



Strengthening Investments
in Gender-Responsive
Climate Adaptation

CLIMATE RISK AND VULNERABILITY ASSESSMENT NANUMBA SOUTH DISTRICT

SUMMARY VERSION



Plate 1: Stakeholders from Validation Workshop Discussions
Credit: Antwi-Agei and team, 2024



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KEY TAKEAWAYS

Nanumba South District is facing escalating climate hazards, including droughts, floods, bushfires, and extreme heat, which are threatening food systems, water access, and human health. Droughts are a particularly persistent problem, exacerbating food insecurity for farmers, especially women. The district is projected to experience hotter and drier conditions, with average temperatures potentially rising by up to 2.5°C by 2050 under high-emission scenarios. Economic vulnerability is deepening, as most households rely on rain-fed agriculture and have limited access to resources. This is compounded by gender inequality, which limits women's ability to adapt. Infrastructure deficits, weak social safety nets, and a lack of formal support further compound these challenges. The key findings from the Climate Risk and Vulnerability Assessment (CRVA) emphasize the need for an inclusive, place-based, and gender-sensitive adaptation approach that leverages community-level knowledge to build equitable resilience across Nanumba South.

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Climate hazards are escalating and overlapping.

Droughts, floods, bushfires, and extreme heat are becoming more frequent and intense, threatening food systems, water access, and human health across the district.



Drought is the most persistent hazard.

Communities such as Nakpayili, Lungni, and Gaunguni report recurrent dry spells that delay planting, reduce yields, and exacerbate food insecurity, especially for women farmers.



Seasonal flooding disrupts mobility and markets.

Kotoya, Tampoaya, and Kukuo experience flood-related damage to feeder roads and market access points, straining livelihoods and emergency response.



Heat stress is an emerging health and education risk.

In Nabayili and Bandiyili, rising temperatures are affecting school attendance, classroom concentration, and elderly well-being, particularly in poorly ventilated buildings.



Economic vulnerability is deepening.

Over 80% of households rely on rain-fed agriculture, yet limited access to inputs, land, and credit—especially among women and youth—curtails adaptive capacity and productivity.



Gender inequality magnifies vulnerability.

Women face structural barriers to land ownership, credit, and participation in decision-making, making it harder for them to adapt effectively to climate risks.



Infrastructure deficits compound exposure.

Many communities lack resilient roads, safe water systems, and all-weather health facilities, increasing physical vulnerability and delaying recovery after climate shocks.



Social safety nets are weak or non-existent.

There is limited access to formal health care, educational support, and social protection, particularly for PWDs and the elderly in remote areas like Gbungbaliga and Lungni.



Climate projections signal a hotter, drier future.

Under SSP2-4.5 and SSP5-8.5 scenarios, average temperatures could rise by up to 2.5°C by 2050, with prolonged dry periods and erratic rainfall undermining agricultural calendars.



Community-level knowledge is a vital asset.

Traditional weather observations, indigenous farming practices, and local support networks offer important entry points for designing context-specific adaptation strategies.



Adaptation must be inclusive, place-based, and gender-sensitive.

Tailored solutions—such as women-led climate cooperatives, youth agritech incubators, and solar-powered water systems—are needed to build equitable resilience across Nanumba South.

A

INTRODUCTION

This report presents the findings of the Nanumba South District Climate Risk and Vulnerability Assessment undertaken as part of the SIGRA Project—Strengthening Investments in Gender-Responsive Climate Adaptation. The assessment aims to guide inclusive and district-specific climate adaptation actions in the district. It aligns with Ghana’s National Adaptation Plan and emphasizes equity, particularly the differentiated climate impacts on women, youth, and other vulnerable groups.



Plate 2: People in a boat crossing a body of water in the Nanumba South District
Credit: Antwi-Agyei and team, 2024

A1. Background

This summary report presents key findings and recommendations from the Climate Risk and Vulnerability Assessment (CRVA) conducted in Nanumba 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.

Coordinated by the Environmental Protection Agency (EPA), the NAP prioritizes decentralized, locally driven adaptation. Nanumba South is among the districts in Ghana’s Northern Region increasingly impacted by climate change, with rising incidences of **droughts, floods, and bushfires** threatening agriculture, infrastructure, and public health. These hazards have cascading impacts on livelihoods, food security, and social cohesion—especially in rural and peri-urban communities. In this context, the **CRVA was conducted to assess how climate change is affecting local systems and to inform targeted adaptation strategies.**

It reflects the growing imperative for districts like Nanumba South to proactively plan for climate-resilient development using spatially disaggregated and socially inclusive data. In this context, the CRVA was conducted to assess how climate change is affecting local systems and to inform targeted adaptation strategies.

A2. Scope and Objectives of the Assessment

The Nanumba South assessment aimed to:

- Identify major climate hazards and their seasonal manifestations;
- Examine the district's physical, economic, and social vulnerabilities.
- Elevate the voices of vulnerable groups, especially women, youth, persons with disabilities (PWDs), and migrants.
- Recommend inclusive and cost-effective adaptation actions aligned with district development goals.

The study applied a participatory, mixed-methods approach—integrating desktop analysis, stakeholder consultations, household surveys, FGDs, key informant interviews, and climate projections (SSP2-4.5 and SSP5-8.5).

A3. Prioritizing Gender and Equity

Gender inclusion and social equity were embedded throughout the assessment process. Women, youth, the elderly, persons with disabilities (PWDs), and climate-displaced populations were not only included as participants but **were actively consulted to inform the framing of vulnerabilities and priorities**. Special attention was paid to:

- **Recognizing** the gendered burden of unpaid care work and its implication for women's adaptation capacity.
- **Addressing** unequal access to land, extension services, and decision-making platforms.
- **Identifying** the particular risks faced by pregnant women, widows, girls, and female-headed households.
- **Incorporating** the voices of young men and returnee migrants, especially in areas facing seasonal labor migration and climate-induced land degradation.

The outcome is a localized, equity-sensitive diagnosis of climate risk that forms the foundation for strategic planning and community action in Nanumba South District.

A4. Nanumba South District Profile

A4.1. Geography and Climate

Nanumba South District (NSD), with its capital at Wulensi, is geographically located in the eastern corridor of Ghana's Northern Region. NSD lies between latitudes 8.5° and 9.0° North and longitudes 0.5° West and 0.5° East, with Wulensi situated near 8.65° N latitude and 0.017° W longitude (GSS, 2021). It spans approximately 1,789 km². It is bordered by Nanumba North, Krachi West, Nkwanta North, and Kpandai districts (**Figure 1**).

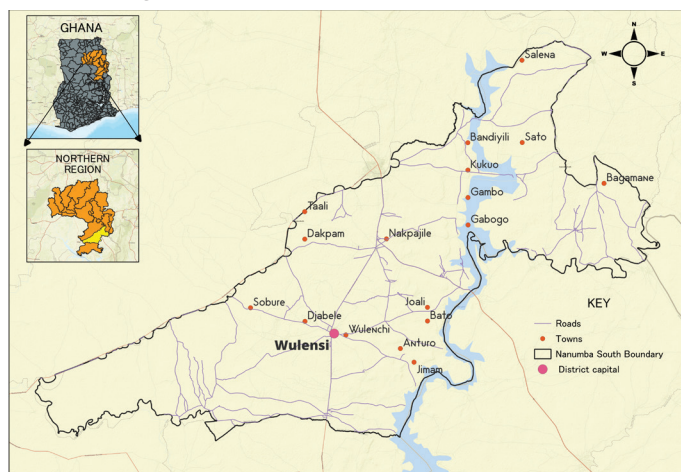


Figure 1: Map of NSD showing major towns and boundaries with other districts

The district lies within the Guinea Savannah ecological zone, characterized by grasslands and scattered trees. The climate is tropical with a single rainy season (May–October) and a dry season (November–April), influenced by Harmattan winds. Annual rainfall averages 1,000–1,200 mm, supporting agriculture but also contributing to seasonal flooding and erosion. **Rising temperatures and erratic rainfall patterns have increased the district's vulnerability to droughts and food insecurity.**

A4.2 Social Demographics

Nanumba South District has a population of 106,374—52,511 males and 53,863 females (GSS, 2021). Over 84,000 residents live in rural areas, and the district remains predominantly agrarian. The population is youthful: 45% are under 15, 50% are working age, and only 5% are 65 or older—straining health, education, and employment systems. Ethnic groups include Gurma, Gonja, Mole-Dagbani, Ewe, and Guan, with cultural diversity especially evident in fishing communities.

Women and girls face entrenched gender inequalities—limited access to land, credit, education, and decision-making—deepened by poverty, water scarcity, school dropout, and inadequate healthcare.

A4.3 Economic Activities

Agriculture is the mainstay of Nanumba South's economy, employing over 80% of the population (GSS, 2021). Key crops include yam, maize, millet, and groundnuts, alongside livestock rearing and petty trading.

Women often engage in shea butter processing (**Plate 1**), dawadawa production, petty trading, and handicrafts, while men supplement their income through fishing, charcoal burning, and small-scale trading. However, low productivity, poor market access, and limited irrigation constrain growth. Women play a major role in farming and trade but face barriers to land, credit, and extension services. Poverty remains high, marked by housing, sanitation, and employment challenges (GLSS 7).



Plate 3: Women and Men in Bandayili engaged in shea processing and Farming
Credit: Antwi-Agyei and team, 2024

A4.4 Critical Climate-Related Hazards

The Nanumba South District faces multiple climate hazards—**droughts, floods, and bushfires**—which increasingly threaten livelihoods, ecosystems, and public health. Climate variability is intensifying these hazards, with disproportionate impacts on women, smallholder farmers, and persons with disabilities.

Drought is the most pervasive hazard, driven by short rainy seasons and long dry spells (Plate 2). High evapotranspiration and poor soils reduce water availability and crop yields, worsening food insecurity. Rain-fed farming and livestock suffer, leading to income loss and youth migration—further burdening women.

Flooding, though seasonal, disrupts farming and damages roads, bridges, and homes (Plate 4). Poor drainage and deforestation worsen the risk. Women and children face displacement, caregiving strain, and limited access to markets, health, and education.

Bushfires, often caused by land clearing and hunting, destroy crops, degrade soils, and contribute to both drought and flood risks (Plate 5).

These hazards strain water resources, drying up rivers and dams and forcing women and children to walk long distances for water. Water scarcity undermines dry-season farming, livestock, and hygiene, deepening food and health insecurity.



Plate 4: Maize farm destroyed by drought in Nabayili of Nanumba South District
Credit: Antwi-Agyei and team, 2024



Plate 5: Road Infrastructure damaged by floods in Wulensi, Nanumba South District
Credit: Antwi-Agyei and team, 2024



Plate 6: Bushfire destroys farm produce in Tanbahimi of Nanumba South District
Credit: Antwi-Agyei and team, 2024

B

METHODOLOGICAL APPROACH

This section outlines the participatory, gender-responsive methodology used to assess climate hazards, exposure, and vulnerability across Nanumba South District. It describes the phased approach—spanning risk identification, risk assessment, and adaptation planning—and details the data collection tools, sampling strategy, and stakeholder engagement methods that underpin the CRVA's credibility and relevance.



Plate 7: A woman's voice rises in a community gathering in Nanumba South District
Credit: Antwi-Agyei and team, 2024

B1. Introduction

The Climate Risk and Vulnerability Assessment for Nanumba South District employed a participatory, mixed-methods approach grounded in the Intergovernmental Panel on Climate Change (IPCC) AR5/AR6 frameworks. This approach analyzed climate risks as the interplay of three interdependent elements: hazards, exposure, and vulnerability. The assessment prioritized gender dynamics and social equity, recognizing that women, youth, migrants, persons with disabilities (PWDs), and elderly populations face disproportionate climate burdens and often have lower adaptive capacity due to systemic barriers.

A total of ten communities were purposively selected across the district's three zonal councils—Bondalikadibu, Dachamba, and Sunkuli—ensuring **geographic spread** and inclusion of communities with varied risk exposure and developmental characteristics. Selection was informed by participatory consultations and vulnerability rankings agreed upon by local stakeholders.

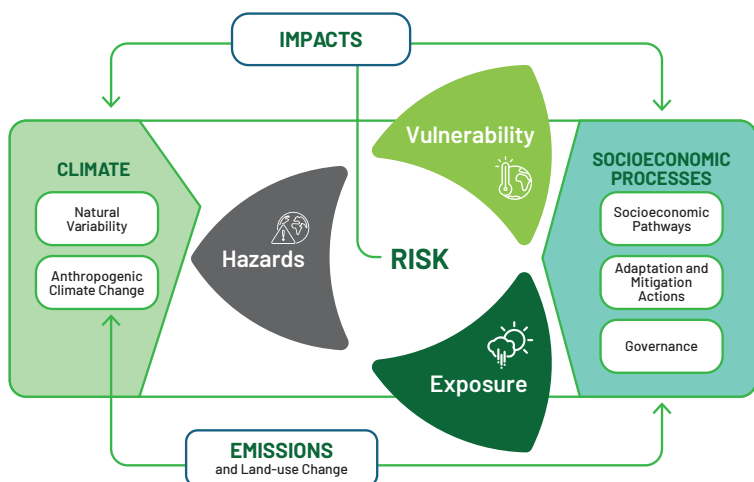


Figure 2: The IPCC Risk and Vulnerability Framework illustrating the interaction of hazards, exposure, and vulnerability in shaping climate risks, with socio-economic processes influencing overall resilience.

Community	Respondent Males	Respondent Females	Total
Bardiyili	18	7	25
Tanbahimi	17	7	24
Kukuo	33	10	43
Nakpayili	61	23	84
Gaunguni	21	9	30
Nabayili	20	8	28
Lungni	48	16	64
Kotoya	30	12	42
Tampoaya	31	12	43
Gbungbaliga	49	17	67
Total	328	122	450

Table NSD 1: Selected communities and sampled households by gender

B2. Three-Stage Assessment Process

The **three-stage approach** was followed to systematically identify, analyze, and validate climate risks and adaptation priorities (Figure 3). This structure ensured scientific rigor, local relevance, and inclusive participation across all phases of the study.

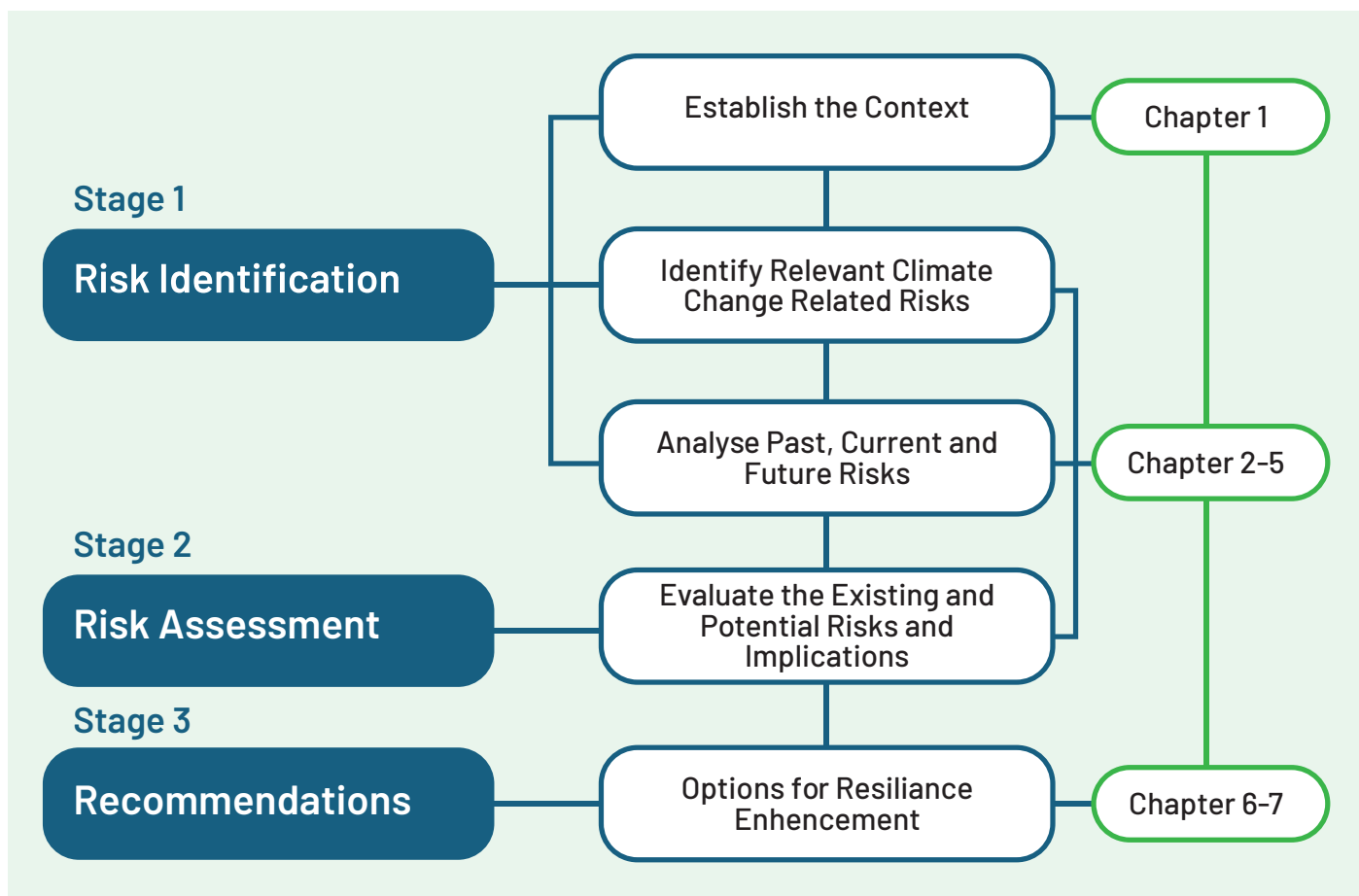


Figure 3: Methodology for climate change risk assessment for the Nanumba South District

B2.1. Risk Identification

A comprehensive **desktop review** initiated the process, synthesizing information from:

- Ghana’s National Adaptation Plan (NAP).
- District Medium-Term Development Plans.
- Meteorological reports.
- Academic literature and vulnerability studies in the Northern Region.

This phase identified key hazards—**droughts, floods, bushfires, deforestation, and soil erosion**—as critical climate threats in Nanumba South. Additionally, it spotlighted the **structural marginalization of women**, including limited access to land, credit, and extension services, as a central axis of vulnerability.

A **district-level stakeholder workshop** was held in August 2024, bringing together representatives from:

- District Assembly staff and decentralized departments (e.g., MOFA, GHS, EPA)
- Traditional and religious leaders
- Women’s groups, youth representatives, and persons with disabilities
- Local CSOs and private actors

Participants co-developed **hazard maps, seasonal calendars, and vulnerability profiles**, which enriched the identification of risk patterns across communities.

The assessment placed a strong emphasis on gender dynamics, recognizing that women, youth, migrants, persons with disabilities (PWDs), and elderly populations face disproportionate climate burdens and have lower adaptive capacity.

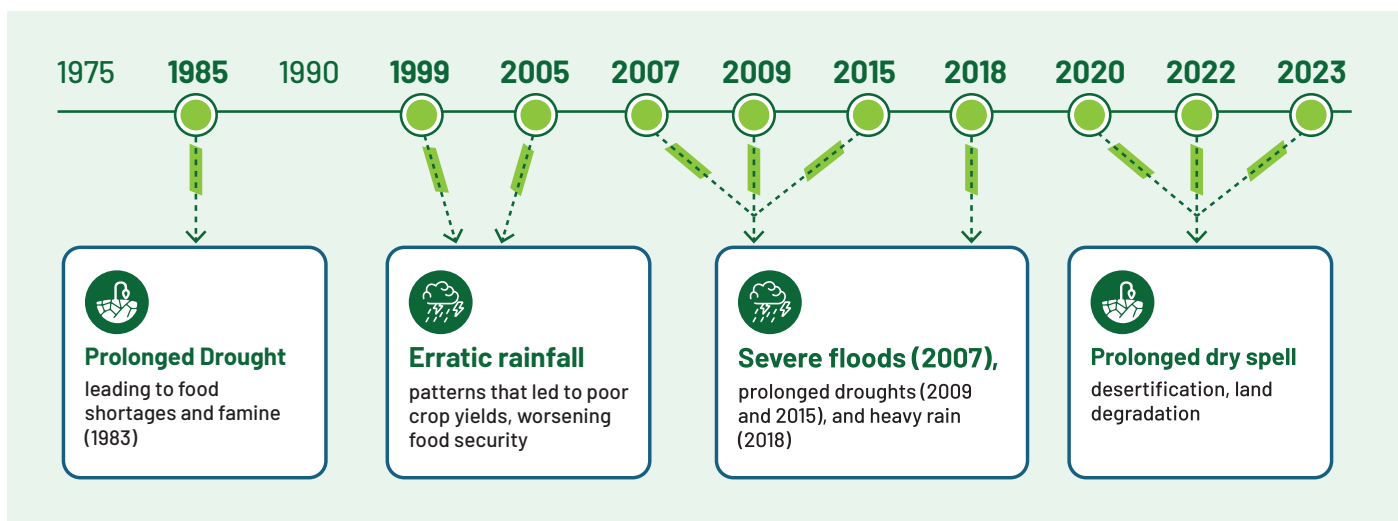


Figure 4: Seasonal Calendar for NSD

B2.2. Risk Assessment

This stage involved multi-tiered fieldwork using both qualitative and quantitative tools to deepen the understanding of exposure, adaptive capacity, and gendered vulnerabilities.

a. Household Surveys: A structured questionnaire was administered to **450 households** using stratified random sampling.

The survey captured:

- Demographics (gender, age, household size)
- Access to land, water, credit, and extension services
- Impacts of past climate events
- Coping strategies and aspirations for adaptation

Surveys were administered in Dagbani and Konkomba, and gender-disaggregated responses were emphasized to highlight disparities in climate impacts and resilience.

b. Focus Group Discussions (FGDs): A total of **10 FGDs** were conducted with separate groups for:

- Women
- Youth
- Persons with disabilities (PWDs)
- The elderly

These FGDs explored daily realities of climate stress, including the burden of caregiving during heatwaves, water insecurity, and exclusion from decision-making platforms.

c. Key Informant Interviews (KIIs): Twelve KIIs were held with:

- Gender Desk Officer
- Women in Agriculture Development Officer
- District Disease Control Officer
- Planning and NADMO officials

These interviews provided insights into institutional gaps, sectoral adaptation efforts, and policy implementation challenges.

d. Participatory Hazard Mapping and Matrix of Function (MoF): Communities participated in physical mapping of critical infrastructure, climate hotspots, and livelihood zones. The **MoF tool** was used to assess functional resilience of water, roads, and health systems.

e. Climate Modeling and Scenario Analysis: To understand future risks, the study employed:

- **CHIRPS** for historical rainfall (1991–2020)
- **ERA5** for historical temperature extremes
- **CMIP6** ensemble projections for SSP2–4.5 and SSP5–8.5 pathways.

Climate indices used included:

- **Precipitation:** Rx1day, Rx5day, CDD, R95p
- **Temperature:** TXx, TNx, TXn, TNn

Time horizons assessed:

- Near-term: 2021–2040
- Mid-century: 2041–2060
- End-century: 2081–2100

Model outputs were contextualized using **seasonal calendars and FGD insights**, ensuring alignment between climate science and community experience.

B2.3. Adaptation Planning and Validation

Following data analysis, key findings were synthesized into **preliminary adaptation priorities**, which were presented during a **validation workshop held on March 12, 2025**, (Plate 8).



Plate 8: Photos from Validation Workshop Discussions
Credit: Antwi-Agyei and team, 2024

Participants included:

- District-level actors.
- Women-led organizations.
- Youth leaders.
- Religious and traditional authorities.

The session allowed stakeholders to review, critique, and refine adaptation options. Emphasis was placed on **feasibility, gender responsiveness, and alignment with development plans**.

C

KEY ASSESSMENT FINDINGS

The findings section presents an analysis of climate hazards, vulnerabilities, and future risks affecting Nanumba South District. It unpacks how droughts, floods, bushfires, and heat stress are reshaping key sectors like agriculture, education, health, and infrastructure, especially for the most marginalized. The results are disaggregated by hazard type, sectoral vulnerabilities, and gendered impacts, using both community narratives and quantitative evidence.



Plate 9: Shea trees (*Vitellaria paradoxa*) are a significant feature of the landscape in the Nanumba South District.
Credit: Bofo YA, 2025

C1. Climate Hazards and Exposure

Nanumba South faces escalating climate threats—droughts, floods, bushfires, extreme heat, and deforestation—that are disrupting agriculture, health, and livelihoods, with vulnerable communities bearing the brunt of these compounding hazards.

C1.1. Major Hazards

Nanumba South is increasingly exposed to **climate-related hazards** that now occur with greater frequency and intensity. The five most significant hazards reported across all 10 surveyed communities are:

- **Droughts and Prolonged Dry Spells:** Drought is the most widespread hazard in the district. The **shortening of the rainy season and increasing dry spells** during critical periods of crop growth have led to poor yields, livestock deaths, and rising food insecurity. Farmers in Lungni and Gaunguni recalled instances where they had to replant maize two to three times due to failed rains.

*“We used to plant once in May and harvest by August. Now we plant in May, June, and still lose it all by August.”
— Male farmer, Lungni*

- **Flooding:** Seasonal floods, especially in August and September, are now more destructive due to deforestation and poor drainage. In Nabayili and Tanbahimi, flash floods washed away farm boundaries, eroded roads, and inundated low-lying homes. Several focus groups noted **increased cases of malaria and diarrhoea** during post-flood periods.
- **Bushfires:** Common during the **Harmattan season** (December–February), bushfires destroy farmlands, especially in upland communities like Gaunguni and Tampoaya. Poor fire control practices, hunting, and land preparation methods are major triggers.
- **Extreme Heat:** March to May is now marked by **oppressive daytime temperatures and hot nights**, making it difficult to sleep or work outdoors. School attendance drops, and the elderly and PWDs suffer disproportionately due to heat stress and lack of ventilation.

- **Deforestation and Soil Erosion:** Increased wood cutting for charcoal and fuel, especially by youth and unemployed women, has led to significant vegetation loss, worsening erosion and surface runoff during heavy rains.



Plate 10: Flood Victims in Kukuwo and Lahhato, living close to Oti River, Nanumba South District.
Credit: Antwi-Agyei and team, 2024

C2.3. Social Vulnerability

Climate change has disrupted **education, health services,** and social cohesion.

- **School attendance dips** during heat waves and heavy rains. Classrooms lack fans or shade, and parents fear for children's safety when floods hit.
- **Health outreach services** in Kotoya and Tanbahimi are irregular due to poor road access.
- **Social networks** that supported farming groups are declining, especially as youth migrate in search of jobs.

"When children fall sick from the rain or heat, it's hard to get medicine in time." – Mother, Kotoya

C2.4. Gendered Vulnerability and Intersectionality

Women, girls, PWDs, and elderly persons face unique and compounded climate vulnerabilities:

- Women carry the brunt of food and water insecurity and caregiving burdens. They often miss out on adaptation training, resource allocation, and early warnings.
- Youth in Bandiyili and Tanbahimi expressed a strong desire to migrate due to lack of jobs and "spoiled lands."
- PWDs and the elderly are rarely consulted in development forums, despite being at higher risk during floods, heat events, and displacement.



Plate 11: Women and Girls in Search of Water in Lungni of Nanumba South District
Credit: Antwi-Agyei and team, 2024

"They call meetings about boreholes and farming but forget the blind and the deaf." – PWD participant, Gbungbaliga

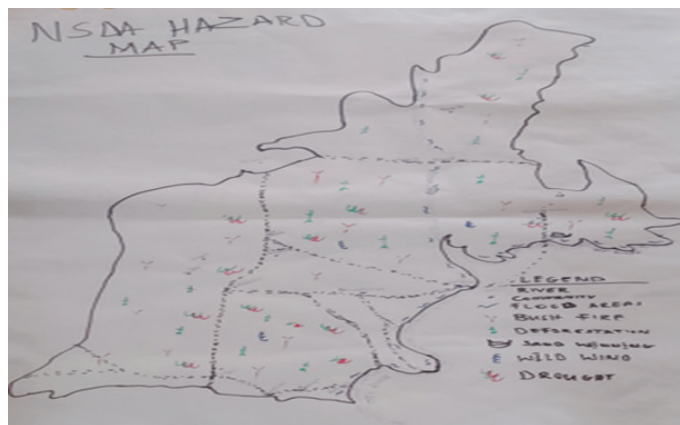


Figure 5: Hazard Exposure Map across 10 Surveyed Communities

C2. Vulnerability Analysis

In Nanumba South, climate vulnerability is shaped by economic hardship, fragile infrastructure, and deep social and gender inequalities—leaving women, youth, PWDs, and the elderly with limited means to cope with escalating climate risks.

C2.1. Economic Vulnerability

The Nanumba South District is primarily agrarian, and over 80% of households depend on **rain-fed subsistence farming**. Key economic vulnerabilities include:

- **Declining yields** of maize, yam, groundnuts, and beans due to erratic rainfall and soil degradation.
- **Limited land access** for women and youth, as customary inheritance and male dominance in land ownership persist. In Nabayili and Kukuwo, some widows and unmarried women cultivate borrowed plots under precarious arrangements.
- **Limited access to inputs** such as improved seeds, fertilizer, and credit.
- **High post-harvest losses** due to inadequate storage, especially in Lungni and Tampoaya.

"Even if you plant and the rains come, without fertilizer the crops will die. And women like us can't get a loan to buy any." – Woman farmer, Nabayili

C2.2. Physical Vulnerability

The district's physical infrastructure is fragile and often worsens the impacts of climate hazards.

- **Roads in Kotoya, Tanbahimi, and Gbungbaliga** become impassable during the rainy season, disconnecting communities from markets, clinics, and schools.
- **Boreholes dry up** between January and April in Gaunguni and Nakpayili, leading to water rationing and reliance on unsafe surface water.
- In low-lying communities like Tampoaya, **poor housing structures** are regularly damaged by floods and bushfires.

"When it rains, the road to the clinic vanishes. We use motorbikes and boats if it's serious." – Health volunteer, Tanbahimi

Sector	Specific vulnerabilities	Impacts on Women	Impacts on Elderly	Impacts on Youth	Impacts on Migrants	Impacts on PWD	Impacts on Men
Agriculture	Erratic rainfall prolonged droughts, soil salinity, low crop yields, and declining livestock productivity.	Declining crop yields undermine subsistence farming, raise workload, and elevate mental stress; reduced income opportunities affect overall wellbeing.	Reduced capacity to adapt due to outdated techniques; increased stress from food insecurity and diminished income sources.	Loss of schooling and reduced access to modern training limit future prospects; early entry into labor often disrupts education.	Limited opportunities for stable agricultural work reinforce dependency on seasonal and informal labor, perpetuating economic vulnerability.	Physical challenge hinder participation in labor-intensive farming increasing dependency on caregivers during climatic shocks.	Men involved large-scale farming and livestock rearing face reduced harvests and declining livestock health, directly impacting household income and economic stability.
Water resources	Water scarcity, seasonal variability, reliance on rainwater harvesting and unclear water sources.	Extended journeys to fetch water impose significant physical strain and risk of waterborne diseases.	Difficulties accessing distant or unsafe water points; increased health risks when mobility is limited.	Children often miss school or leisure time to help fetch water, exposing them to contamination and fatigue.	Competition over scarce water resources intensify marginalization and can lead to disputes with host communities.	Inability to reach water points independently necessitates reliance on others or adaptive technologies.	Men experience indirect impacts through challenges in managing water for livestock and market needs, further stressing household budgets.
Community Health	Extreme heat, increased prevalence of respiratory tract infections, skin heat rashes, cholera, and malaria.	Elevated exposure to firewood smoke from cooking and outdoor works: the dual burden of caregiving heightens mental and physical stress.	Heightened vulnerability to stress and chronic health issues: challenges in accessing timely healthcare.	Greater risk of infectious diseases and malnutrition, with health issues interrupting education and overall development.	Exposure to harsh working conditions and limited healthcare access exacerbate health risks-related infections.	Mobility challenges restrict access to treatment and healthcare facilities, increasing dependency on family support during emergencies.	Men engaged in labor-intensive activities face significant health risks from extreme heat and poor air quality, which impair their capacity to maintain the families.
Infrastructure	Poor resilience to climate extremes, deteriorating houses, inadequate roads.	Loss of safe and secure shelters, along with disrupted community recovery efforts, adds to the burden during emergency.	Difficulty rebuilding homes during disasters like prolonged droughts and floods hazards.	Disruption of housing and community facilities interrupts schooling and daily routines.	Inability to secure safe shelters, coupled with deteriorating infrastructure, deepens economic instability.	Inaccessible evacuation routes heighten risk during disasters, forcing greater support from community assistance.	Bad roads directly affect men's ability to access markets and secure livelihoods, further intensifying economic pressures.

Table 3: Impacts of climate change on critical sectors and vulnerable groups

C3. Projected Climate Trends

Projected increases in temperature, erratic rainfall, and shifting seasons will intensify climate risks across Nanumba South, with uneven impacts on communities and vulnerable groups, underscoring the urgent need for localized, inclusive adaptation planning.

C3.1 Summary of Projections

The climate modeling results for Nanumba South show **alarming trends** under both moderate (SSP2-4.5) and high-emissions (SSP5-8.5) pathways.

- **Temperature:** By 2050, the district is projected to warm by **1.8–2.8°C**. Daytime highs (TXx) and warm night-time lows (TNx) will increase (Figure 6). Heatwaves will last longer and start earlier.

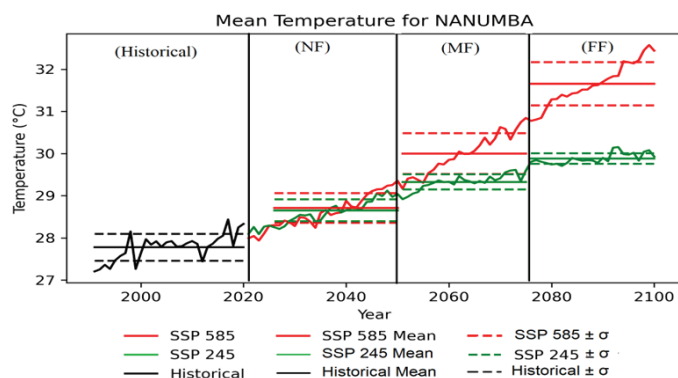


Figure 6: Historical and projected mean temperature patterns under SSP 5-8.5 and SSP 2-4.5 scenarios for Nanumba South District

- **Rainfall:** Annual totals may appear stable but will be highly erratic. **Dry spells** (CDD) are projected to lengthen, while extreme rain events (Rx1day and R95p) will become more intense (Figure 7).

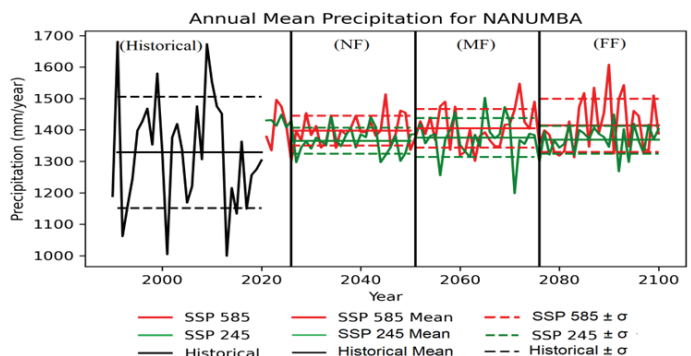


Figure 7: Historical and projected mean precipitation patterns under SSP 5-8.5 and SSP 2-4.5 scenarios for Nanumba South District

- **Seasons will shift:** Traditional farming calendars will need adjustment, particularly for crops sensitive to rainfall patterns (e.g., yam and maize).

Climate Variable	Key Findings	Implications
Rainfall Patterns	<ul style="list-style-type: none"> Increasing wet days under both SSP scenarios. 	Affect farming activities, delay planting and harvesting, reduce crop yields due to waterlogging, and increase susceptibility to pests and diseases.
Annual Precipitation	<ul style="list-style-type: none"> Historical variability of 1000–1680 mm reduces under future projections. SSP 5–8.5 shows a significant increase in mean precipitation but less variability in the far future (~2060–2100). SSP 2–4.5 indicates stable precipitation with fewer signs of long-term variability. 	Reduced variability under SSP 2–4.5 could benefit agricultural planning, while long-term increase under SSP 5–8.5 may disrupt crop water requirements.
Rainfall Extremes	<ul style="list-style-type: none"> Heavy rain days (R95p) and intensity (SDII) are projected to decrease significantly. Consecutive wet days (CWD) increase significantly, while consecutive dry days (CDD) also rise marginally to over 40 days compared to approximately 30 days historically. Intense rainfall days (R10mm) drop significantly to around 3 days compared to over 30 days historically. 	Fewer extreme rainfall events reduce flash flood risks but may lead to extended dry spells and significant water disruptions for crops.
Mean Temperature	<ul style="list-style-type: none"> Temperatures are projected to increase throughout the 21st century, with 31°C projected under SSP 5–8.5 by century's end. A 3°C difference between SSP 2–4.5 and SSP 5–8.5 highlights the impact of emissions on warming. 	Increased temperatures can heighten evapotranspiration, stress crops, and reduce agricultural productivity, intensifying drought and water management challenges.

Table 4: Summary of projected climate trends in Nanumba South District

C3.2 District-Specific Risks and Future Vulnerabilities

Nanumba South District **faces spatially differentiated climate risks**, with each community cluster experiencing a unique blend of hazards shaped by geography, infrastructure quality, and livelihoods. These risks intersect with **gender and social group vulnerabilities**, resulting in uneven impacts across the population.

- Bandiyili, Tampoaya, Tanbahimi** endure drought, floods, and bushfires, exacerbated by erratic rainfall. Women in these zones spend more time collecting water, leading to household food insecurity. Men struggle to access irrigation and farming inputs, while youth face barriers to healthcare and education. Persons with disabilities are often excluded from water access systems and rely heavily on others for mobility during climate events.

Area Zone	Climate Hazards	Women	Men	Youth	PWDs
Bandiyili, Tampoaya, Tanbahimi	Drought, Flood, Bushfires, Erratic Rainfall.	Increased time collecting water; household shortages.	Difficulty accessing irrigation and rebuilding efforts.	Limited access to affordable healthcare and education.	Reliance on others for water and mobility.
Nakpayili, Gaunguni, Nabayili	Drought, Deforestation, Rainfall Variability.	Burden of securing food and water; poor access to schools and clinics.	Irrigation and livestock management challenges.	Excluded from decision spaces and technical training.	Limited access to inclusive infrastructure and support systems.
Lungni, Kotoya, Kuto, Gbungbaliga	Floods, River Overflows, Soil Erosion.	Poor water and sanitation services; school closures.	Struggle to access markets and maintain farming output.	Livelihood insecurity; inaccessible infrastructure.	Heightened isolation during climate events.

Table 5: Climate Hazards and Social Group Vulnerability in Nanumba South

- Nakpayili, Gaunguni, Nabayili** are exposed to **deforestation-driven droughts and rainfall variability**. Women here contend with high domestic burdens, including sourcing water and food for children. Men manage livestock and face crop failure due to inadequate irrigation. Youth have limited options to build adaptive skills or contribute to planning processes. PWDs lack targeted infrastructure and frequently miss out on critical adaptation support.
- Lungni, Kotoya, Kuto, Gbungbaliga** face frequent floods, river overflows, and soil erosion. Women are impacted by poor sanitation, unsafe roads, and the destruction of community water systems. Men must navigate damaged roads to sell crops and protect their farms. Youth have limited job prospects and disrupted education. PWDs, already isolated, face extreme difficulty in reaching safe shelters and services during emergencies.

D

ADAPTATION PRIORITIES AND RECOMMENDATIONS

This section translates the findings into actionable pathways for building local resilience. It proposes strategic and community-specific adaptation measures tailored to the district’s unique risks and socio-economic profile.

The recommendations focus on improving critical infrastructure, such as building flood-resistant roads and installing solar-powered water harvesting systems. They also aim to empower vulnerable groups like women, youth, and persons with disabilities through training, access to finance, and leadership roles.

The recommendations also promote sustainable livelihoods in sectors like climate-smart agriculture and small-scale trading, and align adaptation planning with national frameworks such as Ghana’s NAP and the Sustainable Development Goals.

D1. Strategic Adaptation Options

Transformative climate change resilience in Nanumba South requires inclusive, gender-responsive strategies tailored to local risks and rooted in the needs of the most vulnerable communities.

Based on the climate risk and vulnerability findings from the Nanumba South District, several strategic options are proposed to guide inclusive, gender-responsive, and transformative adaptation. These are grouped into social, economic, physical, and institutional domains:

D1.1. Social Adaptation Strategies

a. Inclusive Governance and Voice:

- Strengthen community platforms (e.g., Area Council forums) to include women, youth, PWDs, and migrants in decision-making.
- Create safe spaces for women’s cooperatives and youth associations to influence adaptation planning.

b. Health and Caregiving Support:

- Introduce mobile clinics and community health assistants trained in climate-health response.
- Establish shaded waiting spaces in clinics and schools to reduce heat stress.

c. Education and Sensitization:

- Mainstream climate and gender education in schools and community trainings.
- Use radio dramas and storytelling to promote awareness on adaptation, targeting non-literate populations.

Adaptation Option	Adaptation Objective	Justification	Potential Partners
Organize gender-responsive workshops for local governance and facilitate women’s participation in decision-making process.	Encourage women’s participation in household decision-making process	Empowerment of women, increased gender equality, and inclusivity in decision-making.	Gender-focused NGOs, local government, women’s groups, and local communities.
Organize community-based seed banks and provide agricultural inputs at subsidies for smallholder farmers.	Access to seeds and farming tools will enhance climate-resilient household	Improved access to resources increased agricultural productivity, and enhanced food security.	Agricultural extension services, NGOs focus on improving smallholder farmers’ livelihoods, and District Assembly.
Strengthen women and youth groups for joint action on climate resilience.	Community-based groups for collective action help to promote sustainable land management practices	Improved social cohesion, network, collective efforts in addressing climate change, enhanced community resilience.	Community organizations, Local leaders, youth groups. Forestry Commission, Farmers, Department of Agriculture, NGOs.
Integrate climate change education into school curricula and conduct training on sustainable farming, water management, and climate change impacts.	Education and awareness on climate adaptation	Increased climate change awareness, adoption of sustainable practices, better preparedness	District Assembly, Local environmental NGOs, CSOs, Ministry of Education, Schools, NGOs
Expand local healthcare infrastructure to climate-resilient health services.	Strengthening healthcare services	Better health outcomes for vulnerable groups, reduced climate-induced health risks, improved access to healthcare	Ministry of Health, local health services, and NGOs
Establish support networks for vulnerable families.	Strengthen community social safety nets	Improved community support systems, enhanced social safety nets.	Local government, community groups, social welfare organizations
Establish youth-led community development projects.	Increase youth engagement in community development.	Increased youth involvement in community resilience, empowerment through active participation.	Local youth groups, local government, NGOs focused on youth empowerment.

Table 6: Strategies to Address Economic Vulnerabilities in the Nanumba South District

D1.2. Economic Adaptation Strategies

a. Climate-Smart Agriculture (CSA):

- Promote drought-resilient crops (e.g., sorghum, cowpea) and intercropping systems.
- Support community-led seed banks and agroforestry practices.

b. Livelihood Diversification:

- Provide start-up kits and skills training in soap making, shea processing, solar-powered agro-processing.
- Establish local agro-enterprise incubators targeting returnee youth and women.

c. Access to Climate Finance:

- Facilitate linkages with financial institutions to provide microloans and climate adaptation insurance for smallholder farmers.
- Support the formation of women-led Village Savings and Loans Associations (VSLAs) with adaptation targets.

Adaptation Option	Adaptation Objective	Justification	Potential Partners
Early Warning System/ Climate Information Services	To increase productivity and ensure food security by addressing rainfall variability through timely information.	Early warning systems and climate information services are critical tools for farmers to manage risks proactively and adapt to changing climatic conditions.	GMet, EPA, Telecommunications companies, NGOs focused on digital literacy (Esoko), and local government.
Promotion and Construction of Irrigation System	To lessen the impacts of drought and long dry spells on crop production by allowing farmers to practice all-year-round production.	Irrigation systems mitigate the risk of crop failure during droughts, enhance food security, promote sustainable water use, and enable diversification of crops.	MoFA, MLGRD, District Assembly and International Organizations focus on improving smallholder farmers.
Promote Adoption of Drought-Resistant Varieties	To lessen impacts of droughts or long dry spells on crop production.	Adoption of drought-resistant varieties ensures food security by enabling crop production despite reduced rainfall.	MoFA, local cooperatives, seed suppliers, NGOs focused on livelihoods.
Sensitization and Farmers' Education on Climate	To raise awareness and build farmers' capacity to understand and respond effectively to the impacts of climate change.	Education and sensitization campaigns enhance farmers' understanding of climate change impacts and adaptation measures.	Department of Agriculture, Agricultural Extension Officers and NGOs interested in improving small-scale farmers livelihoods.
Improve Extension and Education on Climate Smart Agriculture	To promote sustainable and climate-resilient agriculture.	Improving extension and education on climate-smart agriculture enhances farmers' knowledge and skills.	Department of Agriculture, Extension Officers, NGOs focus on improving smallholder farmers' livelihoods.
Create Conditions for Access to Credit	Reduce gender inequalities.	Women, youth, and PWDs face limited access to credit.	Women's groups (VSLAs), local government, agricultural input suppliers
Provide Training in Alternative Livelihoods	Improve skills in manufacturing for women and marginalized groups dependent on climate-sensitive agriculture.	Women and marginalized groups disproportionately affected by climate change impacts on agriculture.	Local businesses, NGOs focused on skills development like SEND Ghana

Table 7: Strategies to Address Economic Vulnerabilities in the Nanumba South District

D1.3. Physical Adaptation Strategies

a. Water Infrastructure and Irrigation:

- Construct solar-powered mechanized boreholes in water-stressed communities.
- Pilot affordable small-scale drip irrigation schemes in dryland farms.

b. Erosion and Flood Management:

- Establish buffer zones and plant vetiver/grass barriers in erosion hotspots.
- Elevate key feeder roads and build culverts in flood-prone zones (e.g., Kotoya, Tanbahimi).

c. Heat-Resilient Infrastructure:

- Promote use of heat-reflective roofing for schools and health facilities.
- Install community tree canopies and shaded markets to reduce extreme heat exposure.

D1.4. Institutional Strengthening and Policy Alignment

Adaptation Option	Adaptation Objective	Justification	Potential Partners
Construction of dug-out wells and dams for water storage and irrigation.	Improve water accessibility and availability	Increased water availability for domestic and agricultural use during dry periods.	District Assembly, Water Resources Commission, and CWSA.
Construction of flood barriers and implementation of erosion control measures along key roads and water bodies.	Strengthen flood management infrastructure	Reduced flood damage to homes, farmlands, and critical infrastructure.	District Assembly, NADMO, and local communities.
Improve road network across communities.	Improve road infrastructure to enhance accessibility	Easier access to farmlands and for the transportation of farm goods.	District Assembly, local communities, local Farmers.
Building of climate-resilient homes, focusing on flood and wind resistance.	Enhance climate-resilient housing and infrastructure	Improved shelter and increase durability for homes against storm damage.	District Assembly, Local Builders, Local Communities, Ministry of Works and Housing,
Upgrading health centres with reliable water and energy systems.	Improve healthcare infrastructure for climate-related risks	Enhanced healthcare services during extreme weather events and power outages.	District Assembly, Ministry of Health, Local Communities, and Ministry of Energy
Tree planting along roads and around water bodies.	Promote sustainable land management practices	Reduced land degradation and enhanced agricultural productivity Enhanced water retention and reduction of soil erosion.	Forestry Commission, Farmers, Department of Agriculture, Local Communities, NGOs.

Table 8: Strategies to Address Physical Vulnerabilities in the Nanumba South District

a. Capacity Building:

- Train Assembly staff, traditional leaders, and local NGOs on gender-responsive adaptation planning.
- Develop a district-level adaptation coordination team to guide implementation and learning.

b. Gender-Responsive Budgeting:

- Integrate climate adaptation into Medium-Term Development Plans with gender budgeting lines.
- Ensure that 40% of adaptation investments directly benefit women and vulnerable groups.

c. Policy Integration and Monitoring:

- Align actions with Ghana’s NAP, SDG 5, and SDG 13.
- Develop a local adaptation monitoring framework with community scorecards.

D2. Community-Specific Recommendations

Table 9 highlights **tailored adaptation actions** for the most vulnerable communities identified in the assessment.

The tailored recommendations for Nanumba South’s communities **align with their distinct climate risks and social vulnerabilities**. Drought-prone areas like Nakpayili and Gaunguni **require soil conservation, irrigation, and women-led restoration**. Flood-exposed communities such as Kotoya and Tampoaya are prioritized for **rainwater harvesting and early warning systems**. Heat-stressed areas like Nabayili and Bandiyili call for **tree planting, inclusive WASH services**, and youth support schemes. Across all communities, **actions focus on vulnerable groups**—particularly women, youth, and PWDs—ensuring that adaptation is equitable, context-specific, and aligned with district planning.

Community	Key Climate Risks	High-Risk Groups	Top Priority Adaptation Actions
Nakpayili	Drought, deforestation.	Women, farmers without land.	<ul style="list-style-type: none"> • Agroforestry training; • Small irrigation demo sites; • Tree nurseries led by women
Gaunguni	Heat, Soil erosion.	Elderly, youth.	<ul style="list-style-type: none"> • Tree-planting in school compounds • Contour farming workplaces • Youth-led erosion watch groups
Lungni	Crop failure, market isolation.	Women processors, PWDs.	<ul style="list-style-type: none"> • Upgrade feeder roads; • Women’s cooperatives for gari and shea; • PWD-accessible market structures
Kotoya	Floods, water contamination.	School children, women.	<ul style="list-style-type: none"> • Rainwater harvesting system in schools • Early food warning dissemination • Improve sanitation infrastructure
Tanbahimi	Erratic rainfall, poor yields.	Youth, landless men.	<ul style="list-style-type: none"> • Skills hubs on poultry and beekeeping; • Dry season vegetable gardens; • Agro-input credit schemes
Bandiyili	Drought, bushfires.	Women-headed households.	<ul style="list-style-type: none"> • Firebreak creation with women’s groups • Shea tree protection patrols • Gender-responsive disaster drills
Kukuo	High temperature, sanitation gaps.	Children, elderly.	<ul style="list-style-type: none"> • Build ventilated school latrines; • Tree corridors for classroom cooling; • Water safety campaigns
Tampoaya	Water scarcity, degraded soils.	Women farmers, migrants.	<ul style="list-style-type: none"> • Low-cost water storage tanks • Compost training • Land restoration community forums
Nabayili	Flooding, waste disposal.	Female traders, PWDs.	<ul style="list-style-type: none"> • Build raised drainage in markets; • Waste sorting and composting center; • Access ramps in public areas
Gbungbaliga	Youth unemployment, degraded lands.	Returnee youth, widows.	<ul style="list-style-type: none"> • Youth-led agro-cooperatives • Microloans for small ruminant rearing • Mentorship from local businesses

Table 9: Community-Level Adaptation Priorities for Nanumba South District

E

CONCLUSION AND NEXT STEPS

The conclusion reflects on the major insights and calls for urgent, inclusive climate action in Nanumba South District. It emphasizes the need for gender-responsive, community-driven approaches to adaptation and highlights the importance of developing a costed, participatory Climate Adaptation Plan as the essential next step to translating Nanumba South's climate insights into equitable, trackable, and finance-ready adaptation solutions. The plan will serve as a strategic roadmap, detailing implementable projects with clear budgets and timelines, which will be crucial for attracting and securing the necessary funding from national budgets, development partners, and global climate finance mechanisms.



Plate 12: Savanna vegetation in the Nanumba South District, illustrating a key landscape susceptible to the impacts of climate change, such as prolonged drought and desertification. **Credit:** Boafo YA, 2025

E1. Summary of Key Insights

Nanumba South faces intensifying climate risks that disproportionately affect vulnerable groups, yet community resilience and local adaptation efforts offer a strong foundation for inclusive, accelerated climate action:

The Climate Risk and Vulnerability Assessment (CRVA) for Nanumba South District reveals a community navigating **multiple, overlapping climate hazards—droughts, seasonal flooding, bushfires, and extreme heat.** These risks are increasingly undermining agriculture, water access, infrastructure, and human health.

Vulnerabilities are not evenly spread: women, youth, persons with disabilities, and the elderly face compounded risks due to limited land ownership, weak infrastructure, and exclusion from planning and decision-making.

Climate projections under SSP2-4.5 and SSP5-8.5 scenarios point to worsening conditions if adaptive action is not accelerated. Nonetheless, communities across the district have demonstrated resilience through local knowledge, social cohesion, and emerging adaptation practices.

E2. Call to Action

Inclusive, gender-responsive climate action in Nanumba South must empower vulnerable groups as leaders in adaptation, bridging sectors to build resilient communities rooted in local realities:

This report calls on all stakeholders—local government,

traditional leaders, development partners, NGOs, and community-based organizations—to prioritize inclusive, gender-responsive, and locally grounded climate action.

Adaptation cannot be effective unless it reflects the lived realities of those most affected. Women, youth, and other vulnerable groups must be supported not just as beneficiaries but as active agents in shaping adaptation responses. Planning must also bridge sectors—agriculture, health, infrastructure, education—to unlock co-benefits and build lasting resilience.

E3. Next Steps

Developing a costed, participatory Climate Adaptation Plan is essential to turn Nanumba South's climate insights into equitable, trackable, and finance-ready adaptation solutions. This plan will translate the CRVA findings into implementable projects with clear budgets, timelines, and monitoring frameworks. It will include:

- Prioritized adaptation investments by sector and community.
- Gender-responsive budgeting to ensure equity in resource allocation.
- Indicators for tracking resilience outcomes over time.
- A roadmap for accessing climate finance and technical support.

This process must be participatory and iterative—building on the CRVA foundation to foster a resilient, just, and climate-smart future for Nanumba South District.



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