climate Risks	High-Risk Groups	Top Priority Adaptation Actions
Kumbungu	Water scarcity, heat stress	Market women, young children	• Construct shaded water kiosks • Promote water reuse technologies • Install solar-powered fans in clinics
Zugu	Bushfires, soil erosion, land loss	Male youth, farmers without land titles	• Form community fire volunteer brigades • Distribute firebreak kits • Train on contour farming and land restoration
Dalun	Flooding, health outbreaks	Children, nursing mothers	• Improve drainage systems • Construct elevated community health posts • Train women in home water purification
Nawuni	Flooding, seasonal water stress	Women farmers, elders	• Construct elevated boreholes • Introduce raised-bed and floating gardens • Set up flood early warning system
Zangballung	Heat stress, crop failure	Pregnant women, school children	• Plant heat-tolerant trees around schools • Provide shaded market structures • Promote heat-tolerant seed varieties
Saakuba	Erratic rainfall, degraded soils	Subsistence farmers, elderly	• Train on composting and mulching • Promote agroforestry practices • Support seed banks
Kpalsogun	Water scarcity, market isolation	Women processors, elderly	• Solar-powered boreholes and storage tanks • Reinforce road culverts • Establish women's market cooperatives
Bognaayili	Income shocks, gender exclusion	Widows, young girls	• Create climate adaptation savings groups • Offer seed grants for soap making and agro-processing • Link to local skills hubs
Gupanarigu	Bushfires, limited access to inputs	Tenant farmers, single mothers	• Train in climate-smart farming • Distribute drovught-resistant inputs • Set up community agro-centers
Gbullung	Flash floods, crop loss	Livestock keepers, landless youth	• Build small earthen dams for water retention • Develop forage banks • Initiate flood-adapted farming trials
Bagon	Drought, youth unemployment	Male youth, returnee migrants	• Establish agro-entrepreneur incubators • Train in solar irrigation and poultry • Support youth cooperatives
Voggu	Unpredictable rains, pest outbreaks	Older farmers, women-led households	• Promote Integrated Pest Management • Establish rain gauges with local training • Introduce early warning text alerts

Table 5: Tailored Adaptation Options for High-Risk Communities in Kumbungu District

Plate 11: Shea trees (Vitellaria paradoxa) are a significant feature of the landscape in the Nanumba South District
Credit: *Mathias Neumann Andersen*

E CONCLUSION AND NEXT STEPS

E1. Summary of Findings and Emerging Insights

Strengthening climate resilience in Kumbungu requires scaling up community-driven innovations and delivering coordinated, inclusive support to those most affected by escalating climate hazards. This assessment reveals that the district faces increasing exposure to seasonal flooding, prolonged droughts, heat extremes, and bushfires—hazards that disproportionately impact women farmers, youth, persons with disabilities, and elderly residents, who often lack access to land, finance, and adaptation resources.

Community voices highlighted the toll of rising temperatures, unreliable rainfall, and degraded farmland on food security, water access, and social wellbeing. Despite these challenges, local knowledge and adaptive ingenuity are evident—from informal savings groups to shaded farming techniques and collective water management.

However, these efforts remain fragmented and under-supported, pointing to a critical need for coordinated action that builds on community strengths and reflects the lived realities of Kumbungu's residents.

E2. Call to Action

Achieving climate resilience in Kumbungu requires inclusive, locally grounded action driven by collaborative governance, equitable investment, and recognition of community leadership.The assessment calls for a decisive shift toward climate strategies that center the most vulnerable, promote fair resource distribution, and elevate the leadership roles of women, youth, and community-based organizations.

District authorities, traditional leaders, development partners, and civil society actors must work together to integrate climate adaptation into governance structures, budgeting processes, and service delivery systems that reflect local realities.

Equally, investments in infrastructure, education, and early warning systems must account for the geographic diversity and differentiated vulnerabilities across Kumbungu's 12 Area Councils—ensuring inclusive and equitable climate resilience for all.

E3. Next Steps

The next phase involves co-developing a costed, inclusive District Climate Adaptation Plan that aligns with Ghana's National Adaptation Plan and the District Medium-Term Development Plan.

This plan should:

- Prioritize high-risk communities and vulnerable groups using CRVA findings to guide targeted interventions.
- Include clear timelines, financing mechanisms, and monitoring frameworks to ensure accountability and track progress.
- Strengthen partnerships among local authorities, traditional leaders, civil society, and development partners for coordinated implementation and shared learning.
- Mainstream gender equality and social inclusion across all stages of planning, budgeting, and service delivery.

Plate 12 : *Livestock grazing on communal rangelands in Kumbungu community*
Credit: *Boafo YA. 2025*

SIGRA
Strengthening Investments in Gender-Responsive Climate Adaptation

Cowater Ghana

In partnership with Canada

4 Digya Lane, Airport Residential Area, Accra – Ghana

info@sigraghana.org
+233 53 046 5748

www.sigraghana.org