SIGRA

Strengthening Investments in Gender-Responsive Climate Adaptation

Cowater Ghana

In partnership with Canada

Climate Change Risk and Vulnerability Assessment

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MION DISTRICT

FREEDOM AND JUSTICE

epa

NATIONAL ADAPTATION PLAN GHANA

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TABLE OF CONTENTS

List of Tables

List of Figures

List of Photos

ACRONYMS AND ABBREVIATIONS

AF	Adaptation Fund
AR	Assessment Report
CARE	Cooperative for Assistance and Relief Everywhere
CCRP	Climate Change Resilience Project
CDD	Consecutive Dry Days
CHIRPS	Climate Hazards Group InfraRed Precipitation with Station Data
CHPS	Community Health Planning and Services
CMIP6	Coupled Model Intercomparison Project - Phase 6
CRVA	Climate Change Risk and Vulnerability Assessment
CSO	Civil Society Organization
CVCA	Climate Vulnerability and Capacity Analysis
CWD	Consecutive Wet Days
CWSA	Community Water and Sanitation Agency
EPA	Environmental Protection Agency
ETCCDI	Expert Team on Climate Change Detection and Indices
EURAC	European Academy of Bolzano (EURAC Research)
FBO	Farmer-Based Organization
FF	Far-Future
FGD	Focus Group Discussion
FHH	Female-Headed Household
GAC	Global Affairs Canada
GCF	Green Climate Fund
GEA	Ghana Enterprises Agency
GES	Ghana Education Service
GFF	Green Finance Facilitator
GHG	Greenhouse Gas
GHS	Ghana Health Service
GIDA	Ghana Irrigation Development Authority
GIZ	*Deutsche Gesellschaft für Internationale Zusammenarbeit* (German Agency for International Cooperation)
GMet	Ghana Meteorological Agency
GoG	Government of Ghana
GSS	Ghana Statistical Service
ICT	Information and Communication Technology
IPCC	Intergovernmental Panel on Climate Change
KIIs	Key Informant Interviews
M&E	Monitoring and Evaluation
MASLOC	Microfinance and Small Loans Centre
MbS	Nature-Based Solution
MDAs	Ministries, Departments, and Agencies
MF	Mid-Future
MHH	Men Households
MLGRD	Ministry of Local Government and Rural Development

MMDAs	Metropolitan, Municipal and District Assemblies
MoE	Ministry of Education
MoF	Ministry of Finance
MoF	Matrix of Function
MoFA	Ministry of Food and Agriculture
MoGCSP	Ministry of Gender, Children and Social Protection
MoH	Ministry of Health
NADMO	National Disaster Management Organization
NAP	National Adaptation Plan
NDC	Nationally Determined Contribution
NGO	Non-Governmental Organization
NHIS	National Health Insurance Scheme
NYA	National Youth Authority
PHC	Population and Housing Census
PWD	Person with Disability
RCC	Regional Coordinating Council
RR	Rainfall Rate
SDG	Sustainable Development Goal
SDII	Simple Daily Intensity Index
SIGRA	Strengthening Investments in Gender-Responsive Climate Adaptation
SSP	Shared Socio-Economic Pathway
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
VSLAs	Village Savings and Loan Associations
WD	Wet Days
WHH	Women Headed-Households

EXECUTIVE SUMMARY

Background

Climate change presents varied challenges to the socio-economic development agenda of Ghana at various levels. The changing climate has a wide-range implications for cities, local communities, indigenous businesses, industry and government at different levels. The government of Ghana, through the national adaptation planning (NAP) process, with technical and financial support from the Global Affairs Canada (GAC), under auspices of the "Strengthening Investments in Gender-Responsive Climate Adaptation" (SIGRA) project commissioned a Climate Change Risk and Vulnerability Assessment (CRVA) in the Mion District of the Northern region of Ghana to support evidence-based decision making and planning in climate change adaptation at the local level. This report presents the findings of the CRVA conducted by the SIGRA project in the Mion District.

The assessment aimed at understanding how climate change impacts different socio-economic groups, particularly marginalized and vulnerable populations with a view to developing sustainable adaptation and resilience building interventions. The assignment also complements current Government of Ghana (GoG) efforts towards National Adaptation Plan (NAP) development and as a response to intensifying climate change impacts, which are proving disruptive to deepen poverty and vulnerability in places such as the Mion District.

A core focus of this CRVA is to explore and unpack how the gendered dynamics in climate impact manifestations and differential experiences of such impacts in diverse places exacerbate the complexities of systemic socio-economic inequalities. In doing this, marginalized groups such as women, youth, elderly individuals, persons with disabilities (PWDs), and migrants were given special attention, given the specific vulnerabilities they face, which are currently being exacerbated by the impacts of climate change.

Women, for example, are often disproportionately burdened with caregiving and food security responsibilities, while youth face unemployment pressures due to declining rural economic opportunities. These situations are being worsened by changing climate and environmental conditions and require that socially inclusive and gender-responsive approaches are employed to fully understand, and to use emerging knowledge to develop gender-responsive and equitable adaptation and resilient building interventions at both national and subnational levels, and in places such as Mion. This assessment, as indicated, aligns with Ghana's National Adaptation Plan (NAP) ambitions, as well as broader sustainable development frameworks and aspirations such as the Sustainable Development Goals (SDGs).

District Profile

Mion District, located in the Northern Region of Ghana, is highly vulnerable to climate change due to its dependence on rain-fed agriculture and weak infrastructure. The district experiences unpredictable rainfall, extreme heat, and droughts, leading to low agricultural productivity and water scarcity. The district is predominantly rural with its entire population relying almost exclusively on climate-sensitive sectors such as agriculture (subsistence farming), livestock rearing, and petty trading. Women, young people, and persons with disabilities (PWDs) face higher climate vulnerabilities due to systemic inequalities and limited access to resources. Targeted gender-responsive adaptation strategies are critical to building an inclusive society and local resilience.

Methodology

This Climate Risk and Vulnerability Assessment (CRVA) utilized both qualitative and quantitative methods to evaluate climate risks and vulnerabilities in seven communities within the Mion District. Household surveys were conducted to gather insights on livelihoods, climate-related challenges, and adaptation measures. Focus group discussions (FGDs) were held with women, youth, migrants, and persons with disabilities (PWDs) to explore social inequalities and community experiences. Key informant interviews (KIIs) with local officials and agricultural officers offered institutional perspectives, while field observations examined environmental conditions such as soil erosion and water availability.

Additionally, a review of secondary data was conducted to contextualize local findings within national climate projections and policy frameworks.

Key Findings

Climate Hazards and Community Vulnerability

- Mion District faces erratic rainfall, prolonged droughts, intense flooding, rising temperatures, and soil erosion, leading to severe agricultural losses, food insecurity, health challenges and economic instability.
- Water scarcity is a persistent challenge, with limited access to safe drinking water and irrigation facilities to support agriculture.
- Critical infrastructure such as roads, homes, schools, and health facilities are at risk as they are exposed to climate hazards such as floods and high temperatures.
- Agriculture, which is the mainstay of the district economy is at risk due to climate variability and change.

Economic Vulnerabilities

- **Gendered Income Disparities:** Men are primarily engaged in crop and livestock farming, while women are more likely to participate in petty trading and food processing. Women predominantly occupy the lowest income bracket (below 500 GHS/month) with fewer opportunities for economic advancement.
- **Asset Ownership Disparities:** Men have greater access to land, livestock, and vehicles, enhancing their economic resilience, while women's assets are often limited to small-scale activities.

Physical Vulnerabilities

- Exposure to Climate Hazards**:** Communities in the Mion District experience severe exposure to droughts, floods, extreme heat, and windstorms.
- Sector Sensitivity**:** Agriculture, water, health, infrastructure, and biodiversity sectors are critically sensitive to climate hazards.

Social Vulnerabilities

- Gender Roles and Decision-Making**:** Women bear the primary burden of household responsibilities, including water collection and caregiving, while men dominate agricultural decision-making.
- Gendered Impacts of Climate Change**:** Women face increased workloads, reduced incomes, and limited participation in decision-making processes.
- Barriers to Resource Access**:** Cultural traditions, financial constraints, and lack of legal rights hinder women's access to land, credit, and information.

Community-Level Variations in Vulnerabilities

- Communities like Kayong and Palari are highly vulnerable due to poor water access and limited health infrastructure.
- Zuro and Kpumi face extreme drought conditions, with water scarcity undermining agricultural productivity.
- Sang experiences urbanizing pressures, poor road networks and insufficient sanitation and hygiene facilities.
- Nyentuo and Dijeo experience frequent flooding, causing significant damage to infrastructure and livelihoods.

Projected Climate Trends and Future Risks

Rainfall and Temperature Changes

Climate projections for the Mion District indicate increased rainfall variability and higher temperatures, particularly under high-emission scenarios (SSP5-8.5). Rising temperatures are likely to intensify heat stress, exacerbate drought conditions, and reduce agricultural productivity. Additionally, rainfall patterns are expected to become more unpredictable, increasing the frequency and severity of floods. These events pose significant risks to crop yields, infrastructure, and water resources, contributing to heightened food insecurity and displacement. The compounding effects of extreme weather events will further strain the district's already limited adaptive capacity.

Future Gendered Vulnerabilities

Climate change is anticipated to deepen existing socio-economic disparities and vulnerabilities in Mion District, disproportionately impacting women, youth, the elderly, and persons with disabilities (PWDs). Women, who are primarily responsible for household water management and subsistence farming, will face increased workloads due to water scarcity and declining agricultural productivity. Economic opportunities for women are expected to diminish further, limiting their adaptive capacity. Youth may experience greater migration pressures as agricultural livelihoods become less viable. The elderly and PWDs will be particularly vulnerable to the impacts of extreme heat and flooding, with limited access to support systems and resources. Targeted, socially-inclusive and gender-responsive adaptation measures will be essential to address these growing vulnerabilities and build community resilience.

Implications for Gender-Responsive Climate Adaptation Planning in Mion District

Although this study primarily assesses climate risk and vulnerability, its findings offer key insights to guide gender-responsive climate adaptation planning in the Mion District. The district faces severe climate threats, including droughts, floods, heatwaves, and soil erosion, which disproportionately affect women, youth, persons with disabilities (PWDs), and other marginalized groups due to existing social and economic inequalities.

Gender-responsive planning is essential to ensure equitable development and resilience building by addressing structural barriers and systemic inequalities. Targeted adaptation measures, such as bridging the adaptive capacity gaps for female-headed households (FHHs) and other vulnerable groups, as well as intentional efforts to enhance access to critical resources such as finance, information, and agricultural inputs, can significantly strengthen community resilience.

These preliminary findings and recommendations align with national and global development objectives, including Ghana's Nationally Determined Contributions (NDCs), Ghana's Climate Change Strategy, National Adaptation Plan (NAP) and the Sustainable Development Goals (SDGs). The specialized focus on gender equality, climate action, and poverty reduction is particularly instructive to adaptation planning processes, both at the national and subnational levels.

Institutional Capacity Building and Adaptation Policy Implications

Mion District, like many others across Ghana, faces significant institutional and policy capacity challenges that limit the effectiveness of climate adaptation governance. Beyond the CVRA, it becomes critically important that conscious attention is given to issues around subnational capacity building to ensure effective and efficient governance of climate change issues at the subnational level. Addressing these gaps require a comprehensive approach that strengthens governance through targeted training programs that enhance capabilities in climate informed decision making. Areas of urgent capacity building interest include: climate finance; mainstreaming of adaptation in mid-term development planning; adaptation planning, climate information services, early warning systems, scenarios analysis, gender inclusivity and participatory planning.

It is particularly imperative that efforts are made to build the capacity of districts such as Mion in Climate Finance paying particular attention to the design of carefully designed training programs that improve access to climate finance, proposal writing, gender-responsive budgeting, and the development of investment plans for the implementation of adaptation strategies. It is also important that such capacity building processes are carried out through collaborative and partnership arrangements that ensure synergies between national and subnational level adaptation planning processes. Here Ghana's NAP and other key national and international agendas such as the Sustainable Development Goals (SDGs) become instructive in serving as avenues for collaboration, knowledge co-production and exchange, as well as for the promotion of learning and the development of partnerships.

Community-Specific Recommendations

Based on the adaptation needs identified, the following community-specific recommendations aim to build resilience in the Mion District:

- **Sang:** Improve water supply systems, upgrade healthcare facilities, and expand financial support for women-led businesses.

- **Kayong:** Develop mechanized boreholes, expand dry-season farming, and establish a mobile health clinic.
- **Nyentuo:** Construct irrigation facilities, enhance road networks, and provide vocational training for youth.
- **Zuro:** Promote climate-smart agriculture, provide financial support for women's cooperatives, and rehabilitate water sources.
- **Palari:** Establish water storage facilities, strengthen community health centers, and introduce sustainable land management practices.
- **Dijeo:** Improve flood drainage systems, support small-scale enterprises, and provide early warning systems for climate events.
- **Kpumi:** Invest in drought-tolerant crops, expand livestock rearing, and support agroforestry programs.

Conclusion and Way Forward

This report highlights the critical importance of gender-responsive climate adaptation planning in Mion District. It lays out the complexity of climate impact manifestations in diverse places and how existing structural and systemic socio-economic inequalities converge with changing climate conditions to deepen poverty and vulnerability among known marginalized groups such as women, young people, migrants, and persons with disability (PWDs). As next step actions, we recommend the development of a district-level and district-specific adaptation plan that provides pathways for adaptive capacity and resilience building in local communities in the Mion District.

1. Introduction

1.1 Project Background

In support of Ghana's NAP, the SIGRA Project (Strengthening Investments in Gender-Responsive Climate Adaptation) has commissioned Climate Change Risk and Vulnerability Assessments (CRVAs) for its five partner Districts. SIGRA (2023-2028) is a Global Affairs Canada funded project that seeks to advance climate action and inclusive governance in Ghana. Its ultimate outcome is to improve the resilience of Ghanaian citizens, particularly women, girls, and vulnerable groups through increased investments in inclusive and gender-responsive climate adaptation initiatives.

The project provides technical assistance to strengthen governance and national systems with key central Ministries, Departments and Agencies (MDAs) while providing direct grants to five MMDAs funding local gender responsive climate adaptation projects. The project supports Regional Coordinating Councils (RCCs) in the Northern and Volta regions and strengthens the ability of targeted MMDAs to plan, implement, and report on climate adaptation initiatives. Additionally, SIGRA seeks to strengthen the participation, voice and influence of women led CSOs in government decision-making.

The project, which is currently being implemented by Cowater International, complements current national climate adaptation and resilience-building efforts in Ghana by recognizing the far-reaching consequences and implications of current and projected future climate change impacts on Ghana's sustainable development aspirations. As climate impacts become more pervasive, verifiable and pernicious in local communities across the country, the imperative for intentional interventions in the form of adaptation planning has also become an urgent policy concern, which has attracted several responses.

The National Adaptation Planning (NAP) as one such response is a flagship national program led by the Environmental Protection Agency (EPA) of Ghana and aims to identify climate impacts manifestations and associated risks and vulnerabilities across sectors and in local communities, and to put in place proactive adaptation interventions that build resilience. Ghana's NAP thus serves as an organizing avenue for subnational adaptation and resilience building through its use of place-based risk and vulnerability assessments, or what is described as a district-specific adaptation planning. The primary objective, as outlined in Ghana's NAP Framework (Antwi-Agyei, 2018), is to reduce vulnerability to climate change impacts by enhancing adaptive capacity and resilience within local communities. Implicit in the district-focused approach is the recognition of the fact that climate change impacts are place-specific; that they are not homogeneous and require carefully considered adaptation measures that are also place-responsive.

The SIGRA Project complements Ghana's NAP processes by helping to address the growing impacts of climate change especially in local communities. The Gendered focus of the project is particularly instructive as it highlights differential experiences of climate change impacts and how that also demonstrate differences in adaptive capacity levels, especially as they relate to women, young people, migrants and Persons with Disability (PWDs). While the project aims generally at improving the lives, livelihoods and well-being of people living in their different places and facing climate change risks and vulnerabilities, the intentional focus on marginalization and differential adaptive capacity provides deeper insights that will inform adaptation planning (Antwi-Agyei et al., 2015). Such an approach does not only enhance understandings around gender-responsive adaptation planning, but also, and perhaps more importantly, they facilitate the development of place-specific knowledge that may guide the direction of future investments in the implementation of adaptation options.

It becomes imperative, therefore, that Ghana's adaptation planning processes foster knowledge building, learning and capacity building (Manteaw et al., 2022). The SIGRA project with its emphasis on specific vulnerabilities, rather than generalized vulnerabilities, affirm the fact that climate adaptation is both a learned and learning process, which requires intentional processes that creates the enabling environment for people to learn to adapt. Adaptation only happens when people have learned to live differently or made the necessary adjustments to their lives to become resilient. And, the logical process is that this work – CRVA – as has been completed for the Anloga District, will serve as the premise from which a costed adaptation plan and associated intervention projects will be developed. A district-specific adaptation plan will ultimately serve as a major tool in the hands of the Assembly to develop innovative and bankable projects as they source funds (climate finance) for implementation.

1.2 Defining Climate Change Risks and Vulnerability

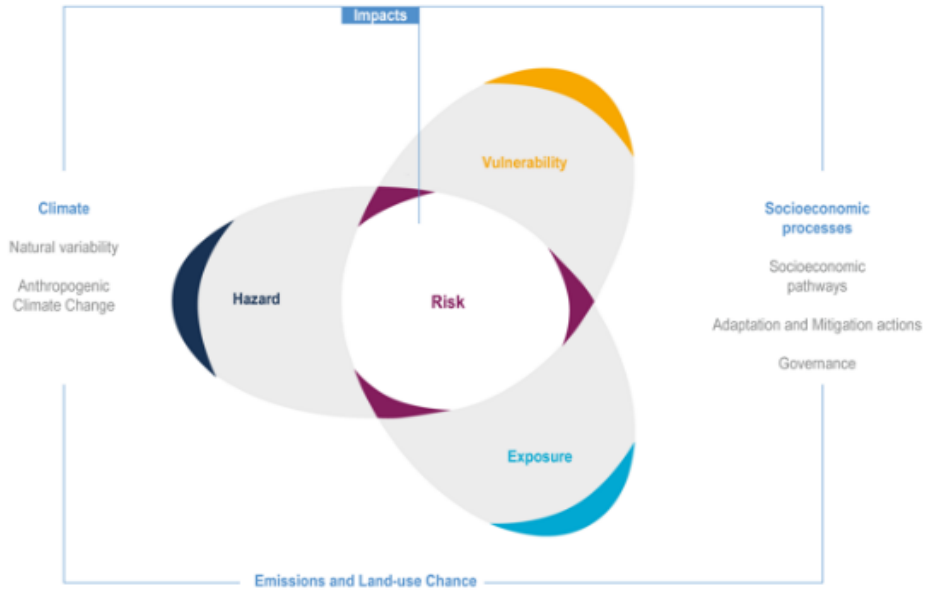
Climate change risk and vulnerability are foundational concepts for assessing the impacts of climate change on human and natural systems. These concepts have been refined and operationalized through frameworks developed by the IPCC, CARE International, and GIZ, each offering unique insights and methodologies. The IPCC provides a theoretical structure for understanding risk, while CARE and GIZ extend this framework by incorporating practical tools and participatory approaches, making them highly relevant for addressing the complex socio-economic and gendered vulnerabilities across sectors and in all communities in Ghana. Ghana's NAP process, as led by the EPA, is guided by these internationally recognized conventions.

1.2.1 IPCC Risk and Vulnerability Framework

The IPCC defines climate risk as the interaction of three core components: hazards, exposure, and vulnerability (**Figure 1**). Hazards refer to climate-related events or conditions (*e.g.*, droughts, floods), while exposure reflects the presence of people, ecosystems, and assets in areas at risk. Vulnerability encompasses the susceptibility to harm and the capacity to adapt, shaped by socio-economic, cultural, and environmental factors (IPCC, 2014; 2022). The IPCC framework emphasizes that climate risk is not only determined by the magnitude of hazards but also by the socio-economic processes influencing exposure and vulnerability. For instance, in Mion District, systemic inequalities such as limited land ownership among women exacerbate their vulnerability to droughts and floods. Without secure land tenure, women often lack the authority or incentive to invest in climate-resilient practices such as irrigation, soil conservation, or drought-resistant crops, leaving them more exposed to the adverse effects of extreme weather events.Additionally, weak governance structures, limited financial resources, and inadequate access to climate information further hinder the district's adaptive capacity, disproportionately impacting marginalized groups like women, youth, and persons with disabilities (PWDs).

Additionally, the IPCC also highlights the concept of compounding and cascading risks, where multiple hazards interact to amplify vulnerabilities. For example, in Mion District, a prolonged drought can lead to severe water scarcity, reducing agricultural productivity and placing additional burdens on women, who are primarily responsible for water collection. This increased workload further limits their participation in income-generating activities, exacerbating gender inequalities and deepening household vulnerability to climate shocks. This interconnectedness underscores the need for integrated and inclusive adaptation strategies. The IPCC framework (**Figure 1**) provides a theoretical backbone for understanding climate risks, offering a basis for assessing hazards, exposure, and vulnerability.

Figure 1: 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



1.2.2 CARE International's Climate Vulnerability and Capacity Analysis

CARE International's CVCA framework builds on the IPCC's concepts by emphasizing the intersection of climate risks with socio-economic and gender dimensions. It focuses on differentiated vulnerabilities, recognizing that gender, age, and social roles significantly influence how individuals and groups experience climate impacts (CCRP, 2019).

The CVCA framework is participatory, employing tools such as community mapping, focus group discussions (FGDs), and household surveys to identify localized vulnerabilities and adaptive capacities. For example, in Mion District, participatory mapping exercises can highlight how women's reliance on rain-fed agriculture increases their vulnerability to droughts, while FGDs can capture their extensive traditional knowledge of drought-tolerant crops and water conservation practices. CARE's approach also emphasizes building adaptive capacity through community-driven solutions. In Mion, this could involve establishing women-led savings and credit groups to finance climate-resilient farming techniques or promoting community-managed water systems to address water scarcity during prolonged dry periods. The CVCA framework operationalizes the IPCC's concepts of vulnerability and adaptation in a way that is tailored to local realities by integrating local knowledge with scientific data.

1.3 Document Purpose

The Climate Vulnerability and Risk Assessment (CVRA) for Mion District is designed to identify, analyse, and prioritize the gendered perspective of climate vulnerability within the Mion District in the Northern region in line with the NAP framework. The climate risk and vulnerability assessments were disaggregated by sectors including gender dynamics, based on local and national information.

The climate vulnerability assessment involved consultation with communities, women, and other vulnerable groups to incorporate their adaptation needs. The assessment incorporates local knowledge through a systematic evaluation of the district's climate risks and climate change impacts, emphasizing the integration of hazard, exposure, and vulnerability components as per the AR5 framework—a conceptual model developed in the IPCC's Fifth Assessment Report (AR5) that defines climate risk as the interaction between climate-related hazards, exposure of people and assets, and their vulnerability to harm. Specifically, the document through this assessment aims to:

1. ***Provide a Comprehensive Overview of Climate Risks:*** To capture a detailed picture of the climate hazards specific to Mion District, including the gendered dimensions of their current and potential future impacts on people, livelihoods, and ecosystems. This entails a rapid but thorough collection of information that informs adaptation planning and decision-making processes.
2. ***Enhance Understanding of Vulnerabilities:*** To deepen the understanding of the district's vulnerabilities, considering gender considerations and the multifaceted nature of climate risks that affect social, economic, and environmental dimensions.
3. ***Support Adaptation Planning:*** To offer a foundational basis for developing targeted and effective adaptation strategies and measures that address the prioritized risks, thereby strengthening the resilience of the Mion District to climate change.
4. ***Promote Stakeholder Engagement and Collaboration:*** To facilitate an inclusive process that engages a wide range of stakeholders, including government agencies, local communities, NGOs, and private sector actors, ensuring that the CVRA process is grounded in local realities and benefits from diverse perspectives and expertise.
5. ***Align with National and Regional Climate Change Frameworks:*** To ensure that the findings and recommendations of the CVRA for Mion District are consistent with national climate change strategies and action plans, contributing to the broader efforts to mitigate and adapt to climate change in Ghana.
6. ***Build Institutional Capacity:*** To strengthen the capacities of Assembly staff and relevant stakeholders. This will equip them with the knowledge and skills needed to effectively govern adaptation efforts, including conducting future climate risk and vulnerability assessments and developing comprehensive adaptation plans.

1.4 Study Aims and Objectives

1.4.1 Study Aim

This assessment focuses on the gendered dimensions of climate vulnerability in Mion District. The goal is to provide actionable strategies for building resilience in vulnerable communities while ensuring equity and inclusiveness in climate adaptation efforts. The assessment integrates local insights with global adaptation priorities to address the unique challenges faced by the district.

The study aligns global frameworks that emphasize the importance of equity and resilience in addressing climate change. Sustainable Development Goal (SDG) 5 on Gender Equality highlights the need to address gender disparities in adaptation efforts and to empower women as key leaders in building climate resilience. Similarly, SDG 13 (Climate Action) underscores the urgency of strengthening adaptation strategies to enhance the resilience of communities that are most vulnerable to the impacts of climate change. Together, these goals provide a foundation for integrating gender-responsive and inclusive approaches into climate adaptation planning in Mion District.

1.4.2 Specific Objectives

- ***Examine Climate Vulnerabilities*:** Assess the vulnerabilities and risks specific to men, women, and marginalized groups in the Mion District. This objective highlights how socio-economic and environmental factors intersect gender to shape exposure and sensitivity to climate impacts.
- ***Identify Gender Gaps*:** Highlight disparities in access to critical resources, climate information, and decision-making processes, which hinder equitable participation in adaptation efforts.
- ***Develop Actionable Solutions:*** Provide evidence-based recommendations for gender-responsive adaptation policies and interventions. These solutions aim to enhance resilience, promote social equity, and address the district's specific needs.

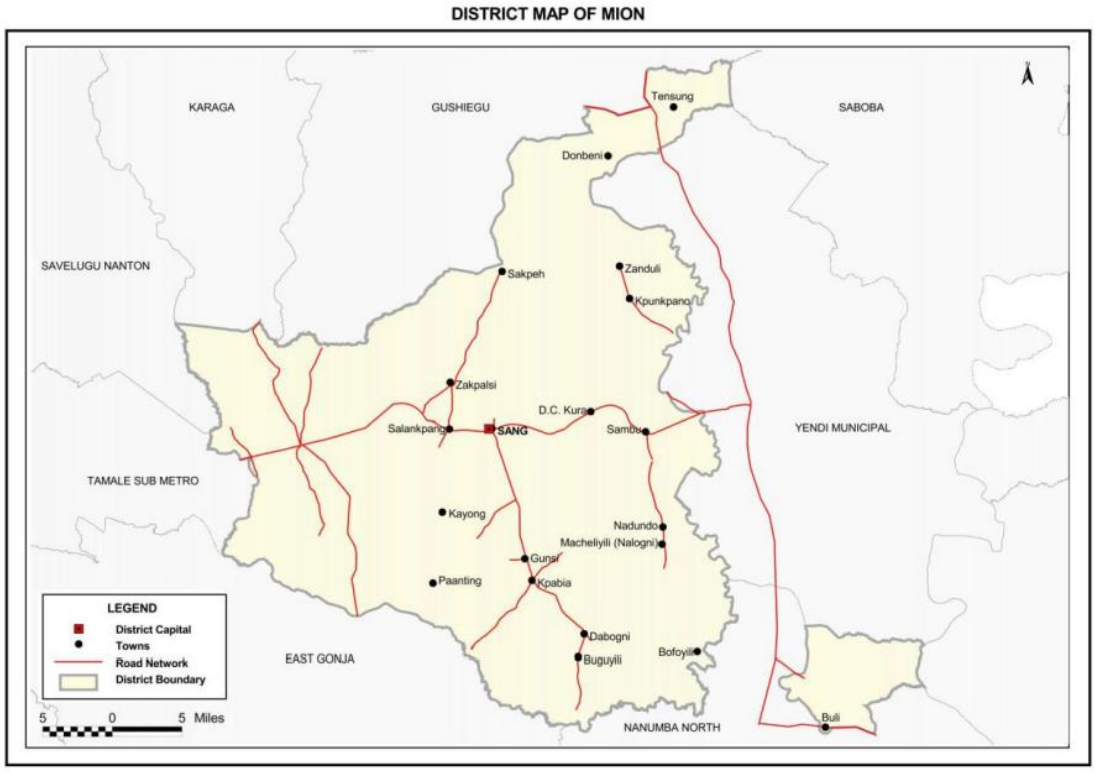
2. Mion District Profile

2.1 Geography and Climate Profile

2.1.1 Geographical Location and Size

The Mion District is situated in the eastern corridor of the Northern Region of Ghana, lying between Latitude 9°35' North and Longitude 0°30' West to 0°15' East (Yakubu, Hudu Zakaria, & Allotey, 2022). Covering an extensive area of approximately 2,714.1 square kilometres, it is among the largest administrative districts within the region (GSS, 2021). The district's capital is Sang. It shares boundaries with several neighbouring areas, including Tamale Metropolis, Savelugu Municipal, and Nanton District to the west; Yendi Municipal to the east; Nanumba North and East Gonja Districts to the south; and Gushegu and Karaga Districts to the north. This vast geographical expanse presents significant logistical challenges for governance and development initiatives, particularly in its more remote locations (USAID Advancing Nutrition, 2022).

Figure 2: Map of Mion District



Source: 2010 Population and Housing District Analytical Report

2.1.2 Topography and Drainage

The terrain of the district mainly consists of flat lowland plains, interspersed with occasional valleys and isolated highlands, particularly along the boundary shared with Yendi Municipal. These valleys, which predominantly slope eastward, act as temporary water catchment areas during the rainy season but frequently dry out during the extended dry season (Yakubu et al., 2022). The River Dakar, along with its network of tributaries, forms the district's primary drainage system and is vital for agricultural and household water needs. Nevertheless, fluctuations in water availability across seasons intensify difficulties in maintaining consistent farming operations and ensuring a reliable supply of potable water throughout the year (Abubakari et al., 2024).

2.1.3 Key Zones

Lowland Plains
The lowland plains dominate the district and are intensively used for agriculture, particularly the cultivation of cereals and legumes. However, these areas are highly prone to soil erosion and nutrient depletion due to unsustainable farming practices (Yakubu et al., 2022).

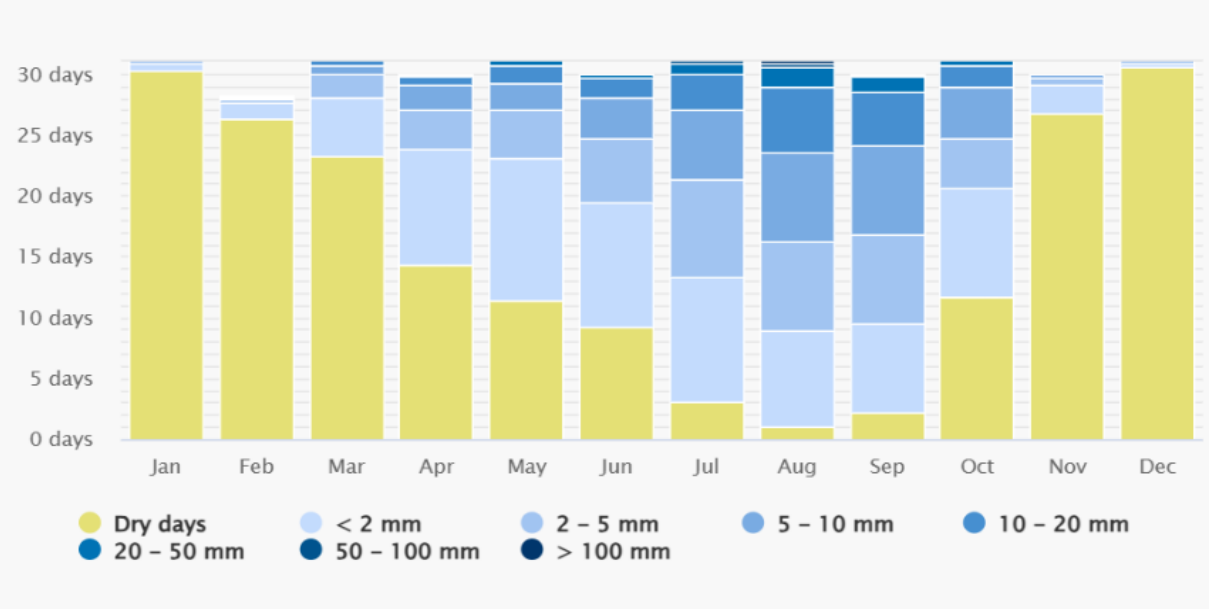
Valley Systems
The valleys, although fertile, are underutilized due to inadequate irrigation infrastructure. During the rainy season, they support rice farming and other water-intensive crops. However, these valleys remain dry for most of the year, limiting their productivity (USAID Advancing Nutrition, 2022).

2.1.4 Climatic Attributes

The main attributes of the climate are rainfall and temperature.

Figure 3 illustrates the rainfall patterns in Mion, showing a clear distinction between the dry and rainy seasons. The dry season spans from November to March, with nearly all days experiencing little to no rainfall. Rainfall begins to increase gradually in April, marking the transition to the rainy season, which peaks from June to September. During this period, Mion experiences frequent wet days, with significant rainfall intensity ranging from 10–50 mm on most days and occasional heavy rainfall exceeding 100 mm, particularly in July and August. The rainy season supports agricultural activities but may lead to waterlogging or flooding in some areas. Rainfall decreases in October as the region transitions back to the dry season. This pattern reflects Mion's hot savanna climate, characterized by alternating wet and dry seasons.

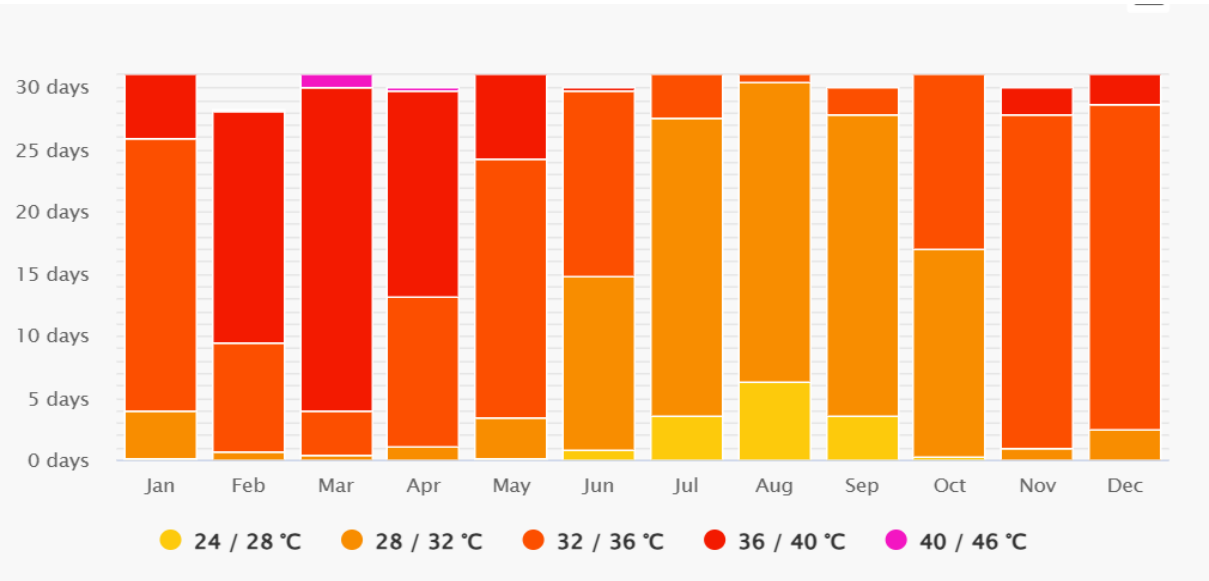
Figure 3: Monthly precipitation amounts in the Mion District



Temperature

Figure 4 reveals maximum temperature patterns in Mion, showcasing consistently high temperatures throughout the year. The hottest months are February to April, where temperatures frequently exceed 36°C, with some days reaching extreme highs above 40°C, particularly in March. The rainy season (June to September) brings a slight relief, with maximum temperatures ranging mostly between 28°C and 36°C, and occasional cooler days below 28°C, particularly in August. Temperatures begin to rise again in October and remain high until December, maintaining the region's characteristic hot savannah climate.

Figure 4: Maximum temperature patterns in Mion District



Source: www.meteoblue.com (2024)

2.1.5 Biogeographical Characteristics

Vegetation

Mion District is located within the Guinea Savannah ecological zone, which is characterized by short, isolated trees scattered across vast expanses of grassland. The region also features Guinea Savannah woodlands, dominated by drought-resistant species like the acacia, Shea, and dawadawa trees. These trees play a significant role in the local ecosystem, but they are heavily exploited for firewood and charcoal production, as approximately 78% of the population relies on these resources for domestic and commercial energy needs (GSS, 2014).

This extensive use of wood and charcoal contributes to environmental degradation across the district. The semi-deciduous nature of these trees exacerbates the issue, as they shed their leaves during the prolonged dry season, making them easier to convert into fuelwood and charcoal. This cycle of deforestation worsens during the dry season, further intensifying the ecological challenges faced by the district.

Fauna

Mion District is renowned for its rich biodiversity, serving as a hub for both wild and domestic animals, including a variety of game species. The district's grasslands provide a natural habitat for numerous wild animals, such as deer, monkeys, buffalos, and hyenas. Additionally, a wide range of game animals can be found, including rabbits, rats, grass cutters, and several species of wild birds. The district also supports a thriving population of domestic animals, such as cattle, goats, and sheep, which benefit from the abundant pasture available for grazing. As a result, Mion District is well known for its supply of bush meat, a key feature of the local economy and food culture (USAID Advancing Nutrition, 2022).

2.1.6 Pedological Characteristics

Lowland Soils

The predominant soils in the lowlands are lateritic and sandy, which are inherently low in nutrients. These soils are suitable for crops such as maize, millet, and groundnuts but require organic supplementation to maintain productivity (Yakubu et al., 2022).

Valley Soils
Alluvial soils in the valleys have better water retention and are ideal for rice cultivation. However, these areas are prone to erosion during heavy rains, further reducing their fertility (GSS, 2021).

Highland Soils
Ochrosols and clayey soils in the highland regions are more fertile but require sustainable agricultural practices to prevent degradation (Abubakari et al., 2024).

2.1.7 Administrative Structure

Under the framework of the Local Government Act 1993 (Act 462), the Mion District Assembly, based in Sang, holds the highest authority for political and administrative decisions within the district. Leadership of the Assembly is vested in the District Chief Executive, who is appointed by the President of Ghana. The district comprises a single electoral constituency, the Mion Constituency, which is represented by an elected Member of Parliament (MP). The MP also serves as an ex-officio member of the District Assembly (Yakubu, Hudu Zakaria, & Allotey, 2022).

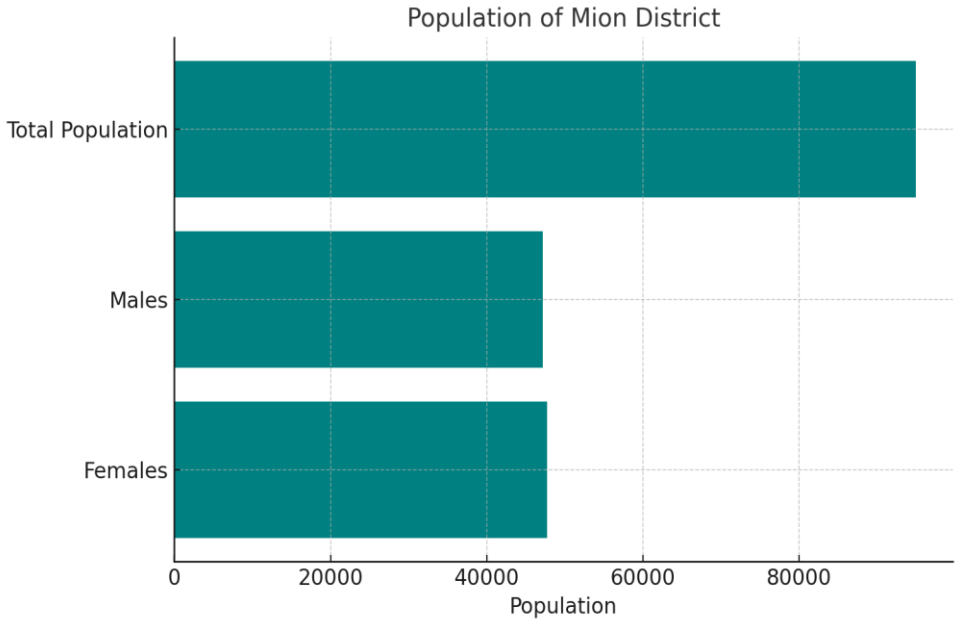
The Assembly is composed of 30 members, including 20 elected Assembly Members, 8 government appointees, the Member of Parliament for Mion Constituency, and the District Chief Executive. Of these, only 3 members are women, accounting for 10% of the Assembly's membership. The district is divided into three area councils: Jimle, Sang, and Kpabia. Each Assembly Member is supported by a five-member unit committee to assist in the governance and management of their respective areas (USAID Advancing Nutrition, 2022).

2.2 Demographic and Gender Gaps

2.2.1 Demographic Characteristics of Mion District

According to the 2021 Population and Housing Census (PHC), Mion District has a population of 94,930, comprising 47,162 males and 47,768 females (GSS, 2021). The district remains overwhelmingly rural, with approximately 89.6% residing in rural areas, compared to only 10.4% in urban centers. This rural dominance increases vulnerability to climate change, as limited infrastructure and services restrict access to adaptation resources. Women and persons with disabilities (PWDs) face greater challenges, with reduced access to climate-resilient livelihoods and emergency support.

Figure 5: Population of Mion District, stratified by gender



Source: Ghana Statistical Service, 2021

The age distribution in Mion (**Table 1**) reveals a predominantly youthful population, with the largest age group being 0-9 years (33,263 individuals), followed by 10-19 years (20,998 individuals). This indicates a high dependency ratio, as a significant portion of the population is under 20 years old. The working-age population, particularly those aged 20-39 years (26,311 individuals combined), represents a critical segment for driving economic productivity. Meanwhile, the middle-aged (40-59 years) and elderly (60+ years) populations are comparatively smaller, with 6,763 individuals aged 40-49 years and only 737 individuals aged 80+ years, reflecting a relatively low life expectancy.

The high dependency ratio places a disproportionate burden on women, particularly those responsible for caregiving, as climate hazards such as droughts and food shortages increase the difficulty of securing food, water, and essential household resources.

Table 1: Age distribution in Mion District

Age Distribution (C 2021)	
80+ years	737
70-79 years	1,426
60-69 years	2,049
50-59 years	3,383
40-49 years	6,763
30-39 years	10,785
20-29 years	15,526
10-19 years	20,998
0-9 years	33,263

The demographic composition and gender dynamics in the Mion District are pivotal in shaping the socio-economic realities and adaptive capacities of its population. These factors intersect with systemic inequalities, impacting resource access, decision-making, and resilience to climate change risks. In terms of disability, there are 1,835 persons with disabilities in the Mion District, representing 2.2% of the total population of the district (GSS, 2010). Among them, 943 (2.3%) are males, while 892 (2.2%) are females. The most common disabilities reported are sight and physical impairments. Among people aged 15 and above, 72.2% of those with disabilities are employed.

Women and persons with disabilities (PWDs) face heightened vulnerability to climate change due to structural inequalities. With agriculture being the dominant livelihood in the district, PWDs engaged in farming encounter mobility challenges that limit their ability to respond to climate-related shocks such as droughts and floods. Women with disabilities experience additional marginalization, with limited access to financial resources and adaptive technologies, making it harder for them to recover from climate-induced losses. (**Table 2**)

The lack of inclusive infrastructure further restricts PWDs from accessing climate information, early warning systems, and emergency response services. In times of extreme weather events, they are often the last to receive support due to physical and social barriers. Addressing these disparities require targeted interventions, such as disability-inclusive climate policies, accessible adaptation programs, and enhanced participation of women, young people and PWDs in climate-informed decision-making processes.

Table 2: Population distribution of disabled persons

	Both sexes		Male		Female	
Disability Type	Number	Percent	Number	Percent	Number	Percent
All Localities						
Total	81,812	100.0	40,649	100.0	41,163	100.0
No disability	79,977	97.8	39,706	97.7	40,271	97.8
With a disability	1,835	2.2	943	2.3	892	2.2
Sight	694	37.8	378	40.1	316	35.4
Hearing	479	26.1	219	23.2	260	29.1
Speech	380	20.7	202	21.4	178	20.0
Physical	397	21.6	187	19.8	210	23.5
Intellectual	332	18.1	163	0.4	169	0.4
Emotional	360	19.6	173	18.3	187	21.0
Other	231	12.6	122	12.9	109	12.2
Urban						
Total	7,278	100.0	3,625	100.0	3,653	100.0
No disability	7,170	98.5	3,570	98.5	3,600	98.5
With a disability	108	1.5	55	1.5	53	1.5
Sight	46	42.6	26	47.3	20	37.7
Hearing	15	13.9	6	10.9	9	17.0
Speech	11	10.2	4	7.3	7	13.2
Physical	27	25.0	13	23.6	14	26.4
Intellectual	5	4.6	4	0.1	1	0.0
Emotional	4	3.7	3	5.5	1	1.9
Other	4	3.7	2	3.6	2	3.8
Rural						
Total	74,534	100.0	37,024	100.0	37,510	100.0
No disability	72,807	97.7	36,136	97.6	36,671	97.8
With a disability	1,727	2.3	888	2.4	839	2.2
Sight	648	37.5	352	39.6	296	35.3
Hearing	464	26.9	213	24.0	251	29.9
Speech	369	21.4	198	22.3	171	20.4
Physical	370	21.4	174	19.6	196	23.4
Intellectual	327	18.9	159	0.4	168	0.4
Emotional	356	20.6	170	19.1	186	22.2
Other	227	13.1	120	13.5	107	12.8

2.2.2 Economic Vulnerability

The economy of Mion District is predominantly subsistence-based, with agriculture serving as the main occupation for over 90% of the population. Key agricultural activities include the cultivation of cereals and tubers, as well as animal husbandry, where cattle, sheep, goats, pigs, and poultry are reared for both domestic use and commercial purposes. Despite the district's enormous potential in agriculture, its dependence on an increasingly unpredictable climate makes the sector highly vulnerable to weather fluctuations, leading to significant risks for the local economy (Composite Budget, 2022).

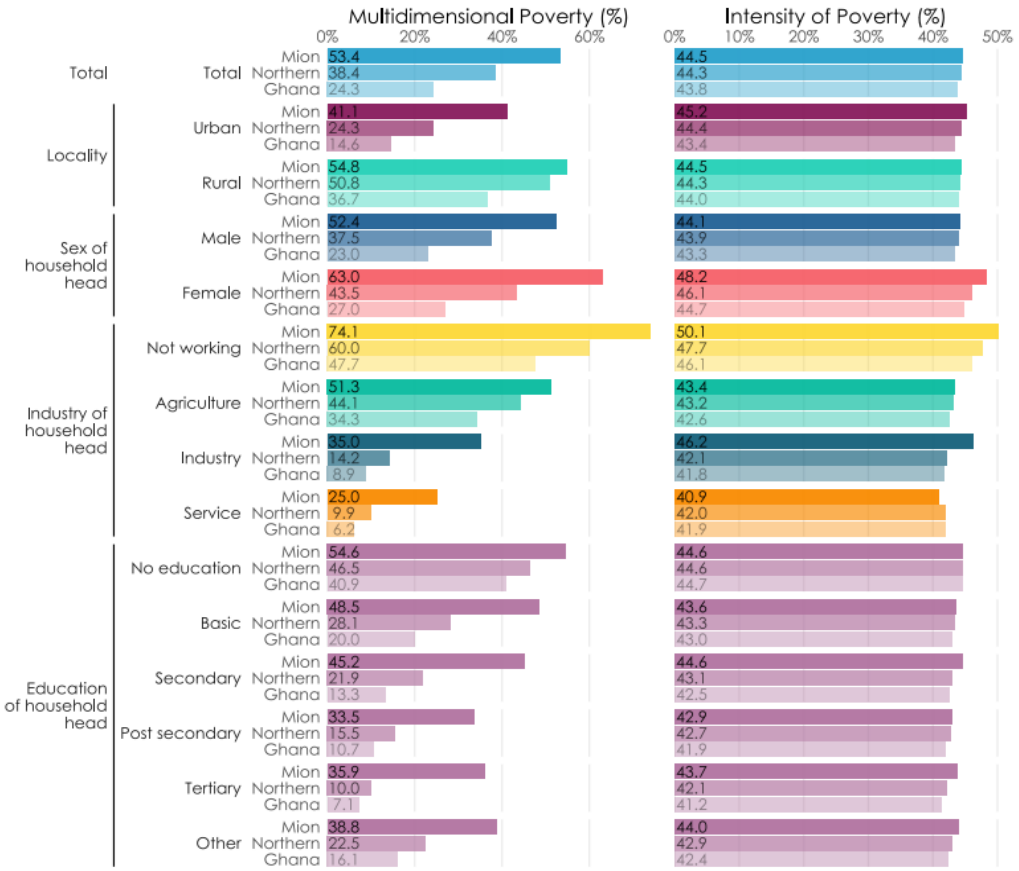
In addition to agriculture, other economic activities are carried out on a small to medium scale. These include:

- Smock weaving
- Agro-processing (such as Shea butter and groundnut oil extraction)
- Meat processing
- Charcoal burning
- Animal husbandry
- Retail and wholesale marketing of general goods
- Transport services

There is also some engagement in small-scale manufacturing, including blacksmithing, baking, mechanics, and agro-processing. One significant challenge to economic development in the district is the absence of banking and financial institutions. Residents must travel to Yendi or Tamale to access banking and other financial services, which hinders business expansion and access to credit and in ways that restricts economic inclusions and growth (USAID Advancing Nutrition, 2022).

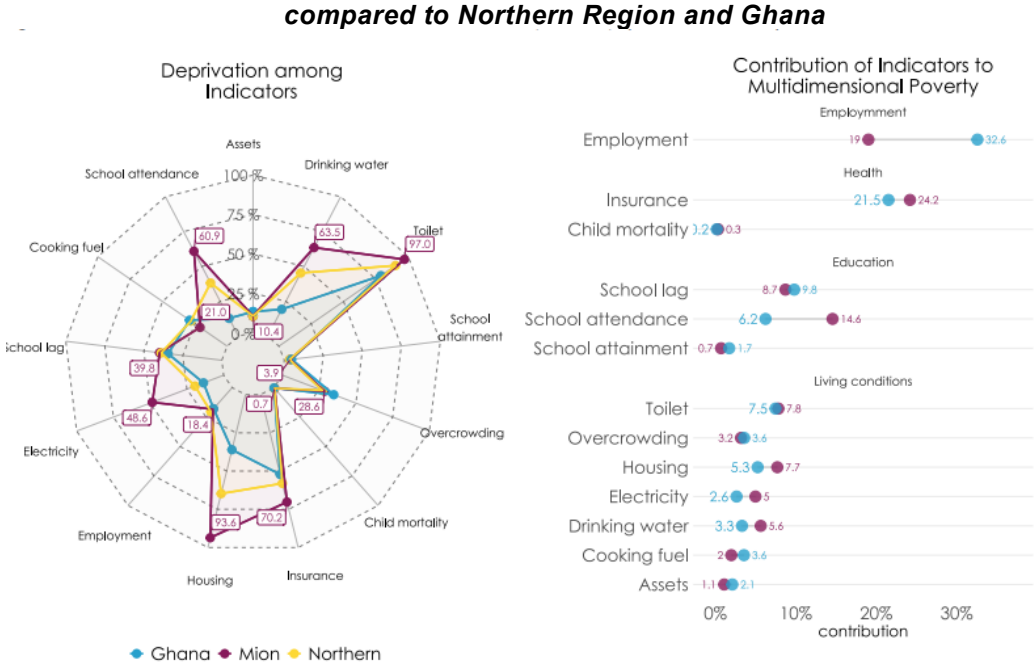
Standard of living in the Mion District is relatively low compared to the national average as highlighted by the district's poverty mapping (Ghana Statistical Service, 2021). From the perspective of multidimensional poverty and its intensity on a relative basis in Mion and Ghana, Mion exhibits a significantly higher multidimensional poverty rate (53.4%) compared to the national average (24.3%) and also exceeds the Northern Region's rate (38.4%) (**Figure 6**). This high poverty rate disproportionately affects marginalized groups, particularly women, children, persons with disabilities, and the elderly, who often have fewer economic opportunities and limited access to adaptive resources, making them highly vulnerable to climate risks.

Figure 6: Multidimensional poverty and its intensity in Mion, Northern Region, and Ghana



Source: Ghana Statistical Service, 2023

Figure 7: Deprivation and its contribution to multidimensional poverty in Mion District compared to Northern Region and Ghana



Source: Ghana Statistical Service, 2023

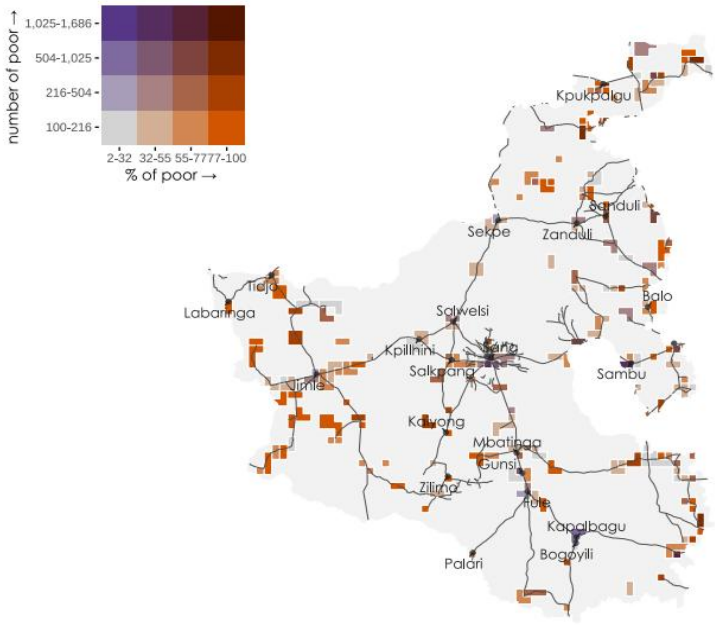
Figure 7 illustrates the average levels of deprivation (ranging from 0% to 100%) across 13 indicators in Mion, compared to the regional and national averages. The results reveal significant deprivations in areas such as access to toilet facilities (77.0%), insurance coverage (70.2%), and housing quality (63.5%), which exceed both regional and national averages. Women and children, who are traditionally responsible for household water and sanitation management, face heightened health and safety risks due to inadequate toilet facilities and poor housing conditions. This vulnerability is deepened during climate-induced disasters such as floods, which further restricts mobility and access to essential services.

Employment emerges as the most significant dimension influencing multidimensional poverty in Mion District, contributing 32.6% to the overall index. This reflects not just the presence of jobs, but the widespread challenge of low-quality, insecure, or poorly paid employment that fails to provide sustainable livelihoods, followed by health (24.2%) and education, with school lag (14.6%) and attendance (6.2%) being key issues. Children from low-income households, particularly girls, are at risk of missing school due to economic hardships and climate-related shocks, which often compel families to prioritize immediate survival over education. Additionally, persons with disabilities, who already face barriers in accessing employment, are further marginalized in the labor market, limiting their ability to build resilience against climate-related economic shocks.

Poor living conditions, including limited access to electricity (5.0%), inadequate housing (7.7%), and lack of clean cooking fuel (3.6%), further exacerbate poverty levels in the district. Women, who are primarily responsible for household energy use, bear the brunt of energy poverty, relying on unsustainable fuels such as firewood and charcoal, which contribute to deforestation and climate change while exposing them to harmful indoor air pollution. The lack of sustainable energy sources not only affects health but also increases the burden of labor on women, further limiting their ability to participate in economic and educational activities.

The map (**Figure 8**) highlights multidimensional poverty hotspots across Mion District, with variations in the density and proportion of poor individuals. Areas such as Sambu, Kpukpaligu, Kapalbugu, and Boagyili show higher concentrations of poverty, as indicated by darker shades on the map. The distribution reflects significant disparities in poverty levels within the district, with some locations experiencing extreme deprivation. Older adults, particularly those without family support, face heightened vulnerability in these poverty hotspots, as they often lack the physical and financial means to adapt to climate-related threats such as extreme heat and food shortages.

Figure 8: Multidimensional poverty hotspots across Mion District



Source: Ghana Statistical Service, 2023

2.3 Gender Disparities

Gender inequalities in Mion District significantly shape access to resources, participation in economic activities, and vulnerability to climate risks. Entrenched cultural norms and systemic barriers create disparities across various domains, affecting women, youth, and persons with disabilities (PWDs). These inequalities intensify the challenges marginalized groups face in adapting to climate change, as limited access to land, education, economic opportunities, and decision-making further restricts their resilience to environmental shocks.

1. Access to Land and Agricultural Inputs

Land ownership is predominantly controlled by men in the Mion District, reflecting broader national patterns where customary inheritance practices often exclude women (Doss et al., 2020). Women typically access farmland through male relatives or community leaders, often receiving smaller, less fertile plots. This dependency limits their ability to invest in long-term improvements or adopt modern farming techniques, perpetuating cycles of low productivity (Asante et al., 2015). With climate variability worsening, women's limited control over land further reduces their ability to implement adaptive farming practices, leaving them more vulnerable to crop failures and food insecurity. Meanwhile, men generally have greater access to mechanized farming tools, fertilizers, and extension services, enabling them to achieve higher productivity and better withstand environmental stressors.

2. Education and Skills Training

Educational access in the Mion District is generally low as most communities lack schools. The lack of schools converges with other local realities to highlight gendered disparities in educational access and attainment. Girls as it has become evident in the study are the most likely not to go to school because of a lack of access, or due to early marriages, household responsibilities, or cultural expectations (GSS, 2021). These barriers limit women's access to knowledge and skills that could enhance their economic independence and adaptive capacity. Without adequate education and climate-related training, women and girls remain disproportionately affected by climate shocks, as they lack access to information on sustainable farming techniques, disaster preparedness, and financial resources to support resilience-building efforts. Additionally, agricultural training programs often fail to accommodate women's schedules and responsibilities, excluding them from opportunities to adopt climate-smart agricultural practices (FAO, 2020). This further restricts their ability to diversify their income and secure climate-resilient livelihoods.

3. Livelihood Activities and Economic Roles

Women predominantly engage in subsistence farming and small-scale livestock rearing, which are particularly vulnerable to climate variability. Their focus on staple crops such as millet and maize, as well as poultry and goats, makes them highly susceptible to prolonged droughts and erratic rainfall. Because women have fewer financial resources and limited access to credit, they struggle to recover from climate-related losses, further deepening cycles of poverty and food insecurity. Conversely, men dominate cash crop farming and manage larger livestock such as cattle, benefiting from better access to credit and markets (Antwi-Agyei et al., 2015). This economic divide reinforces gender-based disparities and limits women's ability to build financial resilience during crises. Similarly, PWDs often face severe challenges in accessing employment opportunities, particularly in agriculture, due to mobility constraints and social exclusion, which further reduces their ability to adapt to climate-induced livelihood disruptions.

4. Health and Social Challenges

The district faces significant health challenges with women and children bearing and the brunt of health risks associated with poor water quality, sanitation and changing climate conditions. The responsibility for water collection often falls on women and girls, exposing them to physical strain and limiting their time for other productive activities. With climate change exacerbating water scarcity, women and girls are forced to travel longer distances to fetch water, increasing their vulnerability to physical exhaustion and gender-based violence in remote areas. Additionally, traditional cooking methods using firewood increase women's exposure to respiratory illnesses, while children face heightened vulnerability to waterborne diseases such as cholera and malaria during flood events or water scarcity (UNICEF, 2021).

PWDs, particularly those with mobility impairments, face additional challenges in accessing safe water and sanitation, as inadequate infrastructure limits their ability to cope with extreme weather conditions.

5. Decision-Making and Leadership

Women's participation in decision-making processes remains minimal, with traditional norms often restricting their involvement in leadership roles. This exclusion undermines their ability to advocate for equitable resource distribution or influence policies that address their needs (Okyere-Nyako & Nsiah, 2016). Without female representation in climate governance, women's perspectives on adaptation strategies and resource allocation are often overlooked, leading to policies that fail to address their specific vulnerabilities. Men, who dominate leadership positions, are better positioned to leverage resources and shape community priorities. Similarly, PWDs face marginalization in decision-making due to stigma and limited accessibility to public forums, further deepening their vulnerability (UNDP, 2022). Ensuring inclusive governance that amplifies the voices of women and PWDs is critical to developing effective climate adaptation policies that address the unique risks faced by marginalized groups.

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3. Methodological Framework

3.1 Introduction

This section outlines the methodological framework used to assess climate vulnerability in Mion District.

3.2 Phases of the Assessment Process

The Climate Vulnerability and Risk Assessment (CVRA) for Mion District was implemented using a gender-sensitive, mixed-methods approach that blended qualitative and quantitative research techniques to capture the complexity of climate vulnerability and adaptive capacity among diverse community groups (**Figure 9**). The assessment framework was guided by Norman et al. (2014) and the IPCC AR5 risk model, which defines climate risk as a function of hazard, exposure, and vulnerability (**Figure 10**). This dual-framework approach ensured that the analysis was both scientifically robust and socially inclusive, emphasizing equity and intersectionality.

The methodology was executed through a three-stage process – Risk Identification, Risk Assessment, and Adaptation Planning and Validation – which integrated the four operational phases: desktop review, information synthesis, stakeholder consultation, and final validation. This allowed for a seamless workflow that was responsive to the lived experiences of women, youth, persons with disabilities (PWDs), and other marginalized groups in Mion District.

3.2.1 Stage 1: Risk Identification

This initial stage established the foundational understanding of Mion District's climatic context, exposure to hazards, and socio-economic vulnerabilities – particularly those that are gender-differentiated.

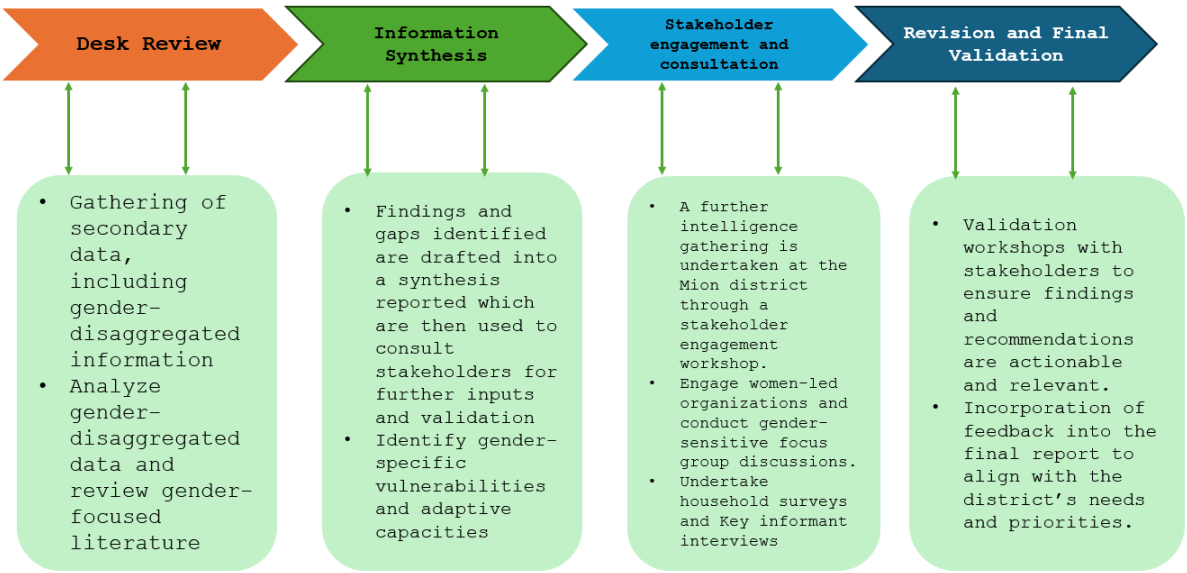
- **Desktop Review and Secondary Data Gathering:** A review of climate data, district development plans, policy reports, and existing academic and grey literature was undertaken to map historical and current climate risks, particularly focusing on droughts, floods, heatwaves, and wildfires. Special attention was paid to gender-disaggregated impacts and how structural inequalities shape vulnerability.

- **Identification of Key Hazards and Vulnerable Groups:** The review highlighted critical climate threats and their interplay with local livelihood systems. Vulnerable groups identified included women (especially those engaged in rain-fed agriculture), youth, the elderly, and PWDs—who face disproportionate exposure due to limited access to adaptive resources and institutional support.

- **Gender and Socio-Cultural Dynamics:** Analysis explored how traditional roles, social norms, and institutional exclusions contribute to gendered risks. For example, women's limited mobility and responsibility for water collection emerged as significant factors increasing their vulnerability to extreme heat and water scarcity.

- **Gap Analysis**: Significant data gaps were found, especially in localized perceptions of risk, community-level coping strategies, and gender-specific barriers to adaptation. These findings informed the design of subsequent primary data collection tools and participatory exercises.

Figure 9: Phases for the assessment process



3.2.2 Stage 2: Risk Assessment

This stage validated and deepened the desktop findings by evaluating identified risks through participatory, field-based engagements with community members and local institutions to understand their real-world implications.

- **Information Synthesis and Fieldwork Planning:** Data from the desktop review were integrated with national climate projections and vulnerability mapping to design a robust fieldwork strategy. A multi-tool approach was adopted to ensure that both quantitative data (*e.g.*, household surveys) and qualitative insights (*e.g.*, focus group discussions and key informant interviews) could be triangulated for a holistic view.
- **Stakeholder Consultations and Participatory Exercises:** The assessment team conducted extensive community engagement activities, beginning with a district inception workshop involving MMDA officials, traditional leaders, women-led CSOs, and civil society stakeholders. This was followed by participatory tools such as:
    - Hazard mapping
    - Resource mapping
    - Seasonal calendars
    - Historical timelines

  These tools facilitated the identification of risk hotspots, coping mechanisms, and institutional gaps.
- **Focus Group Discussions (FGDs):** Gender-segregated FGDs were held in 7 communities to capture the differentiated experiences of women, youth, men, migrants, and PWDs. These discussions revealed nuanced insights, such as how women's access to irrigation and extension services remains severely constrained, or how migration pressures affect youth adaptive strategies.
- **Household Surveys:** Quantitative data were collected through structured questionnaires administered to a stratified sample of households across the selected communities. The surveys gathered information on income sources, climate impacts, coping strategies, access to services, and decision-making roles—disaggregated by gender and other social markers.
- **Key Informant Interviews (KIIs):** Interviews were conducted with district planning officers, agricultural extension agents, health workers, traditional authorities, and representatives of

NGOs and CSOs. These interviews provided expert perspectives on institutional challenges, ongoing interventions, and capacity needs for gender-responsive adaptation.

- **Gender-Sensitive Risk Evaluation and Prioritization:** The assessment evaluated climate risks based on their likelihood, severity of impact, and the adaptive capacity of different population groups. For example, droughts were found to have a higher impact on women due to their reliance on rain-fed farming and limited access to coping mechanisms. A prioritization matrix was developed to guide the identification of the most pressing vulnerabilities.

3.2.3 Stage 3: Adaptation Action Plan

The final stage of the assessment process focused on translating the assessment findings into a comprehensive, gender-responsive Adaptation Action Plan for Mion District, while ensuring stakeholder validation and contextual relevance. This stage consolidated insights from the risk identification and assessment phases to develop actionable strategies aimed at reducing climate vulnerability, enhancing adaptive capacity, and addressing systemic gender inequalities.

3.2.3.1 Draft Report Compilation and Synthesis of Findings

A synthesis of quantitative and qualitative data gathered through household surveys, focus group discussions, key informant interviews, and participatory exercises formed the analytical basis of the draft report. The report outlined:

- A spatial and demographic profile of climate risks.
- Sector-specific vulnerability assessments (*e.g.*, agriculture, water, health).
- A synthesis of gendered adaptation capacities and constraints.
- An inter-community variation in sensitivity and adaptive capacity, offering a spatially differentiated understanding of risk.

3.2.3.2 Strategic Adaptation Measures

Building on these findings, the Adaptation Action Plan will propose a suite of targeted, evidence-based interventions to address the multifaceted dimensions of vulnerability in the district. These included:

- Construction of gender-sensitive water infrastructure (*e.g.*, boreholes, rainwater harvesting systems) to address both climatic and gendered water access constraints.
- Promotion of climate-resilient agriculture, including the adoption of drought-tolerant crops, soil conservation techniques, and agroforestry systems.
- Implementation of capacity-strengthening initiatives focused on women and youth, covering topics such as climate-smart farming, financial literacy, and livelihood diversification.

Each intervention was designed to be context-specific, equitable, and aligned with local development priorities.

3.2.3.3 Participatory Validation and Stakeholder Engagement

To ensure that the proposed measures were socially legitimate and locally grounded, a multi-stakeholder validation workshop was held on March 4, 2025. The session convened representatives from the Mion District Assembly, traditional authorities, women-led civil society organizations, development partners, and other key actors. The workshop provided a platform to present key findings, deliberate on strategic options, and collect feedback on the proposed adaptation pathways.

Participants provided critical reflections on both the process and outputs, particularly concerning the feasibility of interventions, institutional readiness, and barriers to implementation. These deliberations helped to ground the action plan in local knowledge systems and operational realities.

3.2.3.4 Incorporation of Feedback and Finalization of Recommendations

Feedback from the validation session informed revisions to the adaptation strategies, including refinements to gender-targeted actions, clarification of sectoral priorities, and identification of institutional roles and responsibilities. Emphasis was placed on ensuring that adaptation options:

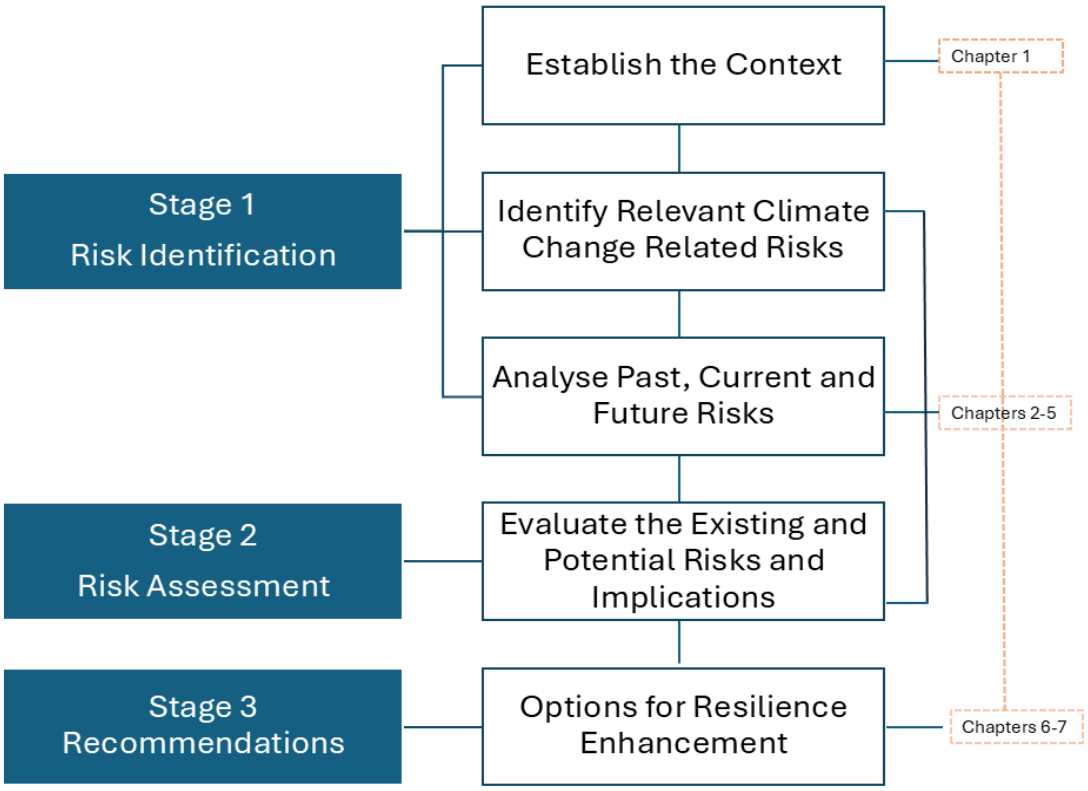
- Advance gender equity, particularly by enhancing women's access to climate finance, land, and extension service.
- Strengthen inclusive decision-making mechanisms, with representation of marginalized groups in local adaptation governance.
- Support the operational capacity of women-led organizations to drive community-based resilience efforts.

The finalized plan includes short- and medium-term actions that address social, economic, physical, and institutional dimensions of climate risk. It also outlines mechanisms for financing, coordination, and monitoring—serving as a practical tool for implementation by district authorities.

3.2.3.5 Alignment with Policy and Development Frameworks

The Adaptation Action Plan is fully aligned with Ghana's National Adaptation Plan (NAP), Nationally Determined Contributions (NDCs), and global frameworks such as the Sustainable Development Goals (SDGs) – notably SDG 5 (Gender Equality) and SDG 13 (Climate Action). By embedding equity and inclusion at its core, the plan contributes to both local resilience building and national climate policy coherence.

Figure 10: Three (3) stages process for gender-responsive approach to climate vulnerabilities assessment



3.3 Data Collection Approaches

3.3.1 Workshop and Participatory Exercises

Stakeholder engagements in climate change vulnerability and risk assessments are expected to be a participatory process to ensure the inclusion of diverse perspectives and knowledge, leading to more comprehensive and effective solutions. A consultative workshop was held to co-develop a district-specific risk and vulnerability assessment and formulate priority adaptation plans. The workshop focused on identifying the unique climate risks and vulnerabilities faced by the district, developing tailored adaptation strategies, and fostering collaboration to enhance resilience within Mion District's communities. A diverse group of relevant stakeholders attended, representing various sectors within the district, including district officials, government agencies involved in climate resilience, the private sector, local NGOs and CSOs, politicians, religious and traditional leaders, women's groups, persons with disabilities, the media, and other local stakeholders.

Photo 1: Photocall of participation in the first stakeholder engagement workshop at the Mion District Assembly building

To promote interactive learning and active stakeholder engagement, the workshop incorporated several participatory activities. These exercises were designed to enable participants to collectively explore vulnerabilities, assess climate risks, and visualize potential impacts. Activities included mapping of the most vulnerable and at-risk locations, hazard identification and prioritization, resource identification, a historical timeline of climate impacts, seasonality calendars, a matrix of function analysis for climate hazards, and a participatory selection of communities to include in a representative survey for gathering quantitative data on climate hazards and vulnerabilities in the Mion District. A dedicated session on Gender-Responsive Adaptation was also included, highlighting the differential impacts of climate change on men and women. This session emphasized the critical importance of incorporating gender considerations into effective adaptation planning.

The participatory workshop began with an introductory session that contextualized Ghana's National Adaptation Plan process and underscored the importance of conducting a vulnerability risk assessment specific to the Mion District Assembly. The session focused on the identification of key climatic hazards and vulnerability hotspots within the district. Subsequently, participants divided into smaller groups to pinpoint specific climatic risks, map areas and resources at risk, and exchange insights on existing community adaptation strategies.

Following these breakout sessions, participants reconvened in plenary to collectively prioritize hazards based on their severity and potential impact. The stakeholders were broken into groups to map out physical/resource, indicate climate trends, historical timeline and seasonality and opine on hazards or risks identification and prioritization for the district, vulnerability matrix and analysis, livelihood risks and explore coping patterns and adaptation strategies/options.

3.3.1.1 Matrix of Function Analysis

The Matrix of Function (MoF) is a spatial planning tool which describes or signals aspects of adaptive capacity. Applied to climate change, a matrix of function increases understanding of how the current spatial structure of the district enables or inhibits the adaptive capacity and resilience of the area to the changes in climate and associated impacts. The matrix involves identifying various climate hazards – such as droughts, floods, or heatwaves – and mapping them against essential functions that may be affected by these hazards. This process helps in understanding the vulnerability of different sectors and identifying critical areas where adaptation or mitigation strategies are needed. By using the matrix, decision-makers can prioritize actions based on the severity of impacts, the resilience of each sector, and the capacity for response, ensuring a more targeted and effective approach to addressing climate risks.

3.3.1.2 Participatory Expert Selection of Study Communities

The workshop further facilitated the co-identification of communities for both qualitative discussions and the quantitative survey. Qualitative data, obtained through focus group discussions, provided context and deeper insights into community perceptions and experiences, complementing the findings from the quantitative analysis of the district's climate risks. Quantitative data, including statistical records on climate patterns, hazard frequencies, and resource conditions, supported the data-driven approach to assessing vulnerabilities and planning adaptive measures.

The participatory process for selecting communities was based on levels of vulnerability agreed upon by stakeholders in Mion District. Facilitated discussions were held to identify communities most vulnerable to climate hazards, considering factors such as exposure to risks, socio-economic conditions, and existing adaptive capacities. Each community's vulnerability was assessed and categorized into three levels: low, moderate, and high. Based on this assessment, stakeholders assisted in the selection of communities for the survey, prioritizing those with higher levels of vulnerability to ensure that the most at-risk populations are adequately represented. The approach also allowed stakeholders to ensure that the selected communities reflected the diverse climate risks across the district, capturing the perspectives of those most affected by climate change.

Table 3: Communities selected for FGD and survey

No.	Level of Vulnerability	Selected Community for FGDs	Selected Community for Survey
1	3=High	Zuro	Zuro
2	3=High	Kpumi	Kpumi
3	3=High	Nyentuo	Nyentuo
4	3= High	Palari	Palari
5	3= High	Dijeo	Dijeo
6	3= High	Kayong	Kayong
7	2= Moderate		Sang

3.3.2 Focus Group Discussions

The methodology for conducting Focus Group Discussions (FGDs) in Mion District was designed to gather qualitative data that would complement the quantitative survey on climate risks. Each FGD aimed to explore community members' perceptions of climate risks, how these risks have impacted their daily

lives, and the challenges they face in adapting to climate change. The FGDs were designed to include diverse participants, particularly focusing on women, youth, persons with disabilities, migrants and the elderly to capture their varied experiences. The discussions were guided by a set of semi-structured questions which explored:

- The impact of climate change on the district's vulnerable communities, focusing on observed changes,
- Current adaptation practices, needs for future adaptation, and
- The sustainability of adaptation actions.

The FGD methodology was participatory and community-driven, ensuring the inclusion of diverse groups and especially the voice of women.

3.3.2.1 Data Collection Process

The FGDs were conducted in person, in each of the selected communities, with groups typically consisting of 8-12 participants. Data was collected through audio recordings, with consent from all participants, and detailed notes were taken to capture key points and insights. The sessions were facilitated by trained moderators who were familiar with the local context and climate issues. To ensure the discussions were gender-responsive and inclusive, separate FGDs were conducted for women and men, after general group discussions. This facilitated a more focused discussion on the specific challenges faced by these groups in adapting to climate risks. It also helped to navigate some cultural and social norms which impeded the voice of women from being heard.

3.3.2.2 Data Analysis

After the FGDs, the qualitative data was transcribed, coded, and analysed thematically. Thematic analysis was used to identify common patterns and emerging themes related to the impacts of climate hazards, vulnerabilities, and adaptation strategies. This analysis was then compared with the quantitative data from the surveys to provide a richer understanding of the district's climate risks and the effectiveness of current adaptation measures. The insights gained from the FGDs plays a crucial role in validating the findings from the quantitative survey and in shaping the district’s adaptation planning, ensuring that the strategies were informed by the lived experiences of the communities most at risk.

3.3.3 Household Questionnaire Surveys

3.3.3.1 Survey Design

Household questionnaire surveys were conducted to quantitatively assess the socio-economic, environmental, and adaptive capacities of households across 7 selected communities in the Mion District. The survey captured data on variables such as income sources and levels, asset ownership, agricultural practices, barriers to resource access, and adaptive strategies. A total of 148 households were surveyed, representing a structured approach to data collection across the district.

The sample size was determined based on the number of households in the district, rather than the total population, to ensure a focus on household-level dynamics. The District Planning Officer of Mion District assisted in sampling the households to ensure representativeness across the communities. Stratified random sampling was employed to capture a diverse range of household characteristics, including gender representation.

3.3.3.2 Data Collection

The data collection process included face-to-face interviews with the head of each selected household. Trained enumerators administered structured questionnaires that covered topics such as climate change perceptions, vulnerabilities, adaptive practices, and community-based responses to climate risks. Data collection was completed between November 21-28, 2024.

3.3.3.3 Data Analysis

Data analysis focused on understanding the gendered dimensions of climate vulnerability, exposure, sensitivity, and adaptive capacity. Household demographics, including the gender of the household head, composition, and the presence of differently-abled individuals, were examined to understand how these factors influenced decision-making and resource access. Economic variables highlighted gender-based disparities in resilience strategies. Additionally, perceptions of climate change impacts were explored, revealing gender differences in how men and women experienced climate risks.

The analysis also assessed gender differences in household vulnerability, exposure to climate hazards, and sensitivity to sectors like agriculture, health, and infrastructure. Social roles were examined to understand the gendered impacts of climate change, particularly how women faced increased workloads and income loss. Women's involvement in decision-making and adaptation strategies was compared to that of men, shedding light on gender inequalities in response to climate risks.

Finally, the analysis explored gender disparities in access to resources for adaptation. It also looked at gender differences in adaptive capacity and the role of local organizations in supporting women's adaptation to climate change.

3.4 Climate Projections Methodology

Assessing the historical climate projections for Mion District in this study involved analysing datasets and employing local stakeholder contributions to present projections particularly to the context of Mion.

3.4.1 Projection Data Sources

The study relied on three key datasets to analyse historical and projected climate conditions in Mion

1. **CHIRPS (Climate Hazards Group InfraRed Precipitation with Station data):** Daily precipitation data from CHIRPS, with a spatial resolution of 0.05°, was used to examine variability in rainfall patterns across the district.
2. **ERA5 Reanalysis:** Hourly temperature records from ERA5, available at a spatial resolution of 0.25°, facilitated the assessment of temperature extremes over time.
3. **CMIP6 (Coupled Model Intercomparison Project Phase 6):** This dataset provided multi-model climate projections necessary for evaluating future scenarios of rainfall and temperature extremes under various Shared Socio-Economic Pathways (SSPs).

3.4.2 Projection Period

The historical analysis focused on the period 1991-2020, aligning with IPCC's framework for climate studies. This timeframe enabled a comprehensive examination of past trends in precipitation and temperature extremes. Projections were carried out for near-term (2021-2040), mid-century (2041-2060), and end century (2081-2100) intervals, offering insights into anticipated climatic changes across different time scales.

3.4.3 Projection Analysis

The analysis aimed to investigate patterns and changes in climate extremes, focusing on rainfall and temperature variations over time and evaluating potential shifts under different climate scenarios, while integrating stakeholder inputs to ensure the findings were locally relevant and actionable for decision-making.

To examine climate extremes, specific indices were used to measure variability in rainfall and temperature. Rainfall metrics included indicators like the most intense one-day rainfall (Rx1day), total rainfall over five consecutive days (Rx5day), prolonged dry spells (CDD), and extended wet periods (CWD), as well as rainfall exceeding the 95th percentile (R95p). For temperature, metrics captured extremes such as the highest and lowest daytime and night-time temperatures (TXx, TNx, TXn, TNn),

which shed light on heatwaves, cold snaps, and other extreme events. The analysis followed a structured six-step approach.

1. First, data on rainfall and temperature was sourced from CHIRPS and ERA5 for past records, while CMIP6 data informed projections.
2. Second, rigorous quality checks ensured accuracy, and daily data was summarized into seasonal and annual formats to compute indices.
3. Third, extreme climate indices were derived using tools like ClimPACT2.
4. Fourth, trend analyses employed statistical methods such as the Mann-Kendall test and Sen's slope estimator to detect significant changes.
5. Fifth, future projections under different SSPs were analysed to anticipate shifts in climate indices.
6. Lastly, community input, including participatory mapping and seasonal calendars, enriched the interpretation, grounding results in the local context.

Table 4: ETCCDI climate indices

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.	Indicates 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

Category	Metric	Description	Interpretation	Units
	TXn	Minimum daily maximum temperature: The lowest daytime high temperature recorded in a given year or season.	Highlights cooler days, potentially beneficial during extreme heat periods but also indicative of cold snaps or unseasonal weather.	°C
	TNn	Minimum daily minimum temperature: The lowest nighttime temperature observed in a given year or season.	Reflects the occurrence of cold nights, important for assessing frost risks, agricultural impacts, and extreme cold weather events.	°C

4. Findings and Implications

4.1 Stakeholder Engagement

4.1.1 Mapping of Most Vulnerable and At-Risk Locations, Hazard Identification and Prioritization

Carefully identified stakeholders were put into different groups and tasked to map out physical/resources in different parts of the districts. They were also asked to identify hazard or risk-prone areas in local communities. Different maps were later shared to the larger group with each group also indicating how people living in and around these hazards organize their lives from either an adaptation or coping perspective.

Vulnerable and Disaster-Prone Areas

Participatory risk and vulnerability mapping led to the identification of several areas within Mion District which were considered highly vulnerable to environmental hazards highlighting the need for targeted interventions to address the district's varied environmental challenges with a particular emphasis on gender-sensitive solutions to mitigate impacts on vulnerable populations. Identified vulnerable areas include:

Flood-Prone Zones

- Communities such as Zuro, Dijeo, Kayong, Tijo and Namvili (dagogyili) experience frequent and intense flood events that threaten livelihoods, destroy critical infrastructure such as schools, roads, medical facilities (CHIP compounds), as well as disrupt agricultural activities.

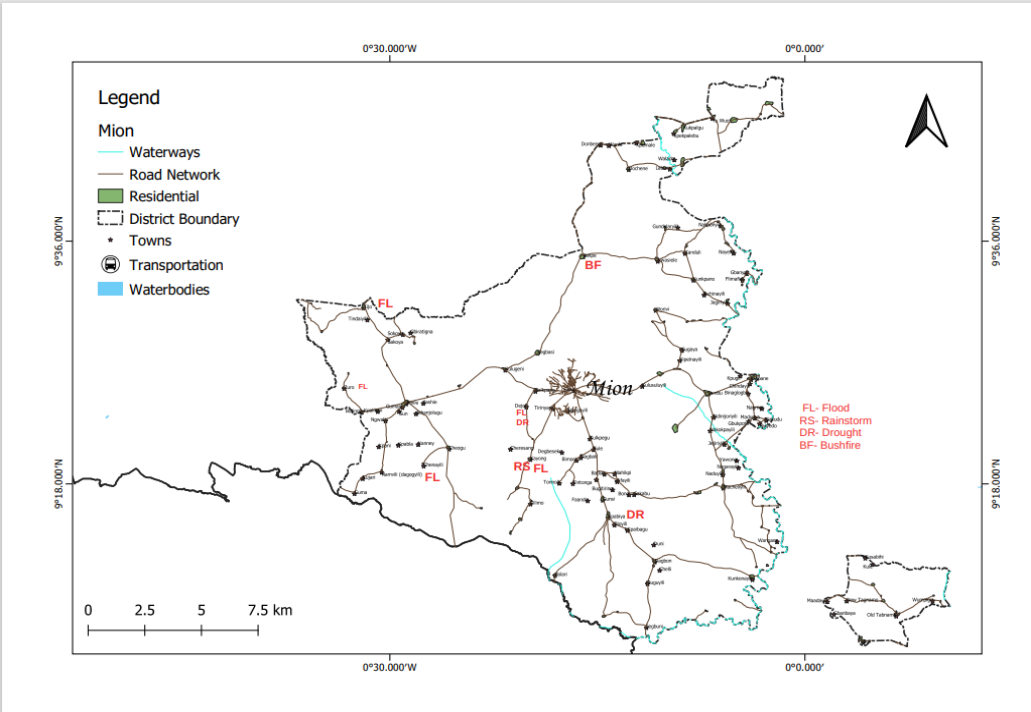
Bushfire zones

- Farmlands across the Mion District are at high risk of bushfires during the dry season, typically from January to April.
- Forested zones such as Sekpe, Palari, Kayong are especially prone to bushfires.
- Bushfire events in the Mion District are attributed to the practice of charcoal burning especially by women and the youth as an alternative source of livelihood during the dry season, and the burning of vegetation by Fulani herdsmen to encourage the growth of fresh grass. These practices increase the susceptibility of these areas to both bushfire and droughts.

Drought-Prone Areas

- Communities like Zuro suffer from severe water scarcity which affects both agricultural productivity and domestic water supply.
- Drought conditions are particularly significant for women, who bear the primary responsibility for water collection, compounding their vulnerabilities and workloads.

Figure 11: Hazard mapping by stakeholders in Mion District



As depicted in **Figure 11**, stakeholders identified hazard or risk-prone areas in the local communities of the Mion District. The map highlights flood-prone areas near water bodies, drought-affected zones in water-scarce regions, and locations susceptible to rainstorms and bushfires. It serves as a valuable tool for understanding hazard distribution and informing climate adaptation and disaster management efforts in the district.

Addressing the district's exposure to floods, bushfires, and droughts calls for deliberate, well-coordinated interventions that enhance community resilience and protect livelihoods. Given the central role women play in agriculture, water collection, and household well-being, any adaptation strategy must prioritize their specific needs with a view to enhancing their capacity to respond to climate-related challenges. Efforts should focus on strengthening climate-resilient infrastructure, promoting sustainable land and water management practices, and implementing inclusive disaster preparedness plans. These measures are essential to reducing the long-term impacts of environmental hazards and fostering equitable development across the district.

4.1.2 Historical Timeline of Major Climate Induced Events

Relying on their individual and collective historical memories, stakeholders recounted major climate-induced events in Mion detailing the year, extent of damage and sectors most affected. These historical climate events, spanning several decades, highlight a recurring pattern of droughts, floods, and other extreme weather conditions that have significantly disrupted agricultural activities, damaged infrastructure, and strained water resources. Stories about the different events were told to detail the extent and nature of climate variability and associated vulnerabilities in the various communities, and the urgent need for adaptive strategies to build resilience across sectors. Agriculture emerged as the most frequently impacted sector, often suffering from crop failure, livestock losses, and food insecurity due to these climatic shocks.

Table 5: Historical timeline of climate events in Mion District

Year	Climate Event	Description of Damage	Sector of High Impact
2024	Prolonged drought	Reduced crop yields, worsened by bird invasions, leading to food insecurity and economic hardship	Agriculture
2022	Flood	Destroyed major farms, caused soil erosion, affected infrastructures	Agriculture Infrastructure
2021	Drought	Water stress Affected farming activities	Agriculture Water resources
2020	Bushfire	Crops were burnt	Agriculture
2010	Drought	Farms were affected	Agriculture
2007	Flood	Crops and animals were affected	Agriculture
1992	Drought	Water shortage Destruction of farms	Agriculture
1989	Flood	Crops were washed away, dams overflowed its bank	Agriculture

4.1.3 Seasonal Calendars of Climate Hazards

Seasonal Calendar Analysis was employed as a tool to understand historical weather patterns and activity trends, and to provide insights into what has changed and how these changes have affected livelihoods, agricultural cycle, water availability and community coping over time. Participatory processes were used by stakeholders to develop a seasonal calendar of Mion. The calendar, developed from the memories of stakeholders, revealed notable changes in the traditional or historical seasonal weather patterns that guides agricultural activities, which, undoubtedly, forms the backbone of livelihoods for most communities and households in the district.

In the context of the Mion District, the seasonal calendar serves as an annual framework that outlines socio-economic and livelihood activities – primarily agricultural practices – aligned with the distinct dry and wet seasons and their defining characteristics. It includes key timelines for planting, harvesting, periods of intense rainfall, drought occurrences, and other significant seasonal events that influence farming.

Table 6: District seasonal calendar

Season (length)	Key Events (Annual Cycle)	Typical Climate	Observed Changes	Observed Impacts
Dry season (November - March)	Harvesting Hunting Building of houses	Hot temperatures Low humidity Foggy weather Extreme heat	Increase in temperature Shift of seasons	Drought Increase in malaria and (cerebro-spinal meningitis) CSM, water shortage Increase in bush burning Post-harvest losses
Major rainy season (April - September)	Planting Fertilizer application Land preparation	Rainstorm High Humidity Rainfall Moderate temperature	Cloudy atmosphere Decline in rainfall Shift in the rainy season	Annual floods, erosion, increase in malaria, pest, and parasite invasion
Minor rainy season (September - November)	Mounding Site selection Ploughing	Little rainfall Dusty	Relatively cold at night and hot during the day Light rains Thunderstorm Minimal rainfall	Outbreak of disease, low yields on crops, bush burning

Agricultural Productivity and Planning

Agriculture, which forms the backbone of livelihoods in the district, is deeply affected by seasonal patterns. During the dry season (November–March), activities such as planting yam, peeling cassava, and preparing farmland dominate. However, the harsh climatic conditions – characterized by strong winds, intense heat, and low humidity – create significant barriers to productivity. These factors accelerate the loss of soil moisture, impede crop germination, and expose farmland to degradation. Farmers are left grappling with declining yields and increasing pressure to sustain their households.

In contrast, the major rainy season (April–October) offers opportunities for land preparation, planting, and practicing essential agronomic activities. Yet, erratic rainfall patterns and prolonged droughts disrupt planting schedules and negatively impact crop growth. Heavy rains often lead to flooding, soil erosion, and nutrient depletion, which further diminish yields. Increased pest infestations and diseases during this period exacerbate the challenges, reducing agricultural output and threatening food security. Post-harvest losses, particularly for crops like cassava and maize, become a significant concern due to high humidity and inadequate storage facilities.

Water Resource Availability and Management

The availability of water in the district follows the seasonal shifts, creating distinct challenges during the dry and rainy seasons. The dry season sees water bodies drying up, leading to acute water scarcity for irrigation, livestock, and domestic needs. This scarcity disproportionately affects women and children, who are primarily responsible for fetching water. The physical strain and time required to access distant water sources significantly reduce their ability to participate in income-generating activities or attend school.

The rainy season brings an abundance of water but also presents challenges such as flooding and contamination. Flooded rivers and streams often introduce pollutants into the water supply, heightening the risk of waterborne diseases. The lack of reliable water infrastructure in the district exacerbates these risks, as communities struggle to access clean and safe water during periods of heavy rainfall.

Livestock and Livelihood Resilience

Livestock rearing, an integral part of livelihoods in the district, is heavily influenced by seasonal conditions. During the dry season, high temperatures and scarce water sources lead to reduced pasture availability and increased livestock mortality. These losses disproportionately affect smallholder farmers who depend on livestock as a source of income and food. Without adequate fodder and water, livestock productivity declines, further compounding economic pressures.

While the rainy season alleviates water scarcity, it introduces new challenges for livestock health. Increased pests and diseases, such as tick infestations and foot-and-mouth disease, pose significant threats to animal well-being. Farmers are often unprepared to address these health risks, leading to economic losses and reduced household resilience.

Human Health and Well-Being

Seasonal changes in climate significantly influence health outcomes in the district. The dry season's combination of extreme heat and low humidity contributes to heat stress, dehydration, and a rise in febrile illnesses such as malaria and respiratory infections. Vulnerable groups, including children, the elderly, and persons with disabilities, face heightened risks during this period due to limited access to healthcare and preventive measures.

In the rainy season, stagnant water from floods creates ideal breeding grounds for mosquitoes, leading to increased cases of malaria. Additionally, contaminated water sources heighten the prevalence of waterborne diseases such as diarrhea and cholera. These health risks disproportionately affect children, whose weaker immune systems make them more vulnerable to infections. Women, as primary caregivers, bear the burden of managing these health crises, further straining their time and resources.

Environmental and Ecological Impacts

The district's natural resources are significantly impacted by the seasonal climate variations. During the dry season, the drying of water bodies and loss of vegetation accelerate land degradation, reducing the productivity of farmlands and threatening biodiversity. High winds exacerbate soil erosion, leaving fields barren and unsuitable for planting.

The rainy season, while replenishing water bodies, leads to severe soil erosion and sedimentation in rivers due to heavy rains. Poor land management practices amplify these effects, undermining the sustainability of natural resources and increasing vulnerability to future climate stresses.

4.2 Quantitative and Qualitative Analysis

4.2.1 Demographics of Households Engaged

The survey targeted randomly selected household heads in Mion District, encompassing a total of 107 respondents from six communities (**Table 7**). Among them, 64.9% were male household heads, while 35.1% were female. A significant majority of respondents (89.6%) were married, while the remaining were single (5.7%), divorced (3.8%), or separated (0.9%).

Educational attainment among respondents varied considerably, with a notable 73.0% having no formal education, making this the most prevalent educational status. A very small number (27.0%) had attained basic to secondary education, underscoring a substantial educational gap within the district, particularly in access to higher education and skill-based training.

Table 7: Distribution of respondents interviewed in each community

Town	No. of Respondents	Percentage
Zuro	18	12.16
Kpumi	18	12.16
Nyentuo	18	12.16
Palari	18	12.16
Dijeo	19	12.84
Kayong	16	10.81
Sang	41	27.7
Total	**148**	

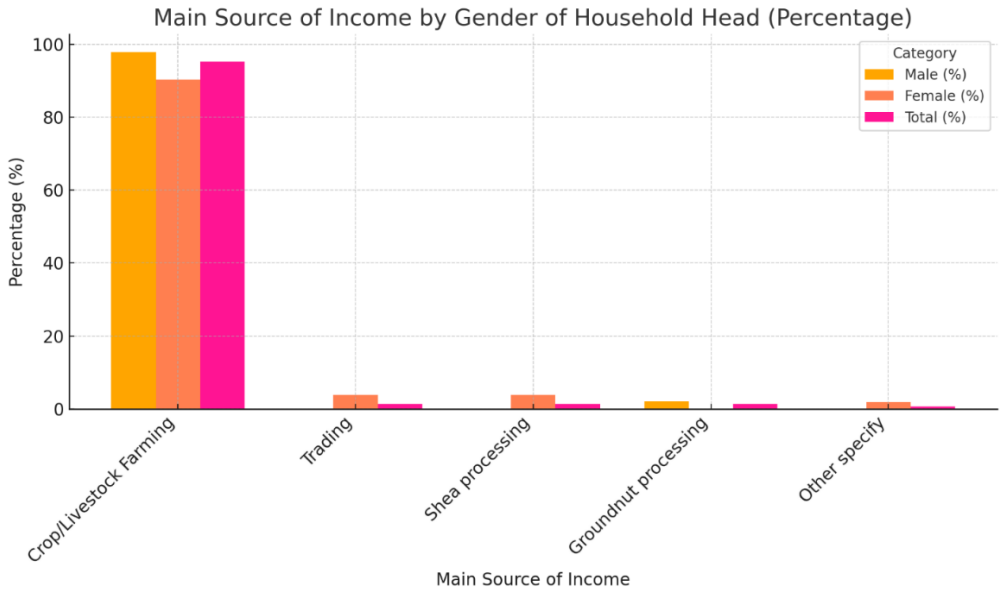
Data from Sang served as a mop up data to boost the voice of female-headed households and to provide deeper understanding and appreciation of gendered disparities in the district. This additional data became necessary because earlier identified communities were much smaller in sample sizes and presented peculiar situations of no or very few female-headed households. This necessitated the identification of Sang, the district capital, with a much larger and socially diverse population, as an additional community for a biased focus on female-headed households. The relatively larger population of Sang gave us access to a larger sample group of female-headed households that validated early data from the smaller communities.

4.2.2 Economic Vulnerability

Agriculture serves as the backbone of Mion District's economy, a fact reinforced by survey results indicating that 95.3% of respondents are primarily engaged in crop and livestock farming (**Figure 12)**. However, while both male and female household heads participate in agricultural activities, men tend to dominate decision-making and control over farm resources, with women often playing supportive or secondary roles in farm management.

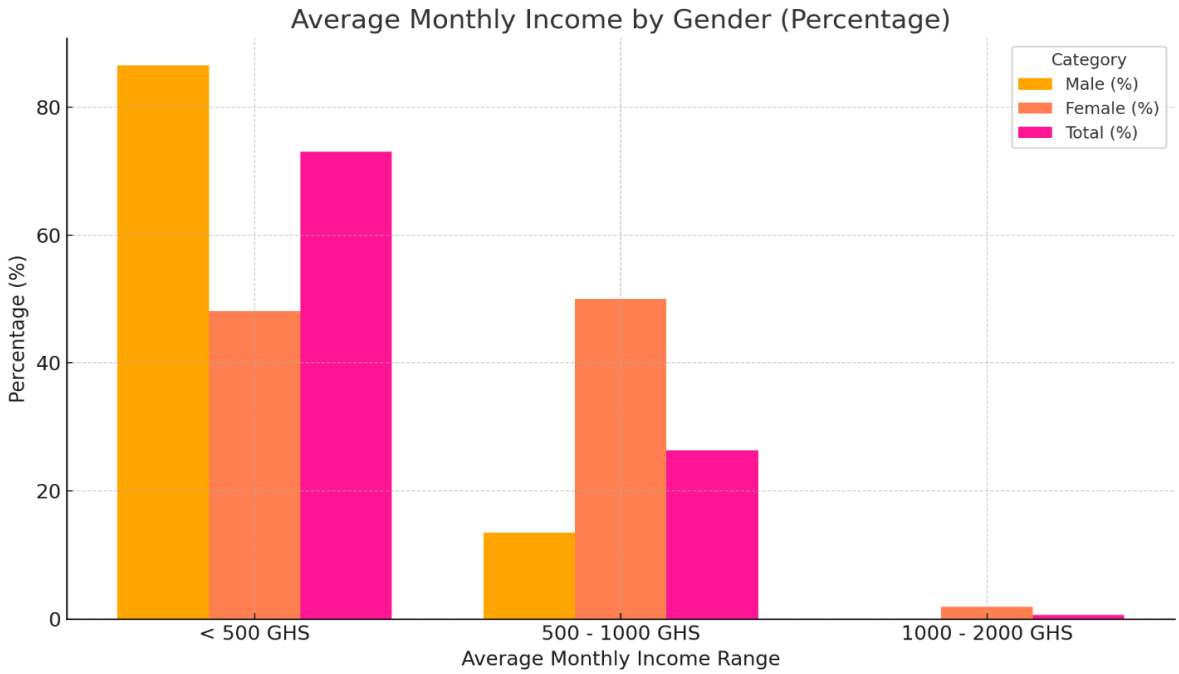
Trading in Shea butter, and groundnut processing represent the second most common source of income, with higher female participation in these activities. As demonstrated in **Figure 12**, these ventures contribute to less than 5% of total household income, highlighting a significant disparity in income-generating opportunities between men and women in the district.

Figure 12: Main source of income for residents in Mion District



As depicted in **Figure 13** below income distribution in households show significant disparity, with 73.0% of respondents earning less than 500 GHS per month. This disparity signals widespread economic vulnerability and limited purchasing power. A relatively smaller number of respondents (26.4%) earn between 500 and 1000 GHS, while (0.9%) earn between 1000-2000 GHS. This income dynamics reflects a limited presence of higher earners in the district and a major indication of vulnerability. Low earnings restrict upward economic mobility while also ensuring the perpetuation of poverty and vulnerability. The findings underscore the need for targeted development strategies aimed at raising income levels as an avenue to building economic resilience across all households.

Figure 13: Average monthly income of residents in Mion District



In Mion District, land ownership is the most commonly reported form of asset ownership, with 27.4% of respondents indicating they own land. However, gender disparities are evident, with 91.1% of those owning land being male compared to 8.9% female landowners, reflecting unequal access to this vital resource. This stark gender disparity highlights women's vulnerability in multiple ways. Limited land

ownership restricts women's participation in commercial farming, confining many to subsistence agriculture, which is characterized by lower productivity and low earnings. Without land security, women struggle to access agricultural credit, investment opportunities, and the ability to expand their farms into more profitable enterprises. This lack of ownership further entrenches economic dependence on male family members, limiting women's financial autonomy and decision-making power within households.

Poultry ownership follows a similar trend, with 16.7% of respondents owning poultry, made-up of 87.3% male-headed households, compared to only 12.7% female-headed households. Given the critical role of livestock and poultry in Mion District – providing income, nutrition, and financial stability – the low-ownership rates among women is particularly instructive as it limits their ability to diversify their livelihoods and build resilience against climate-related shocks. It also has significant nutrition and health implications as they lack the power and freedom to make dietary decisions. Women restricted access to livestock ownership also reduces their ability to generate independent income and, in the process, perpetuates their economic reliance on men. Women are therefore left more exposed to financial hardships during droughts, livestock diseases, market disruptions and other shocks.

House ownership, reported by 15.5% of respondents, is a key indicator of wealth accumulation in Mion District. However, the data highlights significant gender disparities, with women having limited access to property ownership. This limited access restricts women's financial security and economic independence. Since housing often serves as collateral for loans, the lack of homeownership among women reduces their access to credit and opportunities for economic advancement. Furthermore, without secure housing, women are more vulnerable to displacement and housing insecurity. This lack of ownership also diminishes their bargaining power in household decision-making. Addressing these barriers to property ownership is essential for reducing gender-based economic inequality and supporting women's resilience to climate and economic shocks.

Like most communities in northern Ghana, bicycles and motor bikes are critical assets and a major means for mobility. Bicycles are more commonly owned (14% of respondents) than motorbikes (5.5%), but both are largely owned by men. The disparity in popularity of bikes and motorbikes is due to cost and reflects the fact that most people are more able to afford bicycles than motorbikes.

Women's lack of ownership to critical means of transportation limits their access to independent transportation, mobility, market access and economic opportunities. Reality is, without personal transportation such as bikes or motorbikes, women are left with no choice but to depend on male family members for mobility. This, as indicated, reduces their ability to make independent economic decisions, engage in time-sensitive commercial activities, or respond effectively to household emergencies. Limited mobility and especially among women, increases their vulnerability to economic and social exclusion and reinforces traditional gender roles that restrict women's participation in income-generating activities.

4.2.3 Climate Awareness and Perception

Perceptions of climate change are shaped largely by the direct effects on individuals' experience, and the frequency of extreme weather events. These local impacts serve as a primary source of knowledge, leading communities to develop their understanding of climate change based on tangible, observed consequences rather than scientific projections (Sambrook, 2021).

Majority of the respondents (95.3%) report having noticed changes in weather patterns over the past 10 years. Some focus group participants in the different communities lamented on the changing climate patterns through the following direct quotes:

"For the past 10 years, we have experienced changes in rainfall, that is, changes in the volume of rain. The seasons we expect heavy rains, less falls and the season we expect less rains more falls", Woman, Nyentoo
"*Over the past 10 years, the heat we experience is unbearable causing diseases such as malaria, asthma, tuberculosis, chicken pox. We were not feeling this type of heat previously". Woman, Zuro*
"Currently, it is not raining normally, it is raining too much, which is not supposed to be so. The excess rains are destroying our crops". Man, Zuro
"Over 10 years now, we have experienced prolonged droughts in unfamiliar season. The droughts negatively affect our farming activities and our health". Elder, Kayong

It is instructive to note that '10 years' continue to be mentioned as a threshold or timeline for the observation of climate change conditions in most communities. While this may not be exactly accurate, it points to growing awareness of the climate change phenomenon and experience of associated adverse impacts in local communities. Participants' views on changes in weather patterns were attributed to their observations and experiences of rainfall variability, temperature increase and how these are affecting the historical or traditional seasonal calendar of events, especially in agriculture.

The quantitative survey revealed that the perceived impacts of climate change are largely related to the agricultural sector. Respondents indicated that changes in rainfall patterns have generally reduced crop yields (26.6%), damaged properties (22.4%), led to loss of livestock (20.1%), made accessing water difficult (19.5%), increased food insecurity (10.7%) and increased salt intrusion into drinking water sources such as boreholes and on farms as a result of excessive ground water extraction (0.8%). Focus group discussions (FGDs) revealed similar concerns, with participants sharing their experiences of climate impacts on various aspects of household welfare and community life. Below are some relevant direct quotes:

Livestock
"*Floods affect our livestock by leading to the breeding of diseases such as anthrax, bird flu, which affects our animals". Youth, Dijeo*
"*During droughts, the animals are not able to get access to water and that leads to the death of some of them." Man, Palari*

Agriculture
"The way we farm and harvest is not the same as compared to the past years. At first, we do not apply fertilizers, but now due to the low yields we apply fertilizers and even with that, we still experience low yields". Man, Zuro
"Droughts negatively affects our crops. They lack water and dry up". Woman, Kayong
"During drought moments, the soil becomes hard that we cannot plant. Even to plant, we exert so much energy in tilling the soil making farming difficult". Man, Zuro

Water Resource
"During drought, our main source of water which is the Savwali stream gets dried up. We travel long distance to access water". Youth, Zuro
"During flood we are unable to access the stream because the road gets flooded". Woman, Zuro

Human Health
"The heat is too much that, women working in the farm experience severe headaches and other diseases. And because of the extreme heat, the duration we spend on our farms are reduced to prevent sickness". Man, Kayong
"We are now battling with diseases that previously it was not so. The diseases we now experience are malaria, chicken pox, tuberculosis". Woman, Palari

Infrastructure
"When there is a heavy downpour of rain, the road we use to access our farms, market, hospitals get flooded. We would have to wait till the road is clear". Youth, Nyentoo
"When there is a heavy downpour of rain, our buildings are destroyed". Man, Dijoe

Findings from the survey also indicated how extreme weather events, as experienced in Mion District, have had significant socio-economic impacts on their community. The most reported impacts include damage to homes and infrastructure (32.6%), displacement (27.0%), loss of livelihoods (26.3%), psychological stress (12.3%), and increased conflict (1.8%). These statistics highlight the widespread disruption caused by climate-related hazards, affecting both the physical and mental well-being of residents. Displacement and loss of livelihoods are particularly concerning, as they threaten long-term economic stability and force affected individuals to adopt coping mechanisms that may not be sustainable.

To mitigate these challenges, households have adopted a mix of coping strategies and long-term adaptation measures. While some of these responses—such as rainwater harvesting and livelihood diversification—are short-term coping mechanisms aimed at immediate relief, others demonstrate more

sustainable, long-term adaptation. The most widely adopted strategies include improved crop varieties (19.6%), soil conservation techniques (18.1%), and agroforestry (18.1%). The high uptake of improved crop varieties suggests a preference for drought-resistant and high-yielding seeds to counter erratic rainfall and rising temperatures. Meanwhile, the adoption of soil conservation techniques and agroforestry reflects growing awareness of sustainable land management practices that enhance soil fertility, increase biodiversity, and strengthen ecosystem health—key components of long-term resilience.

Other notable adaptation strategies include water conservation (14.7%) and crop diversification (13.1%), which play crucial roles in reducing water scarcity and increasing agricultural resilience. Additionally, livelihood diversification (9.6%) reflects a shift toward reducing reliance on agriculture by engaging in alternative income-generating activities such as trade, handicrafts, and agro-processing. Economic diversification, however, remains a challenge for many as limited access to vocational training, capital, and markets restrict the ability of households to develop alternative livelihoods. Migration (1.8%) is often pursued as a last-resort strategy, typically when local agricultural conditions become unsustainable due to prolonged droughts or declining soil fertility.

There is a clear gender disparity in the adoption of adaptation strategies. For instance, 92.1% of those adopting improved crop varieties and 95.7% of those using soil conservation techniques and agroforestry are male. In contrast, strategies such as rainwater harvesting (81.8%) and irrigation (66.7%) see higher uptake among women. This disparity suggests that men have greater access to resources, agricultural training, and decision-making authority, enabling them to implement a broader range of adaptive responses. In contrast, women's participation in climate adaptation remains limited due to structural barriers, including restricted land ownership, financial exclusion, and socio-cultural norms that limit their involvement in agricultural decision-making. Women are therefore left with fewer adaptation options, making them more vulnerable to climate shocks and economic instability.

4.2.4 Household Physical Vulnerability

The vulnerability of households to climate hazards was assessed by analysing respondents' exposure and sensitivity to extreme weather events. According to the Intergovernmental Panel on Climate Change (IPCC, 2022), vulnerability to climate change is determined by the predisposition of an area, community, or household to be adversely affected. It encompasses factors such as sensitivity to harm and the lack of adaptive capacity, which influence the extent to which a system or population is likely to experience climate-induced damage. Therefore, understanding exposure and sensitivity is essential in identifying the degree of climate risk households face and their ability to cope with and adapt to these threats.

4.2.4.1 Exposure to Hazards

The survey data, illustrated in **Figure 14**, provides insights into household exposure to climate hazards over the past five years, revealing varying levels of impact across different hazards and notable gender differences. Drought emerged as the most significant concern, with 50.7% of respondents reporting experiencing it often (52.1% of male respondents and 48.1% of female respondents), while 40.5% experienced it sometimes (42.7% male, 36.5% female). A smaller number, 2.7%, experienced it very often, and only 1.4% – all male – indicated they had never experienced drought in the past five years.

Similarly, extreme heat was a prevalent hazard, with 50.0% of respondents experiencing it often (53.1% male, 44.2% female), and 45.9% reporting that they had experienced it sometimes (42.7% male, 51.9% female). A further 2.7% (all males) reported experiencing it very often, while only 1.4% of female respondents indicated they had rarely experienced extreme heat.

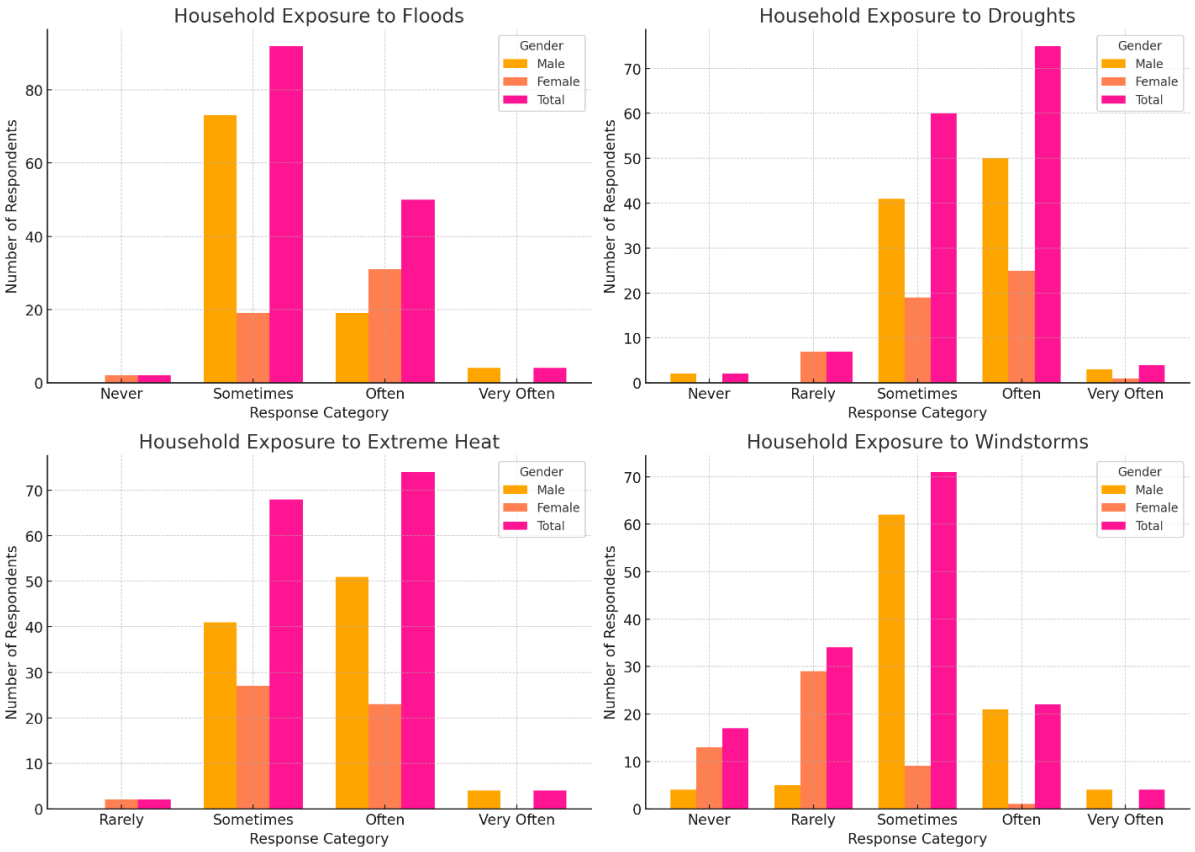
With regard to flooding, 33.8% of respondents experienced it often (19.8% male, 59.6% female), and 62.2% experienced it sometimes (76.0% male, 36.5% female). A small proportion (2.7%) experienced flooding very often (all male), while 1.4% of female respondents had never experienced it. Despite its relatively lower frequency compared to drought and heat, flooding remains a significant hazard due to its potential for sudden and severe disruption to livelihoods and infrastructure.

Windstorms were also widely reported, with 48.0% experiencing them sometimes (64.6% male, 17.3% female) and 14.9% often (21.9% male, 1.9% female). 2.7% (all male) had experienced them very often,

while 23.0% reported experiencing them rarely (5.2% male, 55.8% female), and 11.5% had never experienced them (4.2% male, 25.0% female).

As shown in **Figure 14**, the findings reveal notable gender disparities in exposure to climate hazards in the Mion District. Male-headed households generally reported higher and more frequent exposure to drought, extreme heat, and windstorms, likely due to their direct engagement in farming, herding, and other outdoor labour activities. In contrast, female-headed households, though less represented in some categories, reported disproportionately higher exposure to flooding, and are likely affected in indirect yet severe ways – such as through increased domestic burdens, water scarcity, and food insecurity triggered by these climate shocks.

Figure 14: Household exposure to climate hazards



The survey results also offer a lens through which various climate hazards as experienced in Mion are viewed from the household levels. Flooding, for instance, presented a mixed picture: while 39.2% of respondents described its impact as high and 4.7% as very high, a considerable number (30.4%) experienced it as being less intense and described its impact as somewhat low. 22.3% described impact as low while 3.4% described it as very low. These findings underscore the uneven nature of experiences of floods in local communities and are shaped by place-based particularities such as topography, infrastructure and exposure levels.

In comparison, drought emerged as the most consistently severe and widespread hazard. A substantial 54.1% of respondents categorized its impact as high, with an additional 4.7% noting very high effects. Even though some respondents reported low (21.6%) or very low (7.4%) impact, the data strongly highlights drought's role as a persistent threat, especially to water access, food production, and agricultural livelihoods.

Extreme heat was also cited as a critical stressor, reflecting growing concern over temperature extremes. Nearly 49% of households reported high impact, and 4.1% experienced very high effects.

These figures point to the pervasive influence of rising temperatures, with implications for health, water demand, and farming output.

While windstorms were reported frequently, they were generally perceived as less intense than other hazards. 39.9% of respondents rated their impact as low, 28.4% as somewhat low, and 15.5% as very low. Only 12.2% experienced them as high-impact, and a small 4.1% faced very high damage. This suggests that while windstorms are common, their effects tend to be more manageable, though they may still contribute to long-term structural vulnerabilities.

In essence, the findings position drought and extreme heat as the most pressing climate threats in Mion District – exerting deep pressure on agricultural systems, water supplies, and household livelihoods. Flooding, though significant, appears to be more spatially concentrated and dependent on environmental conditions. Windstorms, while generally moderate in severity, should not be overlooked, especially as repeated events can erode resilience over time. To safeguard households and strengthen adaptive capacity, the data calls for targeted climate strategies that prioritize resilience to heat and drought, while also improving local infrastructure and preparedness for flood and wind-related hazards.

4.2.4.2 Sensitivity to Hazards

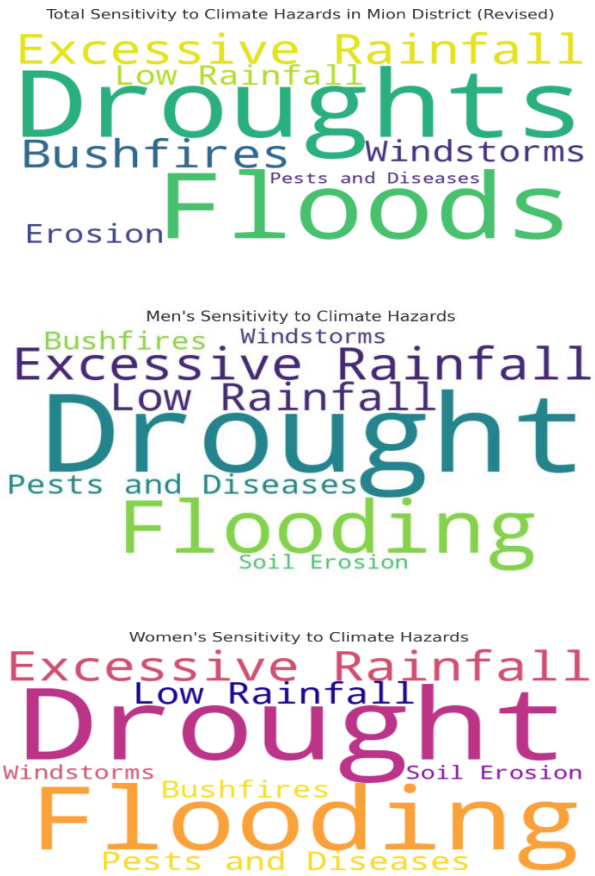
The study analyzed the sensitivity of key sectors in Mion District to climate impacts, focusing on hazards such as floods, droughts, soil erosion, bushfires, windstorms, sea level rise, pests, diseases, and variations in rainfall. The results indicate that the most sensitive sectors are health, water resources, and agriculture, while biodiversity and infrastructure were perceived as relatively less sensitive to climate change impacts.

In the health sector, most respondents reported difficulties in accessing healthcare services, as Mion District lacks a hospital, relying instead on Community-based Health Planning Services (CHPS) compounds with low accessibility. The lack of access to healthcare exacerbates the district's vulnerability to climate-related health risks. Only 27.7% of respondents reported the presence of a health facility in their community, while 72.3% indicated its absence. 92.6% of households rely on motorbikes as their primary means of transportation to health centers, and only 35.8% of respondents are enrolled in the National Health Insurance Scheme. Access to information on climate-related diseases remains low, with just 7.4% having received any training, information or sensitization.

Water resources emerged as a critical area of sensitivity, with 48.6% of respondents relying on dams as their primary drinking water source, while 31.1% depend on rivers, lakes, and lagoons. The availability of these water sources is highly variable, with 89.9% of respondents reporting that their water source is not available year-round. Poor maintenance and environmental degradation have further reduced water availability for domestic use, livestock, and irrigation. Only 10.1% reported daily availability of water, while the rest face challenges accessing water throughout the year.

Agriculture was identified as another highly sensitive sector, given the district's reliance on rain-fed farming. The survey data revealed significant concerns over climate-induced hazards, with 60.2% and 48.0% respectively rating agricultural activities as very to extremely sensitive to drought and rainfall. Flooding also had a notable impact, with 58.1% of respondents indicating that agriculture is very to extremely sensitive to it. Additionally, 43.2% reported pests and diseases and 51.4% reported excessive rainfall as having a high impact on agricultural productivity. Despite these challenges, access to climate adaptation strategies remain limited. Only 22.3% of respondents practice dry-season farming, and just 26.4% have access to any form of irrigation – predominantly manual systems such as buckets and hand-dug wells – further compounding vulnerability to erratic rainfall patterns.

Figure 15: Word cloud with showing the level of sensitivity in gender to climate hazard in Mion District



4.2.4.3 Health and Well-Being

There were notable disparities in climate-related health impacts between male- and female-headed households. Heat-related illnesses, such as heatstroke and heat exhaustion, were frequently reported, with 53.1% of male-headed households and 44.2% of female-headed households indicating they experienced extreme heat often. Similarly, 41.9% of respondents rated flood sensitivity to health as very sensitive, with female-headed households (27 out of 52) reporting higher sensitivity compared to male-headed ones (35 out of 96). This suggests that the health burden of flooding disproportionately affects women.

Lack of daily access to water was reported by 89.9% of respondents, increasing vulnerability to diseases such as diarrhea and cholera. Access challenges were more frequently reported by female-headed households, who were also more likely to use boreholes and tube wells. Although not directly quantified in terms of disease prevalence, this lack of water reliability indicates heightened health risks.

Mental health concerns were reported by 33.8% of households, with a significantly higher prevalence among male-headed households (46.9%) compared to female-headed households (9.6%). Despite this, only 7.4% of respondents indicated receiving any form of sensitization on climate-related health issues, including malnutrition, heat-related illnesses, and psychological stress. This highlights a critical gap in awareness and support services for mental health, particularly as climate-induced stressors become more common.

Access to healthcare remains a significant issue in Mion District. According to the data, only 27.7% of respondents—exclusively female-headed households—reported the presence of a health facility in their community, while 72.3% (entirely male-headed households) stated that no health facility exists nearby. The main mode of transport to the nearest healthcare center is by motorbike, used by 92.6% of households, 5.4% by walking, 1.4% by bicycle and 0.7% by car.

Barriers to accessing healthcare are further compounded by limited enrollment in the National Health Insurance Scheme (NHIS)—with only 35.8% of households enrolled (34 female-headed, 19 male-headed). The vast majority (64.2%) lack coverage, increasing financial vulnerability during climate-induced health crises. Although the dataset does not explicitly cover healthcare costs, the absence of insurance and low accessibility highlight systemic issues in health services delivery and affordability for both male- and female-headed households.

4.2.4.4 Water Resources and Infrastructure

Climate hazards such as drought, low rainfall, and excessive rainfall were identified as major threats to water resources in Mion District. The district's dependence on dams (48.6%) and rivers, lakes, and lagoons (31.1%) as primary sources of drinking water, combined with seasonal variability, contributes to widespread water stress during dry periods. Infrastructure challenges intensify this issue, with 89.9% of respondents reporting that their water source is not available every day, and only 10.1% indicating consistent daily access.

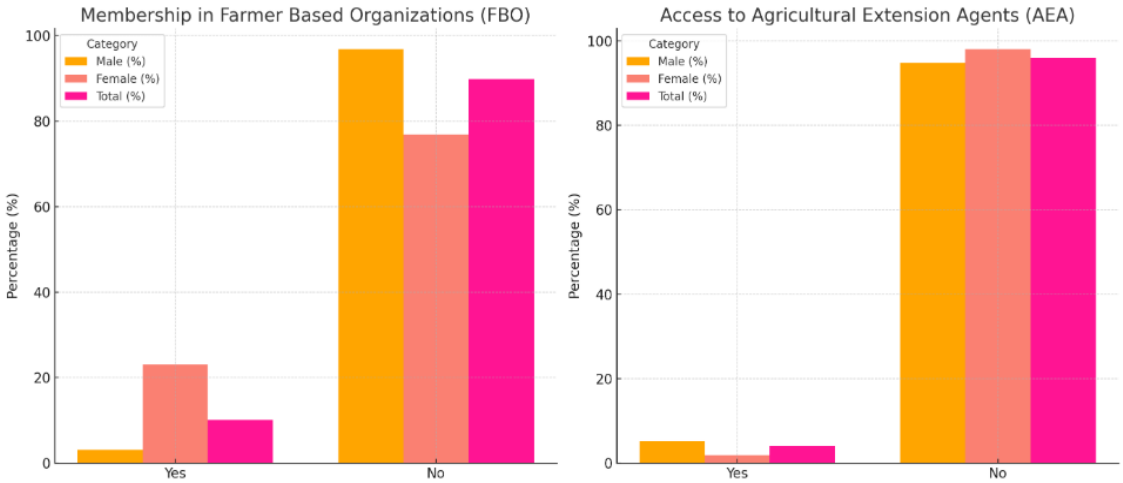
In terms of infrastructure, respondents identified roads, bridges, and houses as highly sensitive to hazards such as erosion and flooding. Specifically, 33.1% of respondents rated infrastructure as very sensitive to erosion and 2.7% as extremely sensitive, while 58.1% rated it as very sensitive to flooding and 4.1% as extremely sensitive. Additionally, 98.6% of respondents stated that they do not have access to a good road network, limiting emergency response, mobility, and access to essential services such as markets, schools, and healthcare facilities.

4.2.4.5 Livelihoods and Agriculture

The study highlighted the high sensitivity of agriculture to climate hazards, with drought (60.2%), low rainfall (48.0%), and excessive rainfall (51.4%) ranking among the most critical threats to agricultural productivity. Bushfires were also a significant concern, with 41.2% of respondents rating them as very to extremely sensitive hazards affecting farming activities. Notably, while both male and female-headed households are actively engaged in farming, male headed households reported slightly higher levels of sensitivity to these hazards—especially in relation to drought and windstorms—underscoring the gendered nature of climate vulnerability within agricultural communities.

Despite these challenges, climate adaptation remains limited. As illustrated in **Figure 16**, only 4.1% of respondents reported having access to agricultural extension services, and just 10.1% indicated membership in a Farmer-Based Organization (FBO). These gaps in access to technical knowledge, information, and institutional support significantly constrain the capacity of farmers—particularly male-headed households who dominate rain-fed farming—to effectively adapt to increasing climate variability and risk.

Figure 16: Access to farmer-based organizations and extension services among respondents



4.2.5 Household Adaptive Capacity

4.2.5.1 Social and Decision-Making Roles

The data reveals how gender dynamics influence decision-making related to climate exposure and sensitivity, with significant differences between male- and female-headed households. The survey explored responses regarding household decisions related to finances, income-generating activities, and children's education.

In male-headed households, 21.9% of financial decisions are made solely by the male head, 76.0% are made jointly, and 2.1% by women. In contrast, in female-headed households, 55.8% of financial decisions are made by women, while 36.5% are made jointly. Similarly, for income-generating activities, decisions in male-headed households are made primarily by the male head (17.7%) or jointly (77.1%), while in female-headed households, 55.8% of income decisions are made by the female head and 21.2% jointly. These findings suggest that while joint decision-making is more common in male-headed households, women in female-headed households tend to hold more control over financial and income-related decisions, pointing to differences in power dynamics across household types.

In decisions about children's education, 13.5% of male-headed households report that men make decisions alone, while 84.4% indicate joint decision-making. Among female-headed households, 59.6% of educational decisions are made solely by the female head, and 23.1% are made jointly. This contrast reflects the more autonomous role women play in managing education in female-headed households, while decisions in male-headed households tend to be more collaborative.

The study also highlights differing responsibilities in farming and domestic roles. In male-headed households, 53.1% of respondents indicated that men are primarily responsible for farming, while in female-headed households, 59.6% of women bear that responsibility. Shared farming tasks are reported by 43.8% of male-headed and 21.2% of female-headed households. This suggests that in male-headed households, farming duties are more frequently shared between partners, whereas in female-headed households, women take on the bulk of agricultural work.

Water collection is overwhelmingly the responsibility of women. In male-headed households, 47.9% of respondents stated that women primarily collect water, compared to 82.7% in female-headed households. Shared water collection is reported in 40.6% of male-headed and 9.6% of female-headed households, indicating a heavier burden on women in female-headed homes.

Childcare responsibilities in Mion District are predominantly shouldered by women, especially in female-headed households. In male-headed households, 16.7% of men and 5.2% of women serve as primary caregivers, with 78.1% reporting shared caregiving responsibilities. However, in female-headed households, 82.7% of respondents indicated that women are the primary caregivers, while only 9.6% reported shared responsibilities. This contrast highlights that while caregiving duties are somewhat shared in male-headed households, they overwhelmingly fall on women in female-headed households.

Regarding the role of women in climate-related decision-making, 49.3% of households confirmed that women are involved. Among them, 65.8% reported women being fully involved, 26.0% partially involved, and 8.2% involved in some decisions. Among households where women are not involved (50.7%), the primary barrier reported was traditional gender roles (79.2%), followed by limited access to information (10.4%), lack of education or literacy (9.1%), and time constraints (1.3%).

These findings underscore the importance of promoting gender equity in household decision-making processes, climate adaptation planning, and access to resources. While joint decision-making is relatively strong in male-headed households, women in female-headed households bear a disproportionate share of responsibilities – especially in farming, water collection, and childcare – while often facing social and structural barriers that limit their adaptive capacity.

4.2.5.2 Access to Resources

The study reveals that women in the Mion District face significant challenges in accessing critical resources needed for climate adaptation. According to the data, 54.1% of households reported that women do not have equal access to land, with the perception shared across both male- and female-

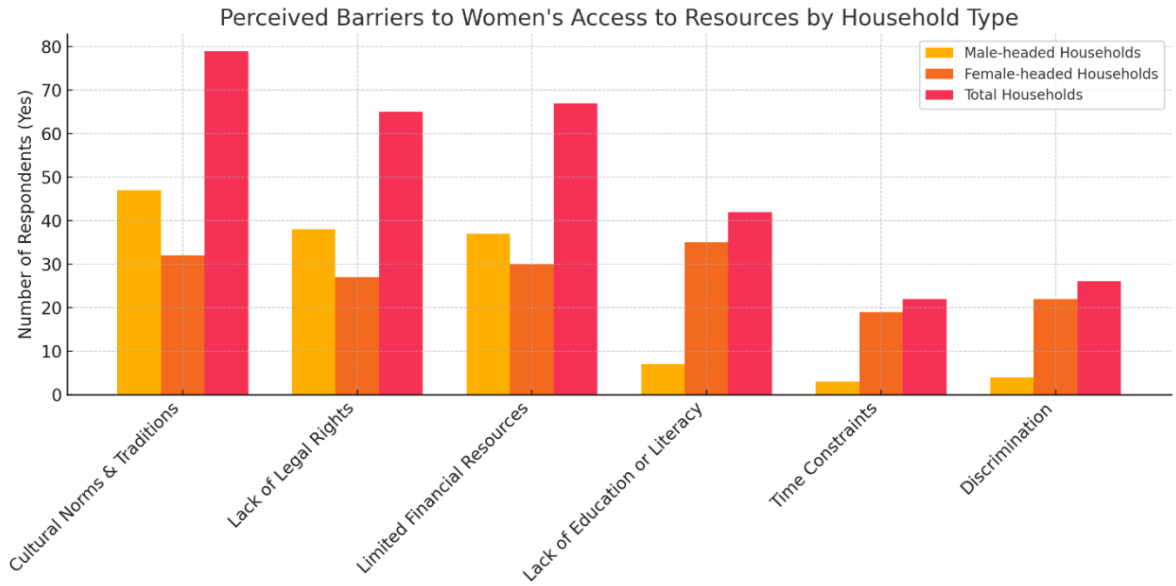
headed households. Similarly, 66.9% of respondents stated that women lack equal access to credit, and 60.8% indicated that women do not have equal access to information and training on climate adaptation. Additionally, 54.7% of households affirmed that women do not have equal access to agricultural inputs such as seeds, tools, and fertilizers. These disparities create substantial barriers for women in adapting to climate change, as access to such resources is essential for building resilience in the face of environmental stressors.

The study also explored the perceived barriers that limit women's access to these resources. As presented in **Figure 17**, most respondents identified cultural norms and traditions as the most prominent barrier, with 75.2% agreeing that deeply rooted gender expectations restrict women's rights and access. Other key barriers included lack of legal rights (61.9%), where institutional limitations and weak enforcement of property and resource rights disproportionately affect women. Limited financial resources (63.8%) also pose a significant barrier, restricting women's ability to invest in climate-smart strategies.

While these three barriers were recognized by the majority, others were viewed as less widespread but still significant. Lack of education or literacy was cited by 40.0% of respondents, mainly reflecting structural inequalities in access to formal learning. Time constraints, due to women's heavy burden of unpaid domestic work, were mentioned by 21.0%, and discrimination was recognized by 24.8% of respondents. Though these were not the most cited obstacles, they remain relevant and underscore the multifaceted challenges that women face.

In summary, the data affirms that gender-based inequalities in access to land, credit, inputs, and information are widely recognized and compound women's vulnerability to climate change. Addressing the social, economic, and institutional barriers identified – especially cultural norms and legal constraints – will be critical in enhancing women's adaptive capacity and promoting inclusive resilience strategies in Mion District.

Figure 17: Barriers to women's access to resources



4.2.5.3 Support and Empowerment

The data reveals that local organizations or groups supporting women in adapting to climate change are limited in Mion District. Only 25.0% of households reported the presence of such organizations in their communities. Among these, 30.2% of male-headed households (29 out of 96) and only 15.4% of female-headed households (8 out of 52) acknowledged the existence of local support groups focused on women and climate adaptation. This finding suggests that male-headed households may be more aware of or have more exposure to such structures, though the overall coverage remains notably low.

The majority of respondents—75.0% overall—reported that no such organizations exist in their communities. This includes 69.8% of male-headed and 84.6% of female-headed households, indicating a widespread lack of access to localized support networks. The data underscores a significant gap in community-based structures that could otherwise play a critical role in supporting women to adapt to climate-related risks, access resources, and participate in resilience-building initiatives.

This limited presence of gender-responsive local organizations highlights the need for enhanced outreach and the development of inclusive, community-based support systems. Such efforts should prioritize the unique vulnerabilities of women—particularly those in female-headed households—while ensuring equitable access to information, training, and opportunities for climate resilience across the district.

4.3 Projected Climate Trends and Implications

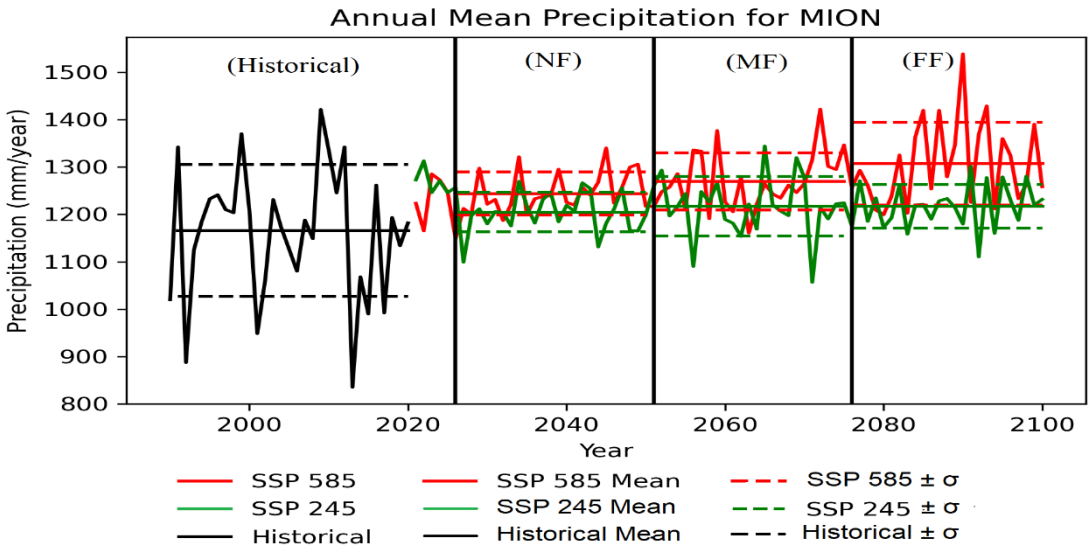
This section presents analysis of projected climate trends in Mion, focusing on how these changes affect gendered vulnerabilities and communal resilience.

4.3.1 Projected Climate Trends

Precipitation

In Mion District, the analysis of total annual precipitation shows historical patterns with significant interannual variability (840 mm - 1410 mm). The projection period shows an increasing pattern in precipitation amount, especially under SSP 5-8.5 (to as high as over 1500 mm). Within the near future (NF: ~2020–2040), the SSP 5-8.5 scenario (red) projects marginally higher precipitation climatology compared to SSP 2-4.5 (green), which widens towards the end of the century (**Fig. 18**), highlighting more wetness towards the end-of-the-century. SSP 2-4.5 represents a “middle-of-the-road” scenario where social, economic, and technological trends follow historical patterns, resulting in moderate greenhouse gas emissions. In contrast, SSP 5-8.5 is a high-emission scenario associated with rapid economic growth driven by fossil fuel use, leading to higher levels of radiative forcing and more intense climate impacts**.** Under SSP 2-4.5, precipitation remains relatively stable across the projection periods, with lower variability and only marginal increase in the rainfall climatology from the near-future to mid-future period.

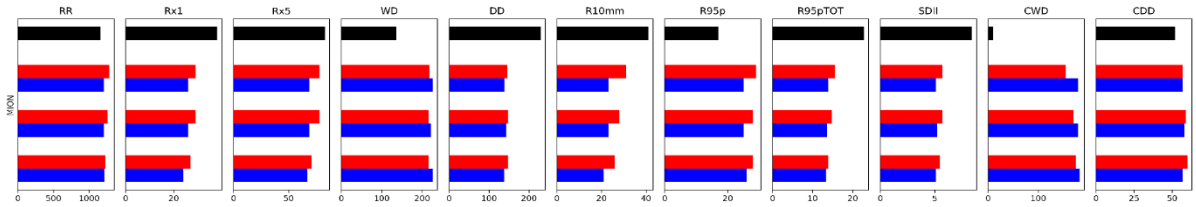
Figure 18: Historical and projected mean precipitation patterns under SSP 5-8.5 and SSP 2-4.5 scenarios for Mion, with descriptions



Climate indices for the Mion District **(Fig. 19)**, similar to Kumbungu, project an increase in RR and decline in Rx1 and Rx5 events, the frequency of dry days, moderate rainfall days (R10mm), very wet days' contribution to total precipitation (R95pTOT), and the simple daily intensity index (SDII). Unlike the southern districts, the indices from Mion District show that despite fewer increases in very heavy

precipitation events within the district, the respective increments are appreciable. Mion is projected to be wetter than its historical phase, however, the wetter conditions are intensified under the moderate scenario (SSP 2-4.5). On the contrary, consecutive wet days are higher under SSP 5-8.5, potentially indicating risks of flooding and waterlogging. The trends indicate a potential increase in the intensity and frequency of extreme and moderate rainfall events and marginally prolonged dry periods.

Figure 19: Historical and projected climate extreme metrics across the Mion District

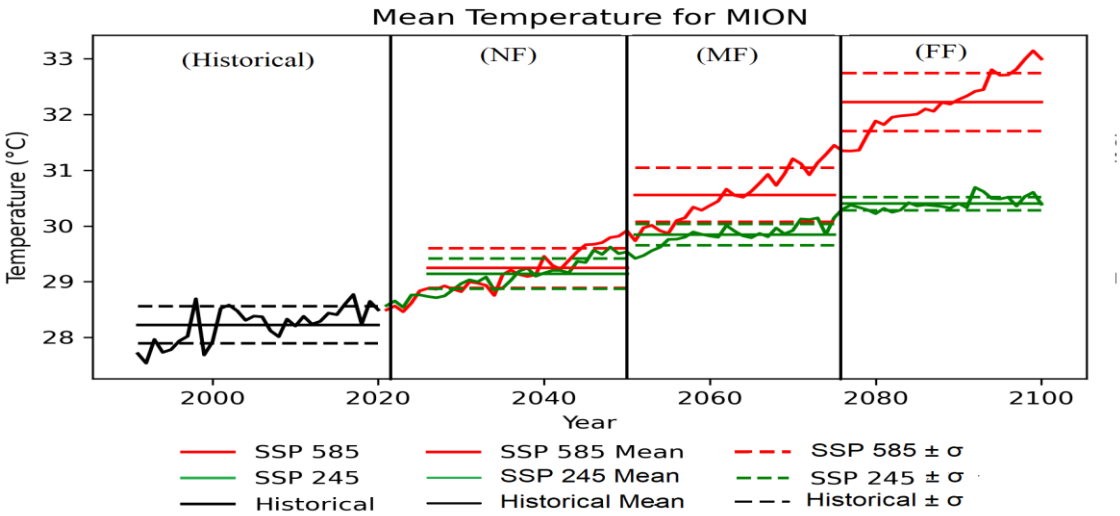


Black bars denote the historical pattern, and the red and blue boxes denote SSP 2-4.5 and SSP 5-8.5 respectively for the projection periods.

Temperature

The temperature projections for Mion, as seen in **Figure 20**, reveal a consistent upward trend throughout. By the end of the century, temperatures under the SSP 5-8.5 high-emission scenario are expected to peak at around 33°C, which is approximately 3°C higher than projections under the moderate SSP 2-4.5 scenario. This significant difference highlights the considerable effect of greenhouse gas emissions on regional temperature increases and emphasizes the importance of adopting climate mitigation strategies to limit the intensity of future warming.

Figure 20: Historical and projected mean temperature patterns under SSP 5-8.5 and SSP 2-4.5 scenarios for Mion District



4.3.1.1 Summary of Projected Climate Trends and Implications for Mion District

The analysis of projected climate trends for Mion District reveals significant shifts in precipitation and temperature patterns, with notable implications for agriculture, water resources, and overall livelihood conditions.

- **Rainy Days Projections for Mion:** Mion is expected to experience an overall increase in precipitation levels compared to historical patterns. The projections under SSP 5-8.5 indicate an increase in total annual rainfall, surpassing 1500 mm towards the end of the century, compared to historical variability ranging between 840 mm and 1410 mm. In the near future (2020–2040), rainfall under SSP 5-8.5 is expected to be marginally higher than under SSP 2-

4.5, with the gap widening towards the end of the century. Unlike southern regions that maintain a stable pattern, Mion's increasing precipitation suggests a shift toward wetter conditions.

- **Wet Days (WD) and Dry Days Projections for Mion:** Projections indicate that Mion will experience more wet days (WD), which could lead to an increased risk of flooding and waterlogging. While moderate rainfall days (R10mm) and very wet days' contributions to total precipitation (R95pTOT) are expected to decrease, there is an anticipated increase in consecutive wet days, especially under SSP 5-8.5. At the same time, the frequency of dry days is projected to decline compared to historical levels, suggesting a shift in seasonal rainfall distribution.
- **R10mm Days (Rainfall Days Over 10mm) in Mion:** Mion is projected to experience a decline in moderate rainfall events (R10mm). While the total precipitation is expected to rise, the frequency of rainfall days exceeding 10mm is anticipated to reduce. This shift suggests a pattern of less frequent but more intense rainfall, which could lead to periods of excessive wetness followed by prolonged dry spells.
- **Consecutive Dry Days (CDD) in Mion:** Despite an overall increase in precipitation, Mion is also projected to experience prolonged dry periods. The number of consecutive dry days (CDD) is expected to increase marginally under SSP 5-8.5, although not as significantly as in drier regions. This increase in dry spells may impact water availability for agriculture and household use, necessitating improved water management strategies.
- **Simple Daily Intensity Index (SDII) in Mion:** The rainfall intensity in Mion, measured by the Simple Daily Intensity Index (SDII), is projected to decline. Unlike the southern regions where SDII shows a drastic reduction, Mion's decrease is moderate, suggesting a shift toward more evenly distributed rainfall patterns. However, under SSP 5-8.5, intense rainfall days are expected to increase, contributing to localized flooding risks.
- **Temperature Trends in Mion:** Mion is projected to experience a steady increase in temperature throughout the 21st century. By the end of the century, under SSP 5-8.5, temperatures are expected to reach approximately 33°C, which is about 3°C higher than the projections under SSP 2-4.5. This rise in temperature will likely increase evapotranspiration rates, exacerbating water stress and impacting crop productivity. The significant temperature rise underscores the urgent need for climate adaptation measures, particularly in the agricultural sector.

Table 8: Summary of projected climate trends in Mion District

Climate Variable	Key Finding	Implications
Rainfall Patterns	• Rainy days projected to increase slightly beyond historical levels under SSP 5-8.5. • Wet days (WD) are expected to exceed 250 days, while dry days reduce significantly compared to historical trends.	Increased wet days can support agriculture but raise the risk of flooding and waterlogging. Decline in dry days may improve water availability but could also disrupt traditional farming cycles.
Annual Precipitation	• Historical precipitation variability (840-1410 mm) increases under future projections. • SSP 5-8.5 shows a steady increase in precipitation until the late century, exceeding 1500 mm. • SSP 2-4.5 projects moderate precipitation increases with more stable seasonal distribution.	Greater rainfall variability under SSP 5-8.5 may challenge water resource planning. Stable seasonal precipitation under SSP 2-4.5 could benefit crop planning but may still require irrigation improvements.

Climate Variable	Key Finding	Implications
Rainfall Extremes	• Moderate rainfall days (R10 mm) decline significantly, suggesting more intense but less frequent rainfall events. • Consecutive wet days (CWD) increase, while consecutive dry days (CDD) remain stable under SSP 2-4.5 but increase slightly under SSP 5-8.5. • Heavy rainfall days (R95p) decrease, reducing flash flood risks but increasing drought potential.	Fewer moderate rainfall days may increase soil moisture stress between intense rainfall events. Increased consecutive dry days could heighten risks of prolonged droughts, impacting crop productivity.
Mean Temperature	• Temperatures expected to rise steadily, reaching approximately 33°C by 2100 under SSP 5-8.5. • A 3°C difference is projected between SSP 2-4.5 and SSP 5-8.5, showing the significant impact of emissions on warming.	Higher temperatures may exacerbate evapotranspiration and reduce water availability. Heat stress could negatively affect both human health and agricultural productivity, requiring adaptive strategies.

4.3.2 Projected Climate Change Trends and Gender Vulnerability

4.3.2.1 Livelihoods and Economic Changes

Climate projections for Mion District indicate significant challenges for local livelihoods, especially in agriculture, the primary economic activity in the region. Insights from the Focus Group Discussions (FGDs) and participatory stakeholder engagement, as presented in **Table 9**, suggest that climate hazards such as erratic rainfall, flooding, droughts, and rising temperatures are already disrupting crop and livestock production. Participants reported that droughts and extreme heat frequently reduce crop yields, leading to income losses and increased food insecurity. Additionally, male participants highlighted challenges in maintaining livestock health due to water scarcity and pasture degradation.

Women, who often engage in subsistence farming and contribute to household food production, are particularly affected by the unpredictability of rainfall. In response, some women resort to alternative income-generating activities like petty trading, Shea butter processing, and other small-scale enterprises. However, the lack of financial support and limited access to resources hinder the growth of these adaptive livelihoods. The FGDs and stakeholder engagements further indicated that youth are increasingly forced to migrate in search of alternative work opportunities, while people with disabilities (PWD) face heightened economic marginalization due to limited mobility and fewer income-generating options.

Table 9: Projected impacts of climate change on livelihoods and economic changes by gender in Mion

Community	Climate Change	Women	Men	Youth	PWD
Sang	Erratic rainfall, droughts	Increased burden in farming, reduced crop yields, and reduced earnings.	Higher financial pressures due to reduced farm productivity.	Disrupted education due to increased labor demands.	Greater reliance on family for support and mobility.
Kayong	Reduced rainfall, water scarcity	More time spent on water collection, limiting participation in economic activities.	Struggle to maintain agricultural productivity and livestock.	Limited entrepreneurial opportunities.	Increased vulnerability to water shortages.

Community	Climate Change	Women	Men	Youth	PWD
Zuro	Flooding and waterlogging	Loss of farmland and income increased burden of securing household resources.	Higher expenses for flood recovery and rebuilding.	Migration to urban areas for work.	Difficulty in accessing essential services.
Nyentuo	Drought and extreme heat	Increased workload in water collection and food management.	Challenges in maintaining crop yields and livestock.	Limited access to sustainable livelihoods.	Heightened vulnerability to heat stress.
Dijeo	Erratic rainfall, soil erosion	Reduced agricultural income and food insecurity.	Increased financial burdens in adopting resilient practices.	Disrupted education and migration for work.	Reduced capacity to cope with livelihood changes.
Kpumi	Prolonged dry spells, heatwaves	Reduced food availability, increased stress in household management.	Struggles to maintain crop productivity.	Fewer educational and employment opportunities.	Mobility issues affecting access to resources.
Palari	Heavy rains, flash flooding	Damage to household resources and crops reduced income.	Increased spending on recovery and infrastructure repair.	Limited employment opportunities.	Difficulty navigating damaged infrastructure.

4.3.2.2 Projected Impacts on Access to Resources

Climate change is projected to severely affect access to key resources such as water, land, and agricultural inputs in Mion District. Insights from the FGDs and participatory stakeholder engagement, as presented in **Table 10** revealed that women, primarily responsible for household water collection and management, will face increased burdens during periods of water scarcity. Participants reported that during droughts, women often walk longer distances to fetch water, reducing the time available for other productive activities.

Men, particularly those engaged in farming, expressed concerns over the declining availability of water for irrigation and livestock. Limited access to climate-resilient agricultural inputs, including drought-tolerant seeds and fertilizers, further exacerbates their vulnerability. The survey data indicated that most farmers lack financial resources to invest in adaptive farming technologies.

Youth and PWD will also face barriers to accessing essential resources. FGDs and stakeholder engagements highlighted how youth often struggle to secure land for farming, particularly due to customary land tenure systems. PWD, on the other hand, reported difficulties in accessing water sources and agricultural inputs due to physical and financial limitations. These disparities underscore the need for inclusive adaptation interventions that ensure equitable access to resources for all community members.

Table 10: Projected impacts of climate change on access to resources by gender in Mion

Community	Climate Hazard	Women	Men	Youth	PWD
Sang	Reduced rainfall and drought	Longer travel times for water collection, reduced access to clean water.	Increased pressure to source water for irrigation.	Reduced opportunities for school attendance.	Limited mobility to access water points.
Kayong	Water scarcity	Difficulty securing drinking water and water for farming.	Reliance on expensive alternatives for irrigation.	Limited access to training on water management.	Strain on caregivers supporting PWD.
Zuro	Flooding and waterlogging	Increased difficulty accessing clean water and sanitation.	Loss of agricultural resources and infrastructure.	Interrupted learning due to infrastructure damage.	Heightened reliance on others for mobility.
Nyentuo	Drought and heatwaves	Reduced household water availability.	Increased reliance on expensive irrigation systems.	Disrupted education and engagement in economic activities.	Difficulty accessing water supply systems.
Dijeo	Erratic rainfall	Strain on water resources for domestic use.	Financial strain from irrigation costs.	Reduced agricultural opportunities.	Greater dependency on caregivers for water access.
Kpumi	Prolonged dry spells	Limited access to water for sanitation and household needs.	Struggles to access livestock water sources.	Reduced school attendance.	Lack of accessible water collection infrastructure.
Palari	Flooding and river overflow	Contaminated water sources and damaged infrastructure.	Increased financial strain to recover agricultural inputs.	School closures due to flooding.	Reduced independence and reliance on caregivers.

4.3.2.3 Responsibilities within Households

Climate change will significantly shift household responsibilities in Mion District, increasing the workload of women and marginalized groups. Insights from the Focus Group Discussions (FGDs) and participatory stakeholder engagement, as shown in **Table 11** consistently highlighted how climate-induced water scarcity, reduced agricultural productivity, and the increased frequency of floods and droughts place additional stress on households. Women are particularly burdened with added responsibilities for water collection, household management, and caregiving.

During discussions, women reported that water collection becomes more labor-intensive during drought periods, often requiring hours of travel. Additionally, female-headed households face even greater difficulties in securing agricultural inputs and recovering from climate shocks. Meanwhile, men reported that their primary focus remains on securing income through farming or other labor-intensive activities, which become increasingly uncertain under climate variability.

Youth, particularly boys, often assist with farm labor, while girls support household chores, exacerbating gender inequalities. In some cases, youth are forced to drop out of school to contribute to family income. PWD face heightened dependence on family members for basic needs during climate stress, as reduced mobility further limits their ability to contribute to household resilience.

The FGDs stakeholder engagements emphasized that without targeted support, these increased responsibilities will perpetuate social inequalities and further constrain the adaptive capacity of vulnerable groups. Holistic, gender-responsive adaptation strategies are essential to reducing these burdens and enhancing overall resilience in the district.

Table 11: Projected impacts of climate change on access to resources by gender in Mion

Community	Climate Hazard	Women	Men	Youth	PWD
Sang	Droughts and water scarcity	Increased responsibility for water collection and food security.	Pressure to ensure agricultural resilience.	Reduced time for education due to increased labor demands.	Increased dependence on family for mobility.
Kayong	Heatwaves and erratic rainfall	Strain on managing water collection and household chores.	Increased time spent adapting farming practices.	Limited participation in school and extracurricular activities.	Dependency on family for support during heatwaves.
Zuro	Flooding and soil erosion	Emergency management of household resources and safety.	Focus on repairing damage to agricultural infrastructure.	Reduced school attendance due to displacement.	Mobility challenges during floods.
Nyentuo	Prolonged dry periods	Increased workload in managing household water and food supplies.	Increased responsibilities in securing water for farming.	Greater engagement in household labor.	Heightened vulnerability to inadequate services.
Dijeo	Erratic rainfall and drought	Managing food shortages and ensuring family well-being.	Seeking alternative income sources.	Contributing to household income through informal work.	Increased reliance on community support.
Kpumi	Heatwaves and drought	Greater burden of caregiving and household management.	Seeking alternative farming strategies.	Providing additional household labour.	Reduced access to social support systems.
Palari	Flooding and waterlogging	Managing waterborne diseases and damaged property.	Rebuilding agricultural resources.	Disrupted school and social activities.	Increased difficulty accessing emergency services.

4.3.3 Projected Climate Implications on Community Vulnerability in Mion District

Mion District is increasingly vulnerable to climate change due to projected shifts in temperature, erratic rainfall patterns, and prolonged droughts. These climatic changes pose severe threats to the district's predominantly agrarian economy, as farmers rely heavily on rain-fed agriculture, making them highly susceptible to dry spells, floods, and unpredictable growing seasons. Key crops, including maize, yam, and groundnuts, are particularly affected by these changes, with prolonged droughts leading to low yields and reduced food security. Extreme weather events such as heavy rains and droughts are expected to exacerbate soil degradation, pest infestations, and livestock health issues, further impacting agricultural productivity and household livelihoods.

The vulnerabilities in Mion District are compounded by weak infrastructure, poor road networks, and limited access to essential services. Poor road conditions hinder market access and emergency responses during floods, while the absence of potable water sources increases dependence on

seasonal rainwater collection, exposing households to water scarcity during dry seasons. Communities such as Kayong and Zuro report severe shortages of clean drinking water, forcing residents to rely on contaminated sources, which poses significant health risks. In addition, limited healthcare facilities and inadequate educational infrastructure reduce the district's overall resilience to climate-induced challenges. Without targeted interventions, these factors could intensify poverty, increase inequalities, spur migration, and weaken the district's adaptive capacity.

➢ Kayong Community

Kayong is experiencing severe climate-related challenges, particularly extreme heat and prolonged droughts. Residents report that during dry seasons, indoor temperatures become unbearable, contributing to health concerns such as tuberculosis, skin infections, and respiratory diseases. Droughts have significantly impacted crop plantations, causing high mortality rates in both crops and livestock. The community also struggles with poor road infrastructure, making access to healthcare facilities in nearby towns like Sang difficult, particularly during emergencies. Women in the community emphasize the urgent need for potable water, as they currently rely on rainwater collection and seasonal sources, which dry up during prolonged droughts.

Key future vulnerability trends for Kayong include:

- Increased health risks due to extreme heat, affecting both human and livestock well-being.
- Reduced agricultural productivity and economic hardship caused by recurring droughts.
- Limited access to healthcare services due to poor road conditions and infrastructure deficiencies.
- Rising concerns over food security, particularly among women who manage household nutrition.
- Dependence on unreliable water sources, exacerbating health and sanitation challenges.

Photo 2: Focus group discussion in Kayong Community

➢ Nyentoo Community

Nyentoo's economy is driven by farming and charcoal production, but these activities are increasingly affected by erratic rainfall patterns and declining soil fertility. Over the past decade, farmers have observed a sharp decline in rainfall, leading to persistent drought conditions and reduced agricultural yields. Women, who are actively involved in farming, report that excessive heat on farms has made working conditions unbearable. The community relies on stream water, which dries up during droughts, forcing residents to search for alternative sources. Health concerns have also escalated, with increased cases of malaria, skin infections, and chickenpox.

Key future vulnerability trends for Nyentoo include:

- Persistent droughts leading to lower agricultural yields and increased food insecurity.
- Health risks from poor sanitation, contaminated water sources, and limited healthcare facilities.
- Increased pressure on water resources, leading to conflicts over access and usage.
- Growing economic hardships, particularly for women engaged in petty trading and farming.
- Risks of migration as livelihood opportunities decline due to climate variability.

➢ Zuro Community

Zuro faces significant climate challenges, with residents reporting increased droughts and heavy rainfall events leading to flooding. The community, which relies on shea and dawadawa trees for economic sustenance, has experienced declining yields over the past decade. Population growth has also placed stress on water resources, with the main sources – Savwali stream and wells – becoming unreliable. Droughts have adversely affected livestock, with animals suffering from dehydration and disease outbreaks. Infrastructure vulnerabilities are also evident, with homes frequently collapsing during heavy rains and roads becoming impassable during floods.

Key future vulnerability trends for Zuro include:

- Drought-induced water shortages affecting both human and livestock populations.
- Increased food insecurity due to lower crop yields and economic hardship for farmers.
- Infrastructure deterioration, including road damage and collapsed buildings.
- Rising economic instability, particularly for women in petty trading.
- Growing dependence on climate-sensitive natural resources, increasing vulnerability to climate shocks.

➢ Kpumi Community

Kpumi residents report significant climate changes, including more frequent floods and unpredictable rainfall. The community has traditionally relied on seasonal rainfall for farming, but excessive rainfall now leads to crop losses, while prolonged droughts cause water shortages and health complications. Farmers in Kpumi struggle to predict planting seasons, making it difficult to sustain agricultural productivity. Health risks have also risen, with children being diagnosed with waterborne diseases due to drought-induced contamination. The absence of a borehole forces residents to rely on a saline river for drinking water.

Key future vulnerability trends for Kpumi include:

- Increasing health risks from waterborne diseases due to limited clean drinking water.
- Rising economic pressures from failed crops and deteriorating agricultural productivity.
- High exposure to extreme weather events, leading to further displacement and infrastructure damage.
- Escalating conflicts over water resources and food insecurity concerns.
- Need for climate-resilient agricultural strategies and improved water management systems.

Photo 3: Focus group discussion in Kpumi Community

➢ Dijoe Community

Dijoe's local economy is predominantly based on farming, but climate change has severely impacted agricultural activities. Over the past decade, community members have observed significant shifts in rainfall patterns, leading to unpredictable growing seasons. Farmers struggle to plan their planting schedules due to erratic rainfall, and prolonged droughts have resulted in low crop yields. Additionally, excessive heat has made agricultural work more difficult, particularly for women, who bear the responsibility of both farming and household chores. Livestock health is also declining as droughts reduce access to pasture and water sources.

Water scarcity remains a pressing concern in Dijoe, with residents depending on streams and wells that dry up during drought periods. Infrastructure challenges, such as poor road networks, further isolate the community, making it difficult to access markets, healthcare, and educational facilities. Rising temperatures have exacerbated health issues, including malaria outbreaks and heat-related illnesses.

Key future vulnerability trends for Dijoe include:

- Increasing drought conditions lead to reduced agricultural productivity and food insecurity.
- Worsening water scarcity, placing additional stress on households and livestock.
- Health risks, particularly from malaria, heat stress, and waterborne diseases.
- Poor road infrastructure, limiting market access and emergency response efforts.
- Higher risks of migration, as economic conditions worsen and farming becomes less viable.

Photo 4: Focus group discussion in Dijoe Community

➢ Palari Community

Palari faces growing climate-related challenges that threaten its agricultural and economic stability. Farming, the primary livelihood, is increasingly unreliable due to changing rainfall patterns. Farmers report that droughts are lasting longer, leading to severe water shortages that reduce crop yields and weaken livestock conditions. The unpredictability of rainfall also results in frequent crop failures, making food security a major concern for the community.

The community struggles with inadequate infrastructure, including poor road conditions that become impassable during heavy rains. Water access is also a critical issue, with residents relying on seasonal streams that often dry up during droughts. Without proper storage systems, families are left without a stable water supply, further exacerbating hygiene and sanitation challenges. Additionally, rising temperatures have led to more cases of malaria and heat-related illnesses, increasing the burden on a healthcare system that is already inaccessible to many.

Key future vulnerability trends for Palari include:

- Extended droughts reducing water availability for agriculture, livestock, and household use.
- Increased food insecurity, as crop failures become more frequent.
- Health vulnerabilities, with rising cases of malaria and waterborne diseases.
- Economic decline, as farming becomes less viable and alternative livelihood options remain limited.
- Potential displacement, as families migrate in search of better living conditions and income sources.

Photo 5: Focus group discussion in Palari Community

➢ Sang Community

Sang, a rapidly growing community in the Mion District of Northern Ghana, is heavily reliant on subsistence and small-scale farming as its primary economic activity. However, in recent years, the community has been increasingly affected by climate variability, which has disrupted traditional farming systems and deepened existing vulnerabilities.

Erratic rainfall patterns and prolonged dry spells have made it difficult for farmers to predict growing seasons and plan their agricultural calendar. This has led to delayed planting, frequent crop failure, and dwindling harvests. Rising daytime temperatures and poor soil moisture retention have made working on farms physically challenging, especially for women, who juggle both field labor and domestic duties. Additionally, livestock rearing is being affected, as prolonged droughts reduce access to pasture lands and dry up shallow water sources, leading to declining animal health and productivity.

Water scarcity has become a pressing challenge in Sang. The community depends largely on seasonal dams, hand-dug wells, and natural water bodies that dry up during the peak dry season. During these periods, women and children often walk long distances to fetch water, adding to daily burdens. The lack of a consistent and reliable water supply not only affects households but also limits the potential for dry-season farming and other livelihood diversification strategies.

Infrastructure limitations further compound the situation. Sang's road network is poorly developed, making it difficult to access markets, healthcare facilities, and emergency services. During the rainy season, parts of the community become inaccessible due to flooding or impassable roads, isolating residents and restricting the movement of goods and services.

Public health is increasingly affected by changing climatic conditions. Rising temperatures and stagnant water during rainy periods have led to higher risks of malaria**,** heat exhaustion, and waterborne diseases such as diarrhea and typhoid. The absence of a fully equipped health facility within the community limits timely healthcare access, especially for children, pregnant women, and the elderly.

Key future vulnerability trends for Sang include:

- Frequent and prolonged droughts, leading to lower agricultural yields and heightened food insecurity.
- Increased water stress, reducing the reliability of sources for domestic use, livestock, and smallholder irrigation.
- Rising health risks, especially from malaria, heat-related illnesses, and waterborne diseases.
- Poor infrastructure, hampering market access, education, and emergency service delivery.
- Potential for out-migration, particularly among youth, as livelihoods become unsustainable under worsening climate stress.

5. Implications for Gender-Responsive Climate Adaptation Planning and Resilience Building

5.1 Introduction

While we acknowledge the limitation of the scope of this work to climate risk and vulnerability assessment, the implications of our findings to the logical step of adaptation planning make it imperative that we provide some early guidance and intervention suggestions for gender-responsive adaptation planning and resilience building. Such guidance, we believe, will inform the conceptualization of adaptation planning processes while also providing early insights into what specific interventions will look like both in the near and longer terms. Again, while these suggested measures are in exhaustive, not screened nor prioritized, we are of the view that as efforts advance to use current findings as the basis for district-specific adaptation planning, some, if not all of suggested measures, will give early indications of what should go into the very important process of gender-responsive adaptation planning and resilience building at the subnational level and in each of the districts.

Thus, and from our findings, there is no doubt that the Mion District faces significant climate vulnerabilities, both observed and projected, that threaten its social, economic, and physical resilience. Current challenges such as erratic rainfall, prolonged droughts, flooding, rising temperatures, and soil erosion disrupt livelihoods, strain social systems, and damage critical infrastructure. These issues are projected to worsen under future climate scenarios, exacerbating the vulnerabilities of already marginalized groups, including women, Persons with Disabilities (PWDs) youth, and migrants. Addressing these challenges require targeted interventions that prioritize equity and inclusiveness and in ways that ensure that no group is left behind in the resilience building process.

Gender-responsive strategies are essential to tackling the differentiated impacts of climate change. Women, who are disproportionately affected due to their caregiving roles and economic reliance on climate-sensitive livelihoods, often face systemic barriers to resource access and decision-making. Similarly, youth, PWDs and migrants encounter unique challenges that limit their ability to adapt effectively. From such a perspective, gender-responsive approaches ensure that these diverse needs are considered and addressed through the promotion of equitable participation, access to resources, and the institutionalization of inclusive governance mechanisms.

The suggested adaptation measures demonstrate how intentional processes of adaptation planning should align with broader national development goals, the Nationally Determined Contributions (NDCs), as well as existing national sustainable development and resilience-building frameworks and policies. In their different forms, the suggested measures support overarching national sustainable development aspirations such as the promotion of food security, inclusive economic growth, and the provision of climate-resilient infrastructure. More, importantly, perhaps, it is also our desire that the suggested adaptation measures and the eventual district adaptation plans will respond and contribute to existing global commitments such as the Sustainable Development Goals (SDGs), particularly those that foreground the elimination of poverty (SGD 1), gender equality (SDG 5), reducing inequalities (SDG 10), and climate action (SDG 13).

5.2 Economic Adaptation Strategies

The economic adaptation strategies in Mion District, as shown in **Table 12**, aim to empower women, youth, and marginalized groups to respond effectively to climate-related livelihood disruptions. With a large portion of the population dependent on climate-sensitive sectors like rain-fed agriculture and livestock rearing, these strategies promote income diversification, inclusive access to resources, and equitable participation in climate-resilient value chains. The strategies also seek to reduce women's economic vulnerability by tackling gender-specific barriers such as lack of land ownership, credit, and market access.

Table 12: Strategies to address economic vulnerabilities in Mion District

Recommendation	Adaptation Options	Expected Impact	Potential Partners
Enhance access to diversified livelihoods	1. Train women and youth in climate-resilient livelihood skills (*e.g.*, beekeeping, Shea processing, solar drying) 2. Promote eco-tourism and agro-processing cooperatives 3. Establish mobile business hubs for women entrepreneurs	Increased income, resilience to climate shocks, reduced economic dependency	MoFA, NGOs, Women's groups, Youth associations, GEA
Strengthen financial inclusion	1. Facilitate access to microloans for women-led households 2. Establish community savings and credit schemes (*e.g.*, VSLA) 3. Integrate financial literacy training in women's community groups	Enhanced financial security, women's empowerment	Rural Banks, MASLOC, NGOs, Financial institutions
Promote climate-smart agriculture	1. Introduce drought-tolerant and early-maturing crop varieties 2. Provide small-scale irrigation kits to women farmers 3. Support climate advisory services using mobile platforms	Improved yields, reduced losses from erratic rainfall	MoFA, Agric extension agents, GIDA, Esoko
Support agricultural value addition	1. Set up women-led agro-processing centres 2. Link women producers to local and regional markets. 3. Provide packaging and branding support for processed goods.	Increased value capture, women's economic independence	Private sector, Trade Ministry, District Assembly
Digital and market literacy	1. Train women and youth in mobile marketing and e-extension platforms. 2. Provide digital tools (radios, apps) to access market and weather info. 3. Develop a community digital resource hub.	Improved decision-making, better market access.	Telecos, NGOs, ICT providers

5.3 Physical Adaptation Strategies

As depicted in **Table 13** below, physical adaptation strategies in the Mion District may focus on improving essential infrastructure and services to reduce exposure to climate hazards, particularly among women who face mobility, water, and energy burdens. These strategies should emphasize equitable investments in water infrastructure, health facilities, roads, and housing to enhance adaptive capacity and reduce risk across genders.

Table 13: Strategies to address social vulnerabilities in Mion District

Recommendation	Adaptation Options	Expected Impact	Potential Partners
Improve water security	1. Construct solar-powered mechanized boreholes in drought-prone communities 2. Expand rainwater harvesting systems for households and schools 3. Promote women-managed water user committees	Reduced water stress, improved women's health and productivity	WaterAid, Community Water Boards, NGOs, WASH Projects
Expand resilient infrastructure	1. Upgrade roads and bridges with climate-proof designs 2. Construct culverts in flood-prone zones 3. Build climate-resilient storage and evacuation centers	Improved market and health access, reduced isolation	Ministry of Roads, Assembly, Contractors, NADMO
Strengthen healthcare access	1. Build CHPS compounds in underserved areas 2. Provide solar energy and clean water to clinics 3. Establish mobile health units for remote women and PWDs	Enhanced maternal care, climate-related disease response	MoH, Solar NGOs, UNICEF, GHS
Promote climate-resilient housing	1. Provide subsidies for storm-resistant roofing and local materials 2. Train women artisans in eco-construction techniques 3. Develop community demonstration housing projects	Safer homes, women's inclusion in infrastructure sector	Housing Ministry, NGOs, Local masons
Establish community infrastructure hubs	1. Develop multi-use centers for storage, training, and shelter 2. Install solar lights in markets and water points 3. Equip community centers with ICT and emergency kits	Improved night safety, increased productivity	District Assembly, UNDP, Women's Cooperatives

5.4 Social Adaptation Strategies

Social adaptation strategies, as presented in **Table 14,** target the underlying gender norms, access barriers, and knowledge gaps that reduce the resilience of women, youth, and vulnerable populations. By fostering inclusive governance, gender-responsive education, and health outreach, these strategies aim to empower communities to co-create adaptive solutions.

Table 14: Strategies to address social vulnerabilities in Mion District

Recommendations	Adaptations Options	Expected Impact	Potential Partners
Strengthen women's leadership in climate governance	1. Establish women-led climate resilience committees 2. Enforce gender quotas in community climate planning bodies 3. Train women in climate negotiation and advocacy	Inclusive decision-making, empowerment of women's voices	Gender Ministry, NGOs, Traditional Authorities
Expand access to education and training	1. Provide adult literacy and numeracy training for women 2. Introduce climate education in schools 3. Provide scholarships for girls in STEM fields	Enhanced awareness, intergenerational resilience	MoE, GES, NGOs, Scholarships Secretariat
Promote climate-health awareness	1. Train local women as peer health educators 2. Conduct campaigns on malaria, heat stress, and nutrition 3. Distribute climate-resilient health kits and info materials	Reduced disease burden, improved coping strategies	MoH, CHPS, Health NGOs
Support vulnerable social groups	1. Create support networks for widows, elderly women, PWDs 2. Provide psycho-social support services 3. Develop inclusive community platforms for decision-making	Reduced isolation, better well-being and cohesion	Social Welfare Dept., Community Health Officers, Disability Councils
Foster youth engagement	1. Develop climate clubs and youth adaptation internships 2. Organize youth-led clean-ups and tree-planting drives 3. Establish innovation hubs for green entrepreneurship	Increased youth ownership of adaptation process	NYA, Schools, Youth-led CSOs

6. Institutional Capacity Building and Adaptation Policy Implication

6.1 Introduction

Adaptation governance requires intentional efforts and adequate capacity at all levels both human and institutional. A major lesson that has emerged from all our CVRA experiences, especially at the subnational level, and in the district, is the lack of climate adaptation governance capacity. This remains a national challenge and one that we have tried, as much as it has been possible, to use our current assignments and engagements with the Assemblies to address. In all instances, we have approached our work in the districts as learning and capacity building journeys and in ways that bring a conscious focus on the need to co-produce knowledge and to build the capacity of district/municipal staff, as well as other critical stakeholders in adaptation planning and in areas such as climate risk and vulnerability assessments, and climate-informed decision making.

While we have done our best, there is still a capacity gap at the institutional level which needs to be addressed. We proceeded from the premise that Mion District is not an exception even though it remains at the forefront of providing the requisite governance machinery for adaptation planning and resilience building in the district. The Assembly, therefore, is supposed to provide leadership to address the district's unique climate impacts and vulnerabilities, which include flooding, drought, soil erosion, and resource scarcity. Our engagements therefore targeted key personnel from the Assembly and relevant stakeholders within the district and the objective was to use participatory learning processes to develop knowledge and build capacity.

These collaborative efforts, as we have learned, enriched the process by ensuring inclusion, voice, ownership and incorporating diverse perspectives. The collaborative processes especially through the use of tools such as participatory risk mapping, seasonal calendar analysis, matrix of function, etc. Highlighted the pressing issues faced by communities, particularly women, youth, and other marginalized groups. The different discussions also provided an understanding of the climate change phenomenon, the nature of impact manifestations and how different groups such as women, children the elderly, etc. experienced impacts and vulnerabilities in different ways and the need for targeted adaptation interventions.

In this chapter, we underscore the critical importance of the Assembly in providing the requisite climate change governance leadership and how capacity at multi-levels also become a critical imperative for effective and proactive adaptation planning. We also highlight an unavoidable concern: Climate Finance, as a necessary topic for broader engagement and discussion. In our view, climate finance is at the very core of adaptation planning both at the national and subnational levels. Thus, we as a consultant team, have been conscious and intentional about making the topic a part of our process and as an effort towards institutional strengthening and capacity building. We provided insights and directions on how to identify funding sources and what to do to attract funding.

Additionally, we have also been very intentional about locating this work within the broader Ghana National Adaptation Plan (NAP) process by educating stakeholders on how the implementation of adaptation actions in the district contributed to the NAP process at the national level. We demonstrated the link between national and subnational level processes and how that responds to the vertical integration approach adopted by the Ghana NAP process. By aligning district level planning processes to national level aspirations, we clearly demonstrated what vertical integration means and how such processes could distil and highlight unique needs and particularities at the district level and how they might be prioritized within national policy regimes. A case in point is the issue of gendered vulnerabilities, biophysical challenges and the diversity and extremity of climate constraints and associated adaptation needs in specific local communities. A principal organizing philosophy that underscored this work was awareness creation, knowledge co-production and understanding of the complex linkages between national level climate risk and vulnerabilities and subnational risk and vulnerabilities. More importantly, we highlighted the gendered nature of climate impacts, risks and vulnerabilities and the critical imperative for gender-responsive adaptation interventions.

6.2 Strengthening Institutional Capacity

6.2.1 Strengthening the Enabling Environment for Climate Finance

Limited access to climate finance remains a major constraint in Mion District. Institutional barriers such as low technical capacity, inadequate understanding of financing frameworks, and weak partnerships with donors have hindered the development and implementation of transformative climate adaptation projects.

Table 15: Key actions, expected outcomes, and collaborators for strengthening climate finance readiness

Key Actions	Expected Outcomes	Collaborators
Train Assembly staff on proposal writing and accessing climate funds (*e.g.*, GCF, Adaptation Fund)	Increased ability to secure external funding	District Assembly, EPA, UNDP, MoF
Develop transparent financial management systems for adaptation projects	Improved donor trust and sustained financing	MoF, Financial institutions, NGOs
Organize district workshops on climate finance access for local stakeholders	Increased awareness of funding opportunities and use	Development partners, CSOs
Foster partnerships with research institutions, CSOs, and international donors	Enhanced proposal quality and project scale	UNDP, USAID, University of Ghana, World Bank

6.2.2 implementing a Gender-Responsive National Adaptation Plan

Mion's climate vulnerabilities disproportionately affect women and marginalized groups. Women face restricted access to resources, time poverty due to caregiving burdens, and exclusion from decision-making processes. A gender-responsive NAP should target these inequalities by promoting inclusive participation in adaptation planning and implementation.

Table 16: Key actions, expected outcomes, and collaborators for gender-responsive adaptation

Key Actions	Expected Outcomes	Collaborators
Train women's groups in drought-tolerant agriculture, entrepreneurship, and climate-smart practices	Improved adaptive capacity among women	MoGCSP, CSOs, MoFA, NGOs
Conduct youth-targeted workshops on climate resilience and green skills	Empowered youth participation in adaptation	NYA, Youth groups, District Assembly
Integrate gender indicators into district adaptation project design and monitoring	Measurable progress on gender equity	MoGCSP, District Gender Desk, NGOs
Facilitate inclusive stakeholder engagement platforms	Enhanced ownership and legitimacy of adaptation plans	Traditional leaders, women/youth groups, CSOs

6.2.3 Enhancing Planning and Execution of Inclusive Projects

Adaptation strategies must reflect local realities and integrate vulnerable voices. Mion District needs structured processes for inclusive planning, participatory monitoring, and equitable project implementation.

Table 17: Enhancing planning and execution of inclusive projects

Key Actions	Expected Outcomes	Collaborators
Conduct participatory planning workshops with women, youth, and PWDs	Community ownership of climate interventions	District Assembly, NGOs, Traditional authorities
Build Assembly staff capacity on inclusive governance and adaptive planning	Better integration of social inclusion in projects	EPA, Development experts, UN Women
Develop M&E frameworks with gender and vulnerability indicators	Evidence-based adaptation tracking	MoP, Research institutions, CSOs
Establish transparent systems for project monitoring and feedback	Increased accountability and learning	MoF, Planning Unit, Local Assemblies

6.2.4 Collaboration Between Key Institutions and Stakeholders

Achieving sustainable adaptation requires collective action. Collaboration among government entities, civil society, academia, private sector, and communities is essential.

Recommendation:

- Strengthen partnerships with University for Development Studies and other research bodies for climate data and innovation.
- Establish inter-agency adaptation taskforces linking agriculture, health, water, and infrastructure.
- Build multi-stakeholder forums to co-design adaptation strategies.
- Establish climate desks in the Assembly.

6.3 Policy Implications

6.3.1 Strengthening Climate-Resilient Infrastructure and Natural Resource Management

Mion's poor infrastructure and land degradation are exacerbating climate impacts. The district lacks resilient roads, boreholes, and adequate storage facilities. Environmental degradation, such as deforestation and bushfires, threatens food systems and water availability.

Table 18: Policy actions for infrastructure and natural resource management

Recommendations	Action	Expected Outcomes	Example
Improve water security	Construct mechanized boreholes and dams	Reliable water access for households and irrigation	Solar-powered boreholes in Sang and Kpumi
Climate-proof road networks	Build and rehabilitate feeder roads with culverts	Better access to farms and markets	Kayong-Palari feeder road upgrade
Restore degraded land	Train communities in sustainable land management, agroforestry	Reduced erosion, enhanced soil fertility	Community tree planting in Dijeo and Nyentuo

6.3.2 Integrating Gender-Responsive Approaches into Adaptation Policies

Women and youth in Mion face systemic barriers in accessing resources and decision-making. Gender-responsive policy integration is necessary to promote equitable resilience building.

Table 19: Gender-responsive adaptation policy actions

Recommendations	Action	Expected Outcomes	Examples
Ensure inclusive governance	Reserve seats for women/youth on local climate committees	Increased participation of marginalized groups	Youth climate reps in Kayong, Women-led platforms in Sang
Close gender knowledge gaps	Provide training on climate-smart practices tailored for women	Enhanced adaptive capacity	Farmer Field Schools for women in Zuro
Promote equitable resource access	Target women and youth for agricultural inputs and credit	Empowered households and enterprises	Input vouchers for women in Nyentuo

6.3.3 Promoting Inclusive Economic Adaptation Strategies

Limited income diversification and value addition constrain adaptive capacity. Targeted economic adaptation can improve resilience among vulnerable groups.

Table 20: Inclusive economic strategies

Recommendation	Action	Expected Outcome	Example
Diversify livelihoods	Train women and youth in alternative income activities (*e.g.,* shea butter, soap-making, agro-processing)	Reduced income vulnerability	Shea cooperatives in Dijeo and soap groups in Palari
Develop agro-value chains	Establish processing centers for maize, rice, and groundnuts	Enhanced income and reduced post-harvest losses	Rice processing center in Sang
Encourage youth entrepreneurship	Provide start-up kits and vocational skills	Self-employment and reduced rural migration	Youth innovation hub in Zuro

6.3.4 Addressing Systemic Barriers to Resource Access

Inequities in land tenure, credit, and information access hinder resilience. Removing these barriers is key to building long-term adaptation.

Table 21: Addressing systemic barriers

Barrier	Action	Expected Outcome	Example
Insecure land tenure	Promote community-based land registration for women and youth	Improved access to credit and security	Pilot tenure project in Palari
Limited water access	Expand rural water infrastructure for domestic and productive use	Reduced time burden and improved health	Mechanized boreholes in Nyentuo
Lack of climate info	Disseminate forecasts through radios, town criers, and SMS	Informed decision-making	Radio updates in Dijeo

6.3.5 Aligning Local Efforts with National and Global Frameworks

Mion District's adaptation efforts must align with Ghana's NAP, SDGs, and UNFCCC frameworks to maximize financing and coherence.

Table 22: Alignment with existing frameworks

Framework	Action	Expected Outcome	Example
Ghana's NAP	Align district actions with national adaptation priorities	Policy coherence and access to national support	District Climate Action Plan harmonized with NAP
SDGs	Integrate SDG targets into adaptation M&E	Better tracking and contribution to development goals	SDG 5, 6, 13 integrated into Sang projects
Climate Finance (GCF, AF)	Build capacity to access and manage international funds	Enhanced project scale and sustainability	Proposal submission training for Assembly staff

7. Community Specific Recommendation

Based on the adaptation needs identified through focus group discussions and survey data, several recommendations can enhance resilience and livelihoods in the Mion District. Focusing on water access, infrastructure improvement, and livelihood diversification is essential for enhancing community resilience against climate variability.

7.1 Sang: Enhancing Livelihoods, Resilience, and Sustainability

Sang, the capital of Mion District, faces challenges with water scarcity, inadequate healthcare, and limited employment opportunities. Community members reported increased heat stress, low agricultural productivity due to droughts, and poor road infrastructure, limiting access to markets and essential services.

Table 23: Adaptation options specifically for Sang Community

Adaptation Options	Expected Impact	Potential Collaborators
Expand water supply infrastructure	Improved water access for households and businesses	Community Water and Sanitation Agency (CWSA), NGOs, District Assembly
Develop solid waste management systems	Enhanced sanitation and reduced health risks	District Assembly, Environmental Protection Agency (EPA)
Establish a community clinic with medical staff	Improved healthcare access and reduced disease burdens	Ghana Health Service (GHS), NGOs, District Assembly
Promote small businesses through financial support	Increased employment and economic resilience	Ghana Enterprise Agency (GEA), Microfinance Institutions, NGOs
Improve road networks	Enhanced market access and reduced transportation challenges	Ministry of Roads and Highways, District Assembly

7.2 Kayong: Addressing Resource Challenges and Enhancing Sustainable Development

Kayong community faces extreme water scarcity, poor road infrastructure, and limited healthcare access. Droughts and erratic rainfall significantly impact crop yields, and livestock suffer from insufficient pasture and water availability.

Table 24: Adaptation options specifically for Kayong community

Adaptation Options	Expected Impacts	Potential Collaborators
Construct mechanized boreholes and install rainwater harvesting systems	Reliable access to clean water for domestic use and farming	CWSA, NGOs, District Assembly
Establish a Community Health Planning and Services (CHPS) compound	Improved healthcare access and reduced health-related travel burdens	GHS, District Assembly
Provide drought-tolerant crop varieties and agricultural training	Enhanced agricultural productivity and resilience	Ministry of Food and Agriculture (MoFA), NGOs, Agricultural Extension Services
Support women's cooperatives and alternative livelihoods	Increased financial resilience and diversified income sources	Microfinance Institutions, NGOs, GEA

7.3 Nyentuo: Community-Led Adaptation Options to Address Water Scarcity and Economic Instability

Nyentuo faces challenges with water scarcity, poor road networks, and inadequate healthcare services. Droughts and low rainfall have reduced agricultural productivity, increasing food insecurity.

Table 25: Adaptation options for the Nyentuo Community

Adaptation Options	Expected Impact	Potential Collaborators
Establish community-managed boreholes and rainwater harvesting facilities	Improved water availability for households and farms	CWSA, NGOs, District Assembly
Promote sustainable livestock rearing practices	Reduced animal mortality and increased income	Veterinary Services Department, NGOs
Provide mobile health services to remote areas	Enhanced healthcare access and early treatment of diseases	GHS, NGOs, District Assembly
Improve road infrastructure	Enhanced market access and reduced transportation costs	Ministry of Roads and Highways, District Assembly

7.4 Zuro: Strategies to Improve Agricultural Resilience and Address Climate Vulnerabilities

Zuro experiences frequent droughts, low crop yields, and challenges with flooding. Farmers are highly dependent on rain-fed agriculture, and the lack of proper drainage systems results in frequent waterlogging.

Table 26: Adaptation options for the Zuro Community

Adaptation Options	Expected Impact	Potential Collaborators
Construct small dams and establish irrigation systems	Enhanced agricultural productivity and resilience to drought	Ministry of Water Resources, NGOs, District Assembly
Provide climate-resilient seed varieties and fertilizers	Improved crop yield and food security	MoFA, Agricultural Extension Services
Develop drainage systems	Reduced flood risks and improved sanitation	District Assembly, Local Contractors
Promote agroforestry and soil conservation practices	Improved soil fertility and long-term agricultural productivity	Forestry Commission, NGOs

7.5 Palari: Promoting Livelihood Resilience and Enhancing Water Access

Palari community faces persistent challenges with water scarcity, limited access to healthcare, and deteriorating road infrastructure. Agricultural productivity is heavily affected by droughts and low rainfall, leading to food insecurity.

Table 27: Adaptation option for the Palari Community

Adaptation Options	Expected Impact	Potential Collaborators
Provide mechanized boreholes and rainwater harvesting systems	Improved access to water for domestic use and irrigation	CWSA, NGOs, District Assembly
Establish a mobile health clinic	Enhanced access to healthcare services and reduced disease burden	GHS, NGOs, District Assembly

Adaptation Options	Expected Impact	Potential Collaborators
Promote drought-resistant crop varieties and training programs	Increased food security and improved agricultural productivity	MoFA, Agricultural Extension Services, NGOs
Develop local storage facilities and market access	Reduced post-harvest losses and improved market opportunities	MoFA, District Assembly, NGOs

7.6 Kpumi: Building Resilience to Climate Variability

Kpumi suffers from severe water scarcity, poor healthcare infrastructure, and limited livelihood diversification. Farmers face declining yields due to unpredictable rainfall patterns.

Table 28: Adaptation options for the Kpumi Community

Adaptation Options	Expected Impact	Potential Collaborators
Construct small water storage systems and rehabilitate boreholes	Improved water availability for drinking and irrigation	CWSA, NGOs, District Assembly
Provide drought-resistant crop varieties and farming support	Increased agricultural resilience and food security	MoFA, Agricultural Extension Services, NGOs
Establish savings and loan schemes for farmers	Enhanced financial resilience and investment in adaptation	Microfinance Institutions, NGOs
Develop a local health facility	Improved healthcare access and reduced travel distances	GHS, District Assembly

7.7 Dijeo: Enhancing Water Access and Livelihood Resilience

Dijeo faces severe water scarcity, poor agricultural yields, and limited healthcare access. Livelihoods are heavily dependent on rain-fed agriculture, which is frequently affected by droughts.

Table 29: Adaptation options for the Dijeo Community

Adaptation Options	Expected Impact	Potential Collaborators
Install mechanized boreholes and implement water conservation systems	Improved water availability for households and agriculture	CWSA, NGOs, District Assembly
Provide climate-resilient crop varieties and fertilizers	Enhanced food security and increased agricultural productivity	MoFA, Agricultural Extension Services
Develop healthcare outreach programs	Improved health access and reduced travel burden for medical care	GHS, NGOs, District Assembly
Provide agricultural training on drought-resistant farming techniques	Increased resilience to climate impacts and improved income	Agricultural Extension Services, NGOs

8. Conclusion, Recommendations and Way Forward

8.1 Conclusion

The Mion District is increasingly experiencing the complex and multi-dimensional impacts of climate change, affecting social, economic, and environmental systems. These impacts are most profoundly felt by women, youth, persons with disabilities (PWDs), and other marginalized groups whose vulnerabilities are rooted in structural inequalities, poor access to resources, and exclusion from decision-making processes. The district faces a recurrent cycle of floods, droughts, bushfires, erratic rainfall, and extreme heat, which threaten food security, economic activities, water availability, infrastructure, and human health.

The climate vulnerability and risk assessment conducted under the SIGRA Project revealed that agriculture, the mainstay of the Mion economy, is highly sensitive to changing climate patterns. Women, who are primarily engaged in subsistence agriculture and caregiving roles, bear a disproportionate burden, facing increased labor demands, limited mobility, and restricted access to land, credit, and climate information. Similarly, men are impacted through the loss of productive assets like livestock and crops, and young people are often forced to migrate or abandon farming due to uncertainty in agricultural returns.

Institutional gaps further constrain the adaptive capacity of Mion District. Poor infrastructure, limited health services, weak access to water, and inadequate support systems deepen household vulnerabilities. The absence of effective early warning systems and tailored adaptation planning further limits timely responses to climate hazards. Despite these challenges, the community has demonstrated resourcefulness, adopting local strategies such as agroforestry, diversified crop production, and water harvesting. However, these efforts remain under-resourced, uncoordinated, and insufficient in addressing systemic vulnerabilities.

Gendered vulnerabilities in Mion District are particularly striking. Women's limited access to productive resources, coupled with socio-cultural expectations, restricts their ability to adapt effectively. The assessment also highlighted that disability status, educational background, and household income are significant determinants of adaptive capacity. As climate risks intensify, targeted, inclusive, and gender-responsive adaptation measures will be essential to protect lives, improve livelihoods, and build long-term resilience.

8.2 Recommendations

To address the multiple dimensions of climate vulnerability and promote inclusive resilience in Mion District, the following recommendations are proposed:

1. **Enhancing Gender Equity and Inclusion**
    - Promotion women's land ownership and access to productive assets through policy reforms and community sensitization.
    - Strengthen the participation of women, youth, and PWDs in adaptation planning and governance structures.
    - Establish women-led climate adaptation groups to implement community resilience activities.

2. **Investing in Climate-Resilient Infrastructure**
    - Construct climate-proof infrastructure, including flood-resistant roads, culverts, and bridges to improve market and emergency access.
    - Develop solar-powered mechanized boreholes and rainwater harvesting systems in drought-prone communities.
    - Establish climate-resilient housing schemes using local materials and eco-construction technologies.

3. **Strengthening Livelihood Diversification**
    - Expand access to vocational and climate-resilient livelihood training (*e.g.*, beekeeping, Shea processing, solar energy services).
    - Support small-scale enterprises, especially for women and youth, with start-up capital and technical support.
    - Enhance animal husbandry and poultry-rearing capacity through veterinary services and improved breeds.

4. **Promoting Climate-Smart Agriculture**
    - Distribute drought-resistant and early-maturing crop varieties to smallholder farmers.
    - Provide small-scale irrigation tools, compost training, and conservation agriculture practices.
    - Strengthen extension services and Farmer-Based Organizations (FBOs) with a gender focus.

5. **Improving Access to Water, Health, and Education**
    - Expand community access to CHPS compounds and mobile health services, especially in hard-to-reach areas.
    - Train local women as community health educators on climate-sensitive health risks.
    - Include climate adaptation in school curricula and build climate-smart educational facilities.

6. **Enhancing Climate Information Systems and Early Warning**
    - Develop localized early warning systems with radio alerts, mobile updates, and community messengers.
    - Translate climate forecasts into local languages and ensure dissemination through women's and youth groups.
    - Train district staff and community members in interpreting and acting on weather information.

7. **Building Institutional Capacity and Partnerships**
    - Train district officials on gender-responsive adaptation planning and resource mobilization.
    - Forge partnerships with NGOs, research institutions, and private actors for knowledge-sharing and funding.
    - Establish local monitoring and evaluation systems with gender indicators to track adaptation effectiveness.

8. **Scaling Up Financial Inclusion**
    - Expand access to microcredit, savings schemes (*e.g.,* VSLA), and insurance products tailored to climate risks.
    - Create revolving climate funds managed by women's cooperatives for community adaptation projects.
    - Leverage mobile banking and digital finance tools to enhance access for remote populations.

8.3 Way Forward

The path to climate resilience in Mion District lies in inclusive, participatory, and gender-responsive planning and action. Future adaptation interventions must be rooted in local realities and co-created with the communities they intend to serve. The Mion District Assembly should integrate this assessment into its Medium-Term Development Plan, with clear budget allocations for climate adaptation, especially for women and vulnerable groups.

Additionally, the Assembly should prioritize the development of a comprehensive District Adaptation Plan aligned with the National Adaptation Plan (NAP), SDG 13 (Climate Action), and SDG 5 (Gender Equality). This plan must be informed by continuous community consultations, strong partnerships, and an institutional commitment to equity and sustainability.

Finally, the findings of this assessment provide a strong evidence base to attract funding from climate finance institutions such as the Green Climate Fund (GCF) and the Adaptation Fund. By investing in resilience today, Mion District can safeguard its people, economy, and ecosystems from the worsening impacts of climate change, ensuring a just and sustainable future for all.

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