

INTEGRATION OF CLIMATE CHANGE ADAPTABILITY AND DISASTERS FRAMEWORK IN STRENGTHENING RESILIENCE IN MALAWI. A CASE STUDY OF MCHINJI DISTRICT.

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29 MAY,2026

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ABSTRACT

This study examines the integration of Climate Change Adaptation (CCA) and Disaster Risk Reduction (DRR) frameworks in strengthening community resilience to climate-related hazards in Malawi, with a focus on Traditional Authority (T/A) Simphasi in Mchinji District. Malawi frequently experiences climate-related disasters such as floods, droughts, strong winds, and prolonged dry spells, which continue to affect livelihoods, food security, infrastructure, and vulnerable populations. Despite the existence of climate and disaster management policies, challenges such as weak institutional coordination, limited resources, and inadequate community participation continue to hinder effective implementation. The study employed a comprehensive research methodology involving data collection from both primary and secondary sources to assess the effectiveness of integrating CCA and DRR frameworks in reducing vulnerability and enhancing adaptive capacity. The findings indicate that integrated CCA and DRR approaches can improve disaster preparedness, response, and long-term resilience among communities. However, barriers including insufficient funding, technical capacity gaps, and policy implementation challenges remain significant. The study recommends strengthening stakeholder coordination, enhancing community participation, increasing investment in climate adaptation initiatives, and promoting sustainable resilience strategies. Overall, the research contributes to the understanding of how integrated CCA and DRR frameworks can support disaster risk management and resilience building among vulnerable communities in Malawi.

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ACRONYMS/ABBREVIATIONS

CCA: Climate Change Adaptation

DRR: Disaster Risk Reduction

DoDMA: Department of Disaster Management Affairs

DCCMS: Department of Climate Change and Meteorological Services

FGD: Focus Group Discussion

KII: Key Informant Interview

GIS: Geographic Information System

CBA: Cost-Benefit Analysis

CDA: Cross-Dimension Analysis

SPSS: Statistical Package for Social Science1

ADRMC: Area Disaster Risk Management Committee

VDRMC: Village Disaster Risk Management Committee

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1 INTRODUCTION

1.1 Background of the study

Climate change is one of the most pressing global challenges, intensifying natural hazards such as floods, droughts, storms, and heatwaves (IPCC, 2022). Developing countries, particularly in Africa, are disproportionately affected due to fragile ecosystems, rain-fed agriculture, and limited adaptive capacity, despite contributing less than 4% to global greenhouse gas emissions. For example, flooding in Dakar, Senegal in 2020 displaced over 10,000 people, while droughts in Ethiopia's Zarima sub-basin and recurrent droughts in Nigeria have severely threatened food security and economic stability ((FAO), 2021)

Malawi mirrors these continental challenges, experiencing recurrent floods, prolonged dry spells, and devastating cyclones, including Cyclone Freddy in 2023, which caused significant loss of life, displacement, and destruction of farmland and infrastructure (DoDMA, 2023). Mchinji District, in Malawi's Central Region, exemplifies these vulnerabilities, with its smallholder, rain-dependent agriculture highly susceptible to erratic rainfall, floods, and droughts (malawi, 2016). High poverty levels, limited resources, and weak institutional support further exacerbate these impacts (NSO, 2018).

Government initiatives such as the Affordable Inputs Programme aim to support agricultural productivity but often reinforce dependence on rain-fed farming, leaving communities vulnerable ((FAO), 2021). National frameworks, including the National Climate Change Management Policy (2016), the National Resilience Strategy (2018–2030), and the Disaster Risk Management Act (2023), exist to address these challenges ((IPCC), 2022). However, these policies often operate in silos, lacking integration between climate change adaptation (CCA) and disaster risk reduction (DRR). At the community level in Mchinji, this fragmentation results in

duplicated efforts, inefficient resource use, and persistent vulnerability, trapping communities in cycles of food insecurity and reliance on external aid

1.2 Problem statement

Climate change in Mchinji District continues to intensify hazards such as droughts, dry spells, floods, and crop diseases. Unlike in countries with strong coping mechanisms, where even large-scale disasters may result in limited impacts, Mchinji suffers disproportionately from comparatively moderate hazards. This is largely due to weak adaptive capacity, poor preparedness, and inadequate institutional coordination ((IPCC), 2022). Households remain highly dependent on donor and government relief during shocks. Interventions such as the AIP, while valuable, remain tied to rain-fed systems that are increasingly unreliable. This perpetuates cycles of food insecurity and aid ((FAO), 2021). At the same time, Malawi's DRR and CCA frameworks are fragmented, poorly monitored, and weakly enforced ((DoDMA), 2023). With external aid becoming less predictable due to global crises ((OECD), Global humanitarian trends and aid flows 2023, 2020) reliance on external support is unsustainable. Without an integrated approach that harmonizes DRR and CCA, Mchinji District will remain vulnerable, undermining food security, resilience, and long-term development aspirations.

1.3 Research objectives

Main Objective

To develop an integrated framework that harmonizes Climate Change Adaptation and Disaster Risk Reduction to strengthen resilience in Mchinji District.

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Specific Objectives

- To critically analyze existing policies, frameworks, and institutional arrangements guiding CCA and DRR in Malawi, identifying gaps and opportunities for integration.
- To examine community-level vulnerabilities, coping strategies, and adaptive capacities in T/A Simphasi to understand their influence on disaster impacts.
- To design and propose a practical community- based integrated framework that bridges gaps, reduces aid dependency, and enhances long-term resilience in Mchinji District.

1.4 Research Questions

1. What policies, frameworks, and institutional arrangements currently guide CCA and DRR in Malawi, and what structural and implementation gaps exist in Mchinji District?
2. How do community vulnerabilities, coping strategies, and adaptive capacities shape the impacts of climate-induced disasters in Mchinji District?
3. What type of integrated framework can effectively harmonize CCA and DRR to strengthen resilience and reduce aid dependency in Mchinji District?

1.5 Significant of the Study

This study is particurly significant for T/A Simphasi, Mchinji District, and Malawi for several reasons. First, it addresses policy coherence by integrating CCA and DRR frameworks, reducing institutional silos and ensuring efficient resource allocation at the community level ((UNDRR), 2022).Second, it offers community relevance by identifying practical, locally adapted strategies to strengthen coping capacity, enhance food security, and reduce aid dependency in T/A Simphasi (UNICEF, 2021). Third, it informs development partners and policymakers guiding coordinated interventions for maximum impact and sustainability (Garschagen, 2019). Fourth, it

contributes to academic knowledge by filling the gap in studies on harmonizing CCA and DRR at the community level in Malawi, providing a transferable model for other vulnerable communities (Silva, 2018). Finally, it aligns with global goals, contributing to SDG 2 (Zero Hunger), SDG 11 (Sustainable Cities and Communities), and SDG 13 (Climate Action) by addressing agricultural vulnerability and promoting resilience (NSO, 2018)

2. LITERATURE REVIEW

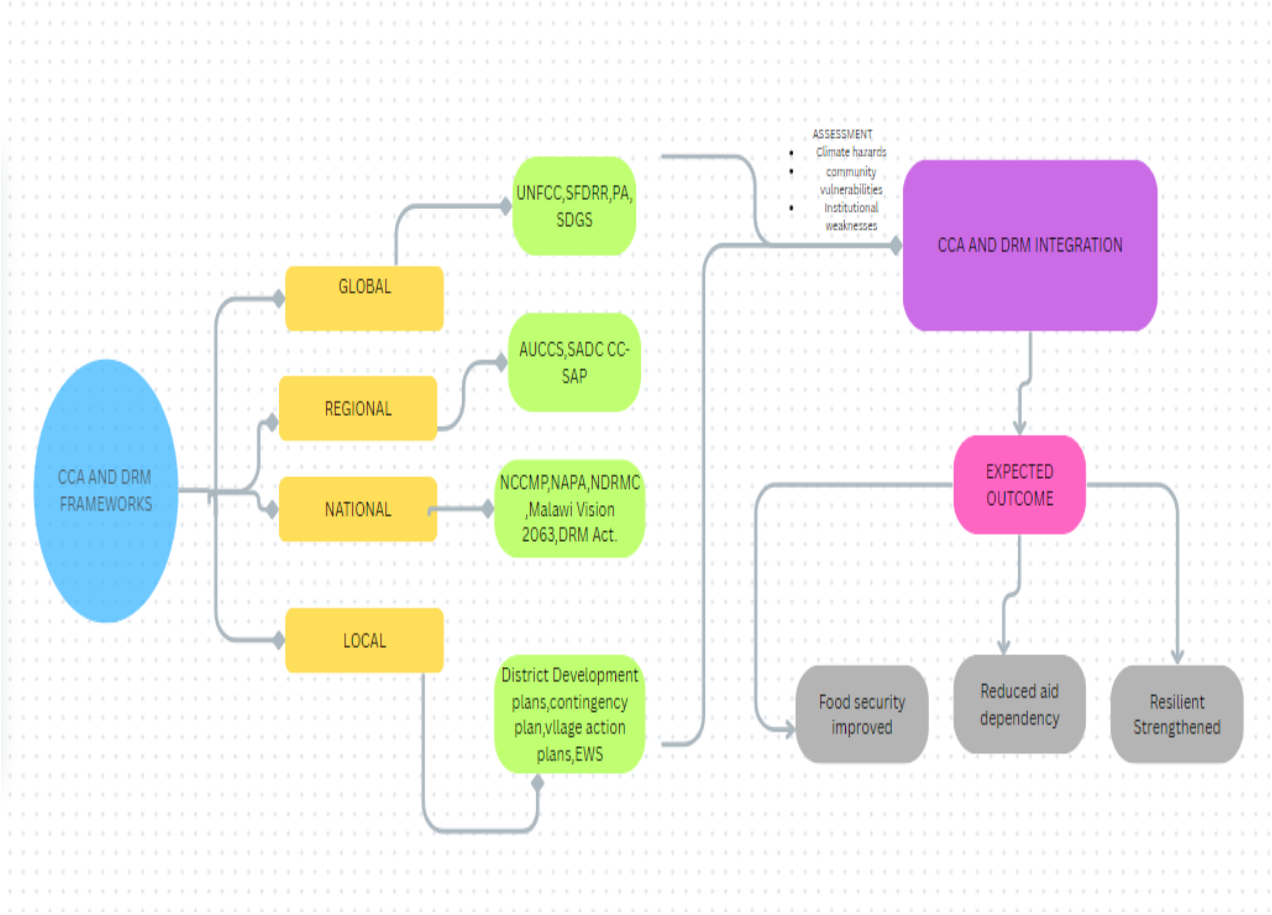


Figure 1: Illustrates the analysis of CCA and DRM Framework Integration

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2.1 Policies and Framework

Malawi has established several frameworks that recognize the need to integrate CCA and DRR (malawi, 2016). These include the National Climate Change Management Policy (Government of Malawi, 2016), the National Resilience Strategy (Government of Malawi, 2018), and the Disaster Risk Management Act (Government of Malawi, 2023). Collectively, these policies aim to promote coordinated disaster management, climate adaptation, and sustainable development. However, despite their strong policy intent, Malawi still experiences challenges such as overlapping mandates, poor intersectoral coordination, inconsistent funding, and weak monitoring systems. These limitations hinder the translation of national strategies into practical actions that benefit local communities.

In areas such as Traditional Authority (T/A) Simphasi in Mchinji District, local communities face recurrent hazards including droughts, dry spells, and floods. While community-based programs such as conservation agriculture, afforestation, and small-scale irrigation exist, they are often implemented in isolation from disaster risk initiatives like early warning systems, flood control, and emergency preparedness. This fragmentation results in duplication of efforts, inefficient resource use, and short-term resilience outcomes (Garchagen, 2019).

Furthermore, community-level policies and plans rarely provide clear guidance on how to operationalize the integration of CCA and DRR. Local institutions such as Area Development Committees (ADRMCs), Village Disater Risk Management Committees (VDRMs), and local NGOs often work independently, each following separate project guidelines and donor priorities. This lack of harmonization weakens coordination, leaving communities without a unified resilience framework.

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Additionally, limited financial resources, inadequate technical capacity, and weak policy awareness among local leaders further constrain effective implementation.

2.2 Community Vulnerability and Adaptive Capacities

RISK (CLIMATE) = (HAZARD × EXPOSURE × VULNERABILITY)

CAPACITY

Globally, climate change disproportionately impacts communities dependent on agriculture, with vulnerable groups such as women, children, and the elderly facing the greatest risks when adaptive capacity is low. In developed contexts like Japan, robust social systems, early warning mechanisms, and infrastructure investments enable communities to manage severe hazards with minimal disruption (IPCC, 2022). In contrast, African rural communities, heavily reliant on rain-fed agriculture, face significant exposure to climate variability. Coping strategies in these contexts are often reactive, including food rationing, asset sales, or reliance on external aid, which provide short-term relief but erode long-term resilience.

In Malawi, rural households, particularly in Mchinji District, are highly vulnerable due to their dependence on rain-fed agriculture and limited access to irrigation, climate information, or diversified livelihoods. The Affordable Inputs Programme, designed to improve agricultural resilience (UNDRR, 2021), [1] inadvertently reinforces reliance on rain-fed systems, leaving households exposed to droughts and erratic rainfall. Poverty, weak infrastructure, and inadequate early warning systems further exacerbate disaster impacts.

In Mchinji, coping mechanisms such as selling livestock or relying on food aid are prevalent but unsustainable, providing temporary relief while undermining long-

term adaptive capacity ((UN), 2015). The absence of community-based resilience programs that integrate scientific projections with practical adaptation strategies widens the gap between existing vulnerabilities and effective responses ((FAO), 2021)

2.3 Integrated Framework

In Africa, efforts to develop integrated frameworks are underway but are constrained by limited resources and technical expertise. Regional strategies provide guidance, but their operationalization at the community level remains weak, particularly in resource-constrained settings like Malawi.

In Malawi, the use of scientific tools such as GIS, hydrological modeling, and drought indices is minimal, especially at the district level. In Mchinji, frequent riverine floods damage farmland and settlements, yet tools like the HEC-RAS hydrological model are not employed to anticipate risks or guide land-use planning. Similarly, annual rainfall data from the Department of Climate Change and Meteorological Services (DCCMS) could inform drought projections, but such data are rarely integrated into local planning ((IPCC), 2022). This disconnects between scientific tools and practical planning leaves communities exposed to preventable climate shocks. A practical, integrated framework that unites policies, institutions, communities, and scientific tools is essential to reduce aid dependency and enhance resilience in Mchinji. (NSO, 2018).

3.MATERIALS AND METHODS

3.1 Introduction

This chapter outlines the methodology and materials that were employed to collect, analyze, and interpret data. It explains the research design, data collection methods, analytical tools, and procedures for ensuring the reliability and validity of the data. The approach integrated qualitative, quantitative, and scientific modeling techniques, including GIS and Remote Sensing, to provide a comprehensive understanding of vulnerabilities, institutional arrangements, and adaptive capacities, supporting evidence-based recommendations.

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3.2 Study area

The study was conducted in T/A Simphasi, Mchinji district (Central Region, Malawi). The district covers an area of 3,131 km2 and has a population of 602,305 .T/A Simphasi covers an area of has a population of 50571 (NSO, 2018).

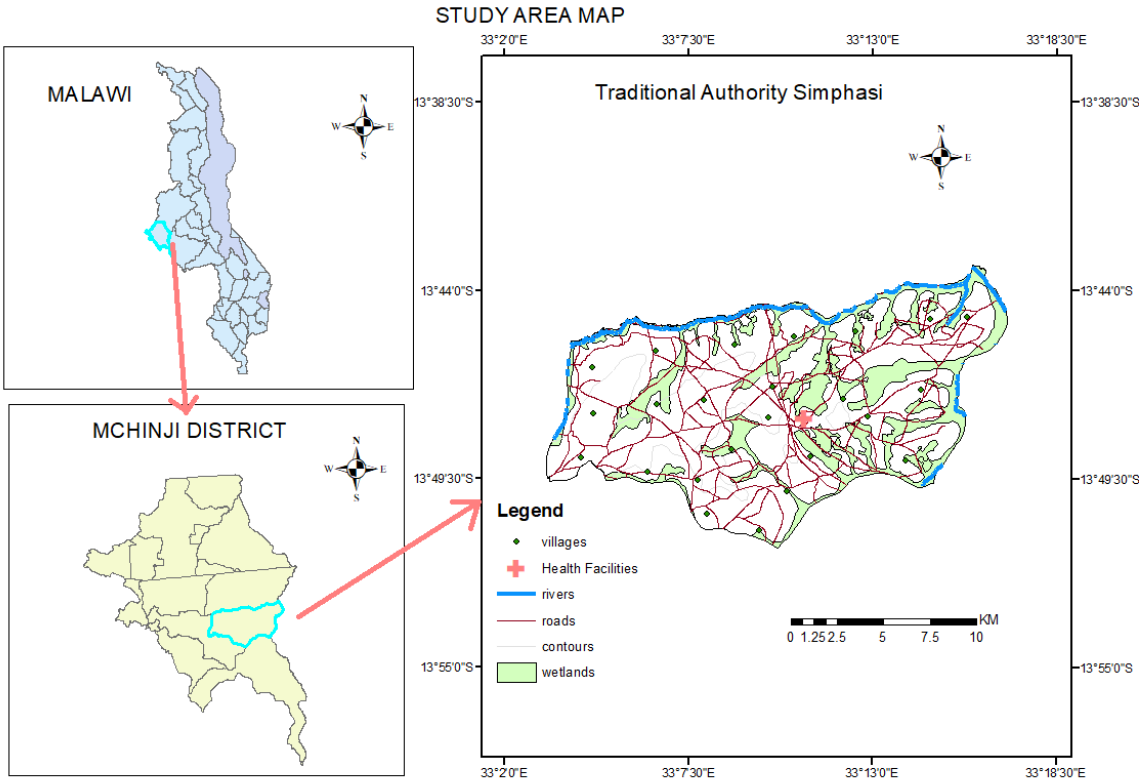


Figure 2: Map of T/A Simphasi, Mchinji district.

3.3 Site Selection

The selected site for this study was Traditional Authority (T/A) Simphasi in Mchinji district.

This area was chosen due to its high vulnerability to climate-induced hazards, including floods, dry spells, and droughts, exacerbated by its proximity to river systems such as the Bua River. Overall, Mchinji District stands out as the most

suitable study area because it clearly reflected the compounded challenges of climate change and disaster risks in Malawi. The district faced systemic problems such as high poverty levels, limited adaptive capacity, and reliance on external aid, while national policies on disaster risk reduction and climate change adaptation remained poorly integrated at the local level. These overlapping vulnerabilities and institutional gaps made Mchinji not only a hotspot of climate risk but also an ideal case for developing an integrated framework that could provide practical lessons for resilience both within the district and across Malawi.

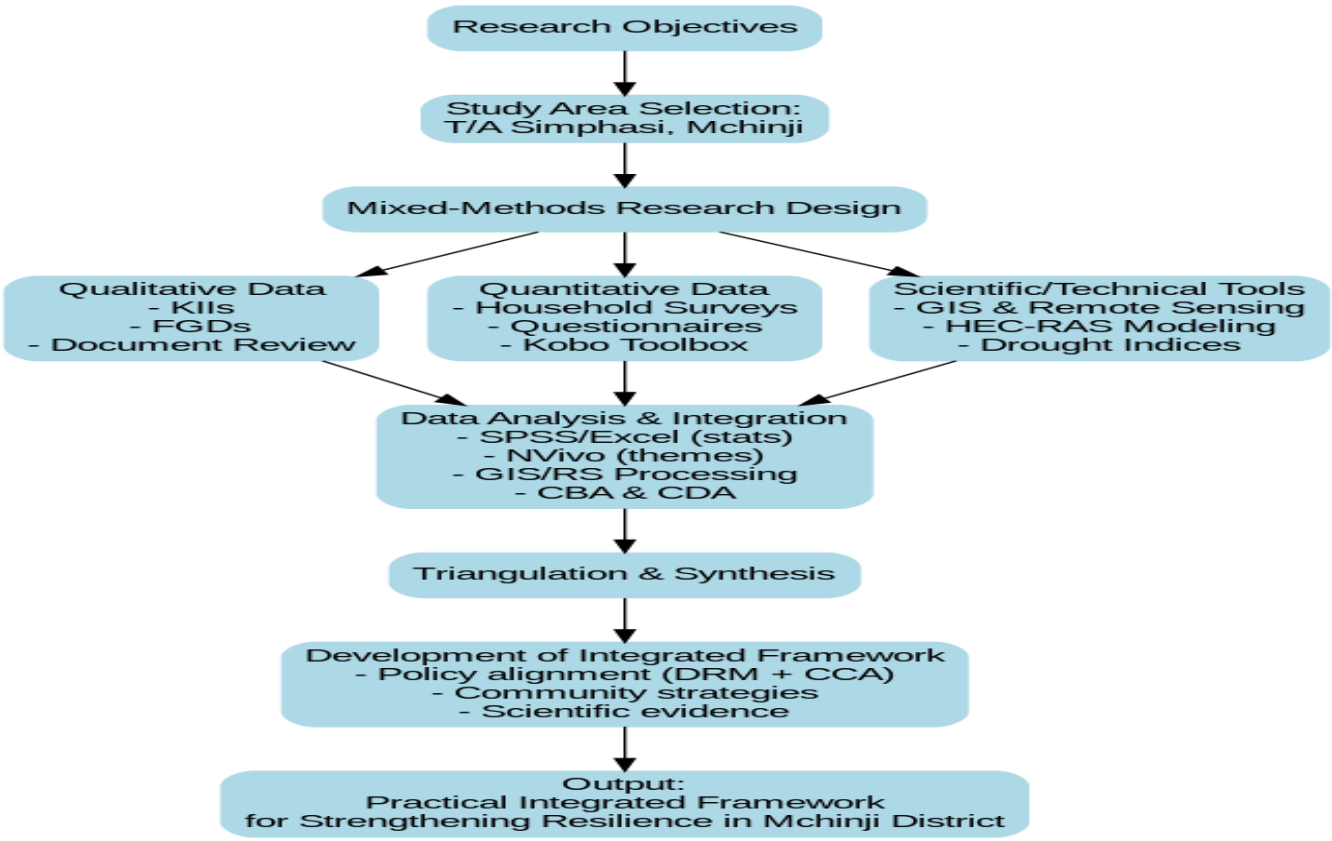


Figure 3: Research Design

A mixed-methods research design was employed, combining both qualitative and quantitative approaches. The qualitative component will explored policies, institutional frameworks, and community perceptions using Key Informant Interviews (KIIs), Focus Group Discussions (FGDs), and document review. The

quantitative component collected numerical data through structured household surveys and secondary datasets, supplemented with scientific tools such as GIS, Remote Sensing, and drought indices. Data from KIIs and FGDs were collected using Kobo Toolbox, ensuring efficiency and accuracy in recording community and official responses. This combination allowed for triangulation, enhancing reliability and providing a holistic understanding of the issues under study.

3.5. Sampling and sample size

The sample size for the study area particularly per T/A was calculated using Tara Yamane's Formula (1967).

The formula is: $n = \frac{N}{1+N(e)^2}$

Where:

n = sample size

N = population

1 = constant

e = error margin (15% or 0.15)

For T/A Simphasi, the population is 50571 (NSO, 2018). The sample size was calculated as follows:

$n = \frac{50571}{1+50571(0.15)^2}$

$n = \frac{50571}{1+1138.5475}$

n=44.4

Thus, the total number of participants selected for this study was 44.

This sample size was a great representation of the community as it covered a range of participants with different characteristics varying in age, gender and status. This sample size helped us avoid reaching the point of saturation whereby the answers from participants became repetitive.

This equation used a 15% margin of error because of its flexibility in studies where resources like time, money, or access to the population were limited. In our study, a slight less precision was acceptable, allowing me to work within these constraints while still obtaining useful data. The goal was to gain a general understanding of trends or patterns rather than achieve highly precise estimates as this an exploratory study. This margin of error has also helped us in obtaining a smaller sample size compared to lower margins (e.g., 5% or 10%) as the population of T/A Simphasi was large and a smaller sample was needed to make the research successful.

3.5 Target Population

The study specifically focused on household heads, either male or female, or any other elder person available per household, who had experienced recurrent disasters that had affected the community in T/A Simphasi. Participants were also selected based on characteristics such as age, gender, and socio-economic status to ensure a wide range of perspectives (Babbie, 2020) Including different age groups is crucial as disaster experiences could vary, gender diversity captured differing roles and responsibilities during disasters, and socio-economic status helped assess how resources influenced vulnerability and the effectiveness of climate change adaptability and disaster risk management actions (UNDRR, 2021)

3.6 Data collection

Primary data were collected through structured household surveys, FGDs, and KIIs. Surveys captured quantitative data on socio-economic status, hazard exposure, and adaptive strategies, administered door-to-door to ensure high response rates. FGDs

will involve diverse community groups, including leaders, women, men, youth, and people with disabilities, to explore perceptions of hazards and coping mechanisms. KIIs were conducted with stakeholders such as the Department of Disaster Management Affairs (DoDMA), the Department of Climate Change and Meteorological Services (DCCMS), and NGOs like the Malawi Red Cross Society and circle for integrated community development (CICOD) to identify policy gaps and opportunities. Kobo Toolbox was used for digital data collection to improve accuracy and efficiency The research matrix below highlights on how data were collected to achieve each objective. Secondary data included policy documents, Mchinji disaster records, and demographic data from Mchinji District Council and NGOs. GIS and Remote Sensing were applied to map land use changes, drought hotspots, and flood-prone areas and also was used to project potential riverine flood and drought risks to guide land-use planning and community preparedness. Participatory vulnerability mapping was performed during focused group discussions, engaging communities to identify hazard-prone areas and critical assets, ensuring context-specific insights.

Key Focus	Methods	Data Collection Tools/Techniques
Policy and Institutional Analysis	Document review, KIIs, content analysis	Policy documents, reports, Kobo Toolbox, interview guides
Community Vulnerability and Adaptive Capacities	Household surveys, FGDs, participatory mapping, GIS,	Questionnaires, FGD guides, Kobo Toolbox, GIS layers, satellite imagery,

	Remote Sensing, drought indices	
Integrated Framework Development	Synthesis of findings, participatory workshops, GIS, Remote Sensing, drought indices	Workshop notes, GIS layers, Remote Sensing data, participatory maps

Table 1Research Matrix

3.7. Data Analysis

The collected quantitative data were analyzed using Excel for descriptive statistics (e.g., means, standard deviations) to summarize the characteristics of the data. Kobo Toolbox was employed for data collection and management, facilitating effective and efficient data handling (Creswell j. P., 2018). The qualitative data from the interviews and FGDs were recorded and transcribed for enhanced accuracy and verification. This data was then be thematically analyzed using NVivo to identify recurrent themes, patterns, and insights related to the research objectives (Braun, 2006). This analysis involved coding the data and categorizing it into key themes. GIS and Remote Sensing data were processed to map land use changes, drought hotspots, and flood-prone areas (IPCC, 2022) and also guided land use planning and hazard mitigation strategies (DoDMA, 2023).

3.8 Data Presentation

The data analyzed by Excel, Kobo, and NVivo were presented in graphs, charts, and tables. Excel was used for initial data organization and to create various visualizations (Pallant, 2020). Kobo assisted in collecting, managing, and visualizing the data into graphs and tables, ensuring it was easily accessible for analysis (Creswell J. P., 2018). Pie charts represented proportions, showing the distribution of participants' views on climate change adaptability and disaster risk management actions. Tables provided detailed numerical data, enabling a clear overview of the results, while graphs visualized trends and relationships among variables. Qualitative data were also presented in thematic reports with key quotes from the participants used to support the narrative (Braun, 2006).

3.9 Ethical Consideration

The Malawi University of Science and Technology Research Ethics Committee, under the Ndata School of Climate and Earth Sciences, approved this study, and the Group Village Head granted authorization to conduct the research. Participants were informed about the questionnaire, mode of delivery, and the importance of conducting the study. Participation was voluntary, with no coercion involved (WHO, 2023). The research ensured integrity and humanity by handling all data obtained from respondents with strict confidentiality, and the study was responsible for any aftermath (UNDRR, 2021).

4.RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the key findings and a detailed analysis of the data collected in Traditional Authority (T/A) Simphasi, Mchinji District. The results are derived

from multiple complementary sources: a structured household survey involving 44 respondents (calculated using Yamane's formula with a 15% margin of error), Focus Group Discussions (FGDs), Key Informant Interviews (KIIs) with stakeholders from the Department of Disaster Management Affairs (DoDMA), Department of Climate Change and Meteorological Services (DCCMS), Mchinji District Council officials, and relevant Non-Governmental Organisations (NGOs). In addition, the chapter draws on documentary analysis of the Mchinji District Disaster Risk Management Plan, Contingency Plan, and Preparedness Plan, multi-year rainfall statistics from the Mchinji District Agricultural Office (DAO) for the period 2019/20–2024/25, and remote-sensing-derived geospatial data including Land Use/Land Cover (LULC) change maps, NDVI vegetation change maps, and land degradation/soil change maps.The chapter provides a comprehensive analysis of climate variability, community vulnerabilities, coping strategies, adaptive capacities, and institutional arrangements. Quantitative data were analysed using Excel and SPSS, qualitative data through thematic analysis using NVivo, and geospatial data in a GIS environment. The findings are presented thematically with supporting tables, figures and maps, and are discussed in relation to the literature reviewed in Chapter 2 and Malawi's national policy frameworks, highlighting the interplay between biophysical hazards and socio-institutional factors that perpetuate vulnerability and aid dependency in the study area.

4.2 Rainfall Patterns and Climate Variability in T/A Simphasi

Rainfall data obtained from the Mchinji District Agricultural Office (DAO) for the third-round growing season (September to May) covering the period 2019/20 to 2024/25 across three monitoring stations serving T/A Simphasi (Chioshya DTC, Mphanga, and Kamwendo East) reveal pronounced inter-annual and spatial variability. This dataset provides essential biophysical evidence of the climatic challenges facing the study area and forms a critical foundation for understanding

community vulnerability to climate-induced disasters, directly supporting the second specific objective of the study.

Table 2: Seasonal Rainfall Totals (mm) for Key Stations Serving T/A Simphasi, 2019/20–2024/25

Season	Chioshya DTC	Mphanga	Kamwendo East	District Mean
2019/20	1247.5	1095.5	956.8	1099.9
2020/21	718.4	733.0	575.7	675.7
2021/22	1021.8	1159.0	786.6	989.1
2022/23	1265.1	1440.0	2710.5	1805.2
2023/24	711.7	433.0	278.0	474.2
2024/25	810.8	976.0	672.2	819.7

This table presents the seasonal rainfall totals recorded at the three monitoring stations. It clearly shows extreme fluctuations, with the district mean rainfall ranging from a critically low 474.2 mm in the 2023/24 season to a very high 1,805.2 mm in the 2022/23 season. These values demonstrate the high unpredictability of rainfall that directly affects rain-fed agriculture in T/A Simphasi, supporting Objective 2 by illustrating the biophysical drivers of vulnerability.

Table 3: Summary Statistics of Rainfall Variability in T/A Simphasi

Statistic	District Mean (mm)	Coefficient of Variation (%)
Mean	977.3	–
Standard Deviation	474.8	–
Minimum	474.2	–
Maximum	1805.2	–
Coefficient of Variation	–	48.6

Source: Calculated by author from DAO data.

This table summarises key statistical measures, revealing a Coefficient of Variation of 48.6% for the district mean. The high CV confirms that rainfall in T/A Simphasi is highly variable and unreliable from one season to another. This statistical evidence strengthens the understanding of climate risk and highlights the need for improved integration of CCA and DRR strategies (Objective 1 and Objective 3).

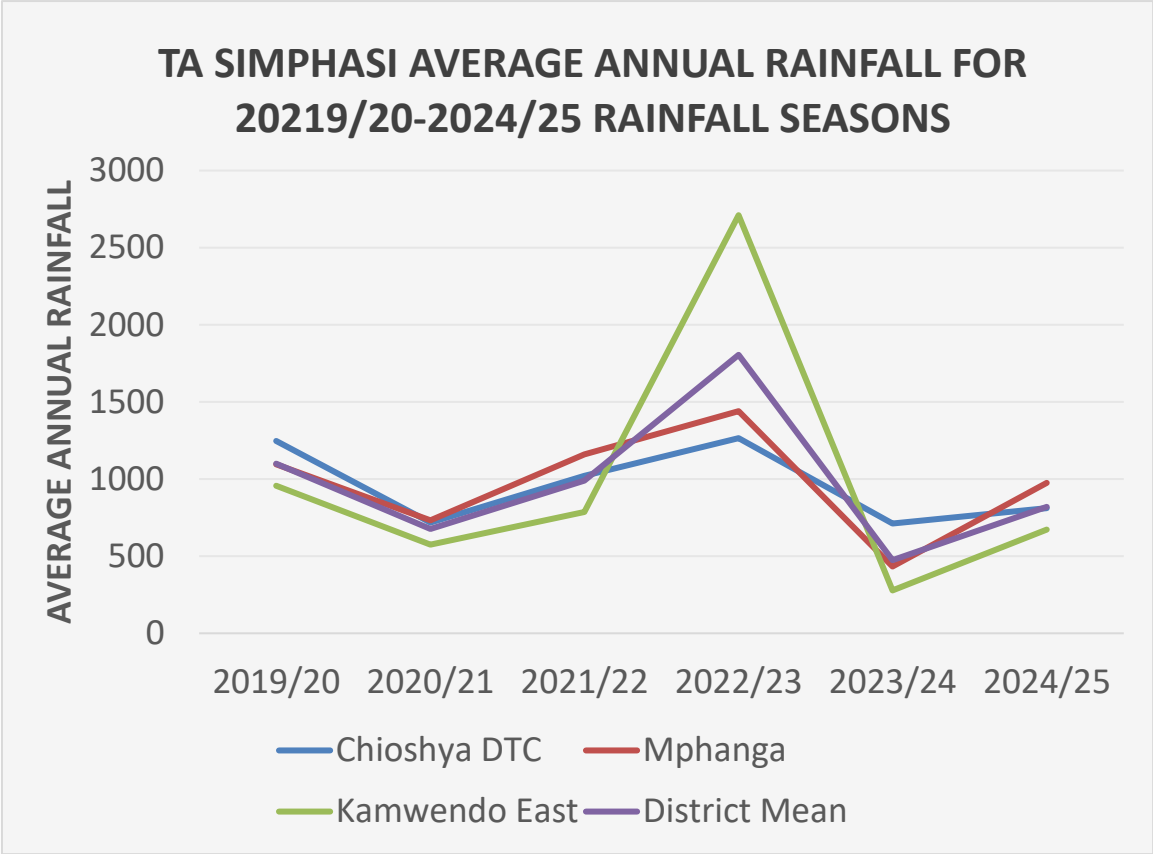
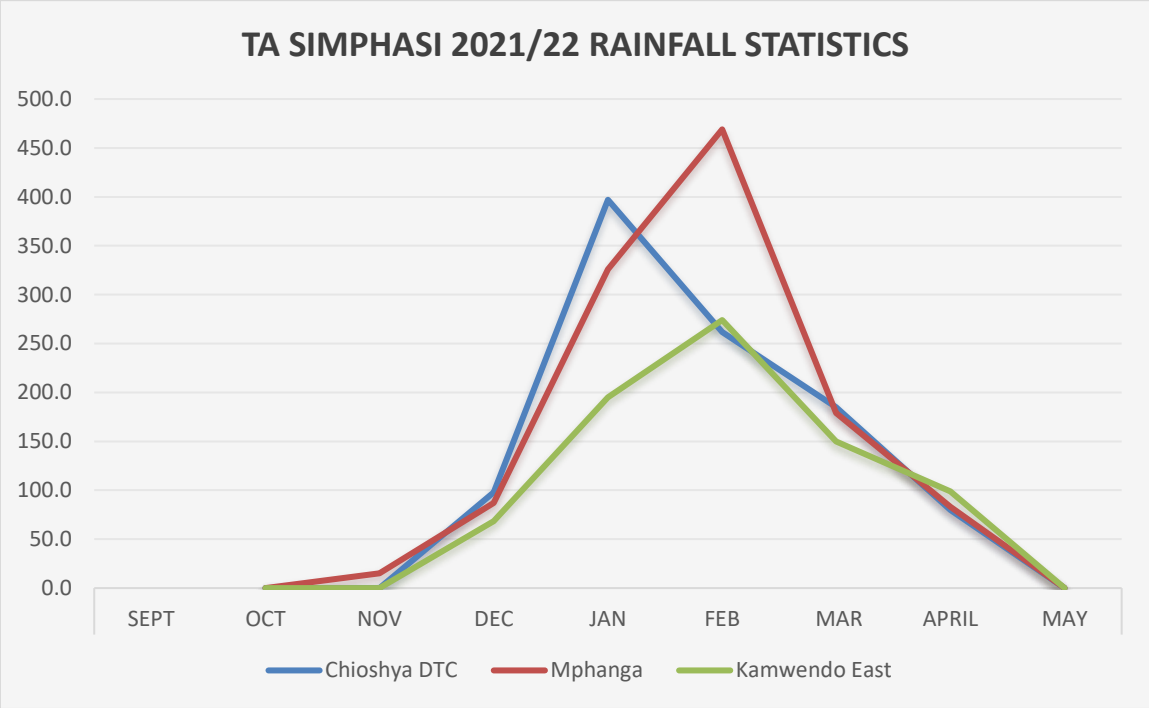


Figure 4: Inter-Annual Trends in Mean Rainfall Totals and rain sseasons in T/A Simphasi (2019–2025 seasons)

This figure visually illustrates the inter-annual trends in district mean rainfall and rainy seasons. It clearly highlights the extremely dry 2023/24 season and the excessively wet 2022/23 season. The graphical representation makes it easier to see the alternating pattern of drought-like conditions and flooding events, which directly exacerbates vulnerability among smallholder farmers and provides strong support for the second objective of examining community adaptive capacities


TA SIMPHASI 2021/22 RAINFALL STATISTICS
500.0
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
SEPT
OCT
NOV
DEC
JAN
FEB
MAR
APRIL
MAY
Chioshya DTC
Mphanga
Kamwendo East

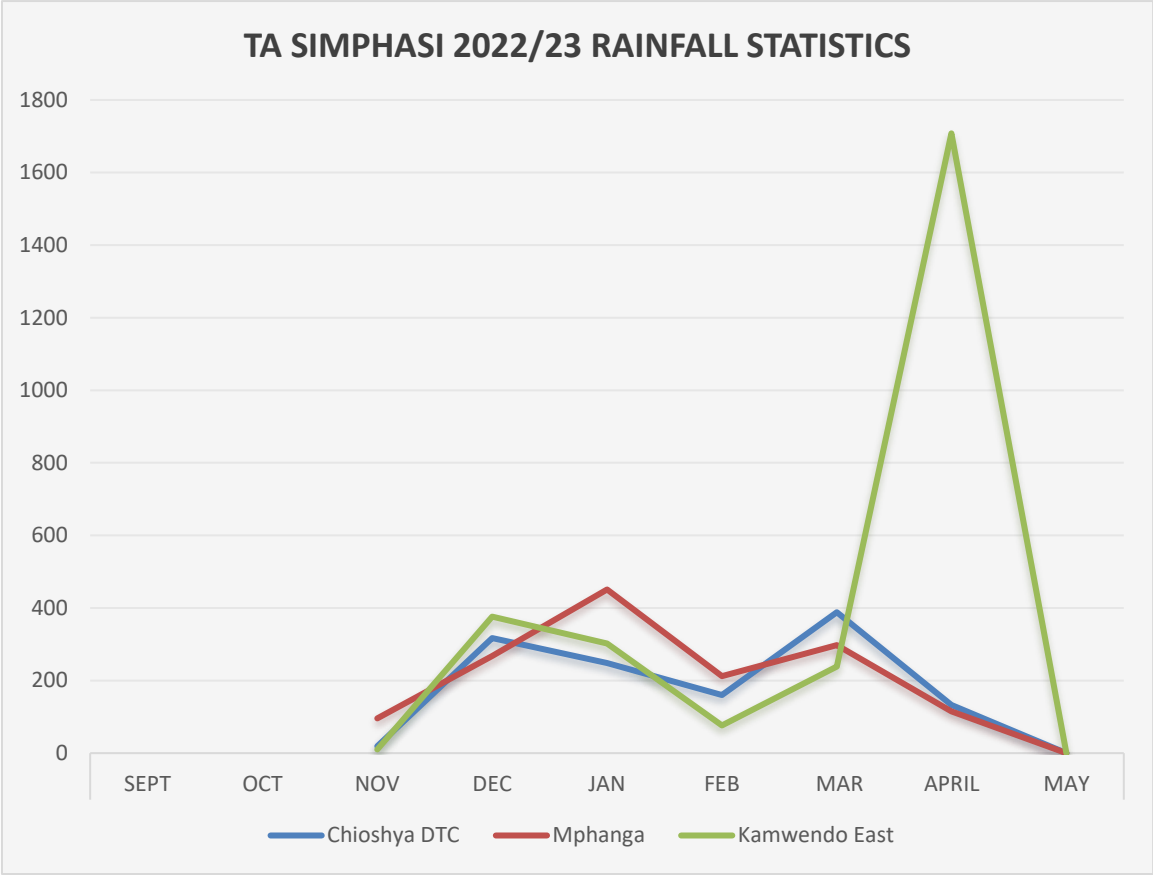


Figure 5: Annual Rainfall Trends 2021/22 season in T/A Simphasi

The data presented in Table 4.1, Table 4.2, and Figure 4.1 collectively confirm the erratic rainfall patterns described in the problem statement. Low-rainfall seasons create prolonged dry spells that reduce soil moisture and crop yields, while high-rainfall seasons trigger flash floods along the Bua River, causing destruction of farmland and displacement. With the majority of households in T/A Simphasi dependent on rain-fed agriculture, this high variability (CV of 48.6%) significantly increases vulnerability, food insecurity, and reliance on external aid.

These findings strongly validate the erratic rainfall patterns described in the problem statement and Chapter 1. In T/A Simphasi, where the majority of the 50,571 residents (NSO, 2018) depend almost entirely on rain-fed smallholder agriculture,

such high variability has severe consequences for livelihoods and food security. Low-rainfall seasons create prolonged dry spells and drought-like conditions that significantly reduce soil moisture availability, limit crop establishment and growth, and result in substantial yield losses. In contrast, seasons with excessively high rainfall trigger flash floods and riverine inundation along the Bua River system, causing widespread destruction of farmlands, erosion of topsoil, and displacement of households.

These findings strongly support Objective 2 by demonstrating how climate variability acts as a primary biophysical driver of disaster impacts. They also expose critical gaps in current district-level CCA and DRR implementation (Objective 1), particularly the limited use of climate information for planning. Ultimately, the rainfall analysis provides essential empirical evidence for designing a practical integrated CCA-DRR framework (Objective 3) that incorporates reliable early warning systems and climate-smart interventions to build long-term resilience in T/A Simphasi.

4.3 Land Use/Land Cover Change, NDVI Vegetation Change, and Land Degradation Analysis

Remote-sensing analysis of T/A Simphasi reveals significant landscape transformations that interact with the high rainfall variability documented in section 4.2. These geospatial changes provide critical evidence of how land degradation and vegetation loss amplify the impacts of erratic rainfall on smallholder farmers.

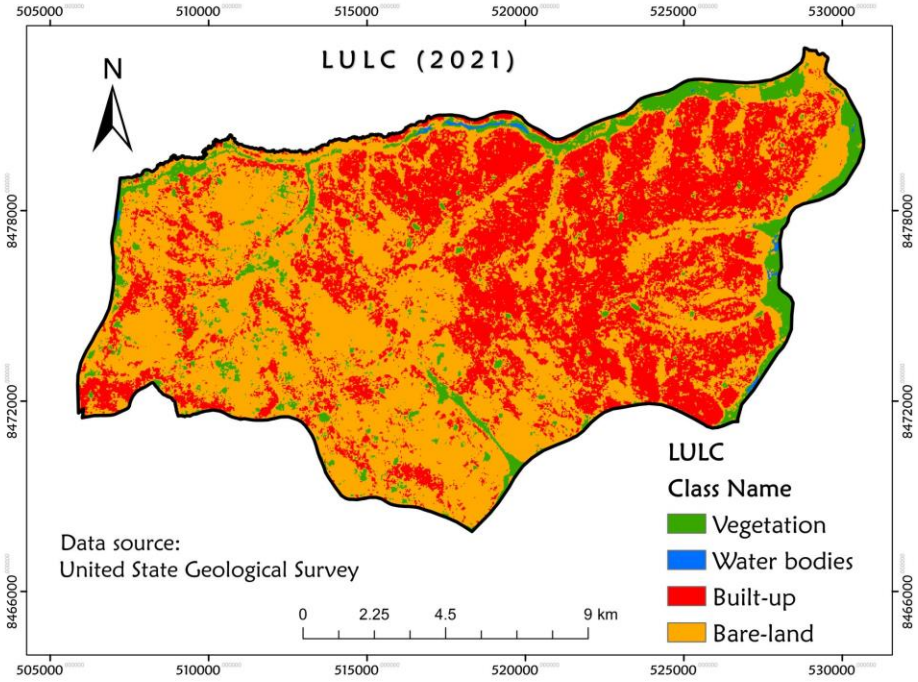


Figure 6: 2021 Multi-Temporal Land Use/Land Cover (LULC) Change Map of T/A Simphasi, Mchinji District

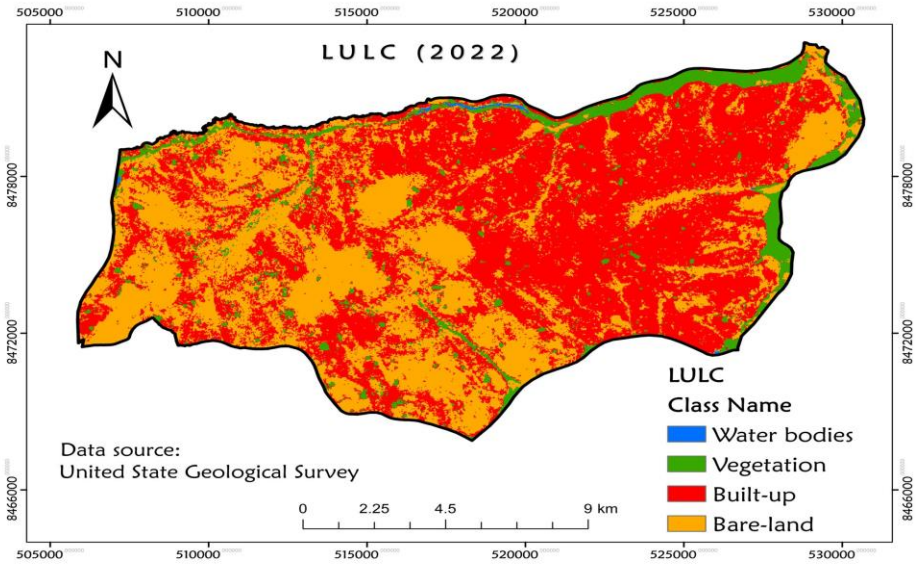


Figure 7: 2022 Multi-Temporal Land Use/Land Cover (LULC) Change Map of T/A Simphasi, Mchinji District

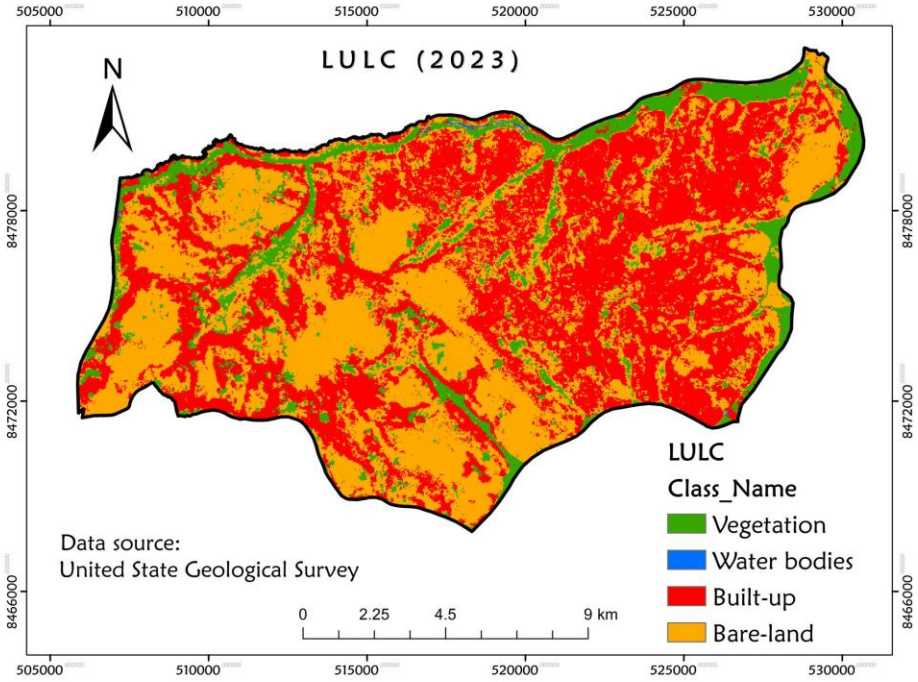


Figure 8: 2023 Multi-Temporal Land Use/Land Cover (LULC) Change Map of T/A Simphasi, Mchinji District

The multi-temporal LULC change maps for 2021, 2022 and 2023 illustrate a clear and accelerating expansion of cropland at the expense of natural vegetation and riparian buffers along the Bua River. In 2021 the map shows woodland and riparian forest still occupying significant portions of the riverine zones. By 2022 cropland had already begun to encroach noticeably into these areas, and by 2023 the conversion had become dominant, with large stretches of former riparian vegetation replaced by agricultural land. This year-on-year progression removed the natural buffers that previously slowed runoff and retained soil moisture. During the excessively wet 2022/23 season (district mean 1,805.2 mm) the progressive loss of riparian cover visible across the three maps led to accelerated runoff and flash flooding that inundated the newly expanded croplands. In the critically dry

2023/24 season (district mean 474.2 mm) the same cleared areas experienced rapid soil moisture depletion. These sequential changes explain the high crop loss reported by 88.6 % of surveyed households, the 79.5 % flood exposure and the 72.7 % drought exposure rates. The maps therefore demonstrate that the year-by-year LULC conversion is a primary biophysical driver combinede with that amplifies the rainfall variability (CV 48.6 %) into severe livelihood shocks for the 93.2 % of households dependent on rain-fed agriculture (Objective 2). They also expose a critical implementation gap: existing district DRM and CCA plans contain no effective land-use zoning or protection of riparian corridors (Objective 1). This spatial evidence across the three years provides strong justification for the proposed integrated CCA-DRR framework (Main Objective / Objective 3), which must incorporate participatory land-use planning and targeted restoration of the exact riparian buffers shown as lost between 2021 and 2023 to reduce flood and drought risks and progressively break the cycle of aid dependency in T/A Simphasi.

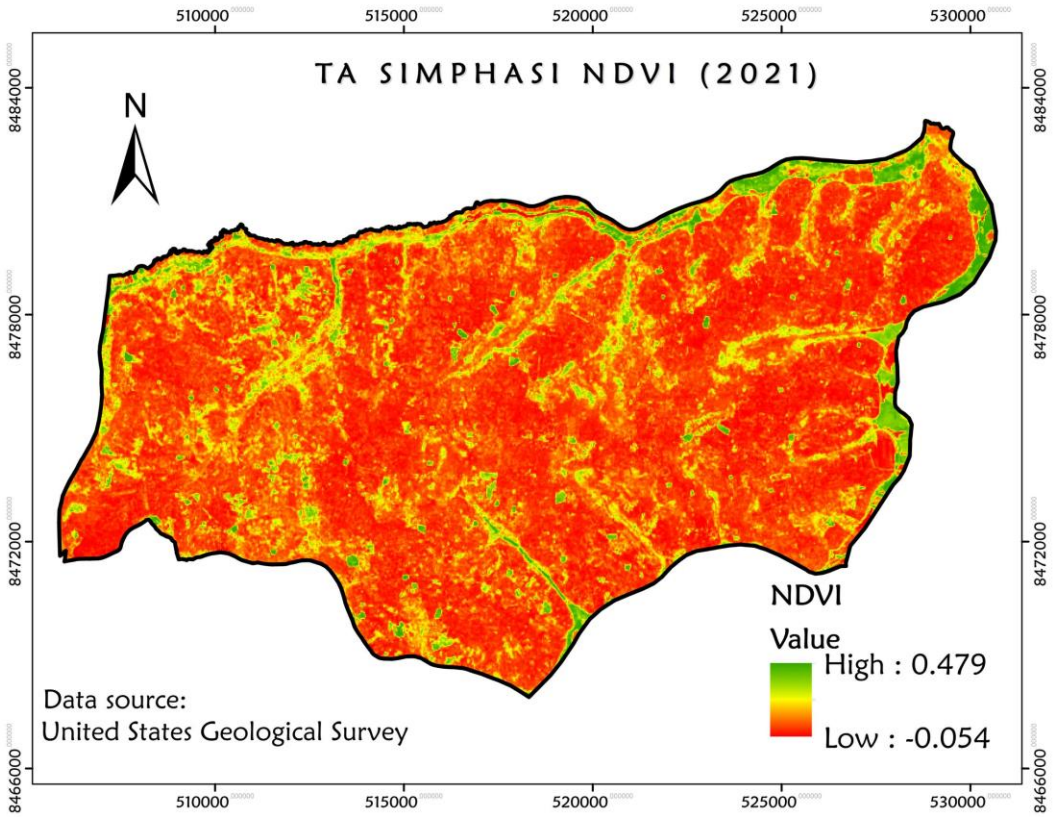


Figure 9: :2021 NDVI Map of T/A Simphasi

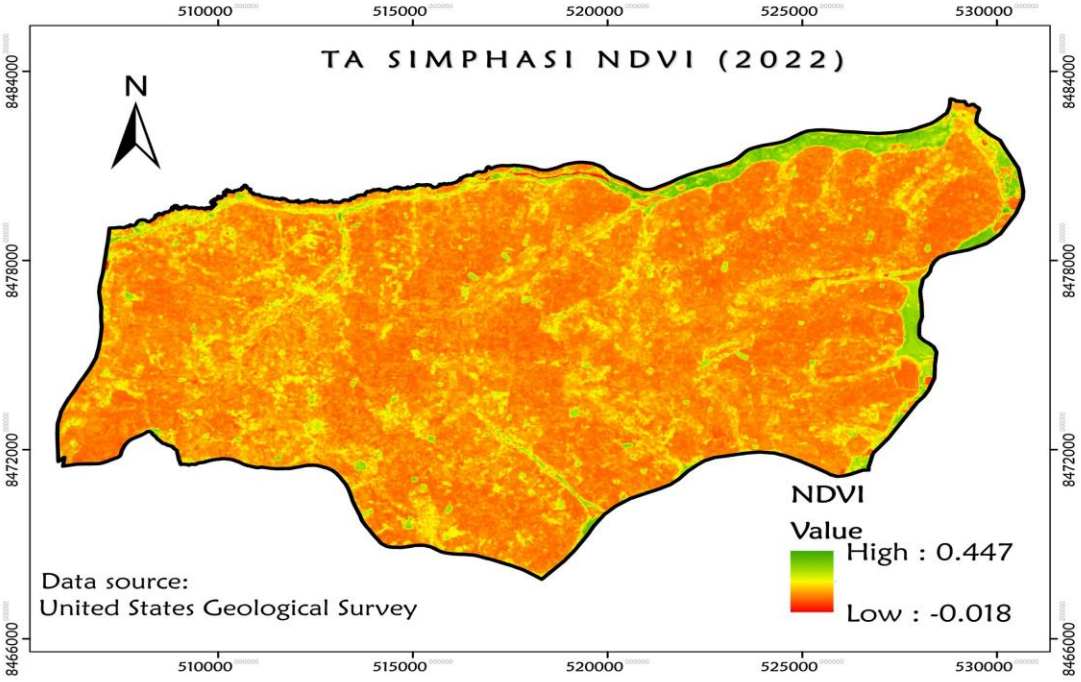


Figure 10: 2022 NDVI Map of T/A Simphasi

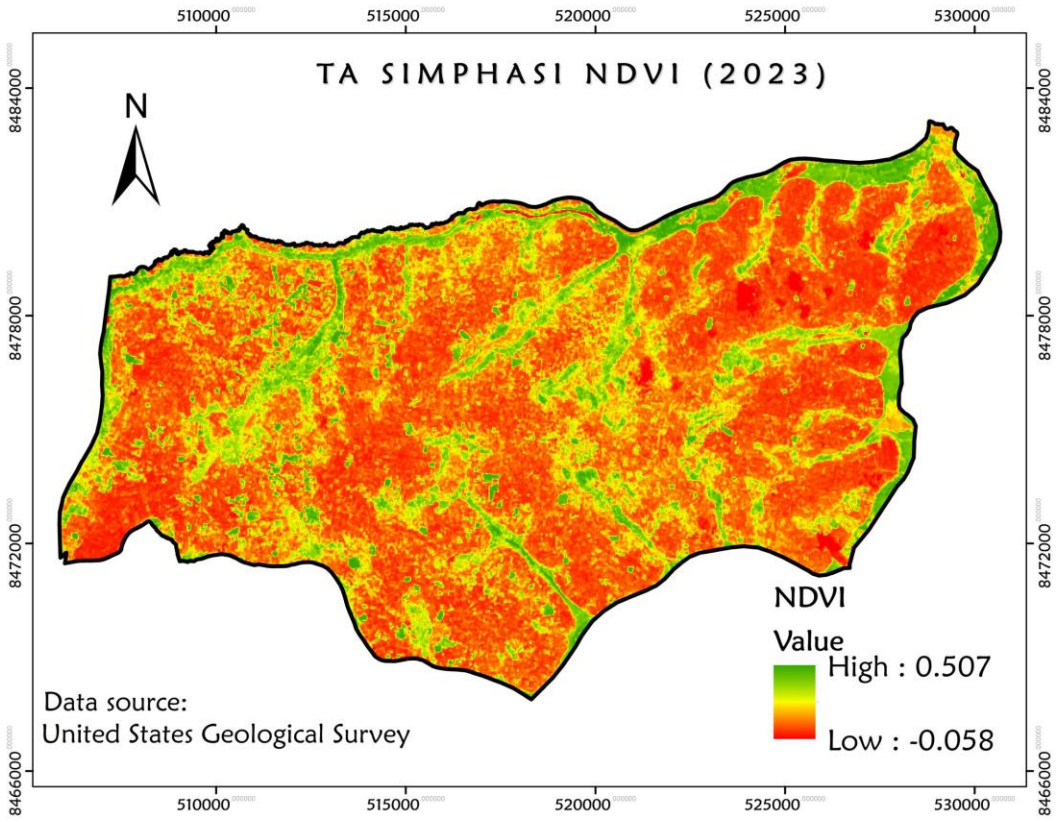


Figure 11: 2023 NDVI Map of T/A Simphasi

The NDVI vegetation change maps for 2021, 2022 and 2023 show a progressive decline in vegetation vigour, with the strongest reductions occurring in newly converted cropland and riverine zones. NDVI values dropped steadily over the three years, particularly where cropland had expanded. This reduction in vegetation cover accelerated drought stress in the low-rainfall 2023/24 season and failed to stabilise soil during the high-rainfall 2022/23 season. The patterns match the 86.4% of households reporting dry spells and the 88.6% crop loss rate. The maps provide evidence that declining vegetation vigour intensifies rainfall variability (CV 48.6%) and heightens vulnerability for rain-fed farmers (Objective 2). They highlight the limited use of vegetation monitoring in district planning (Objective 1). The NDVI analysis supports the integrated CCA-DRR framework (Objective 3), which should

include targeted restoration in the decline zones shown between 2021 and 2023 to restore ecosystem buffering and reduce long-term aid dependency

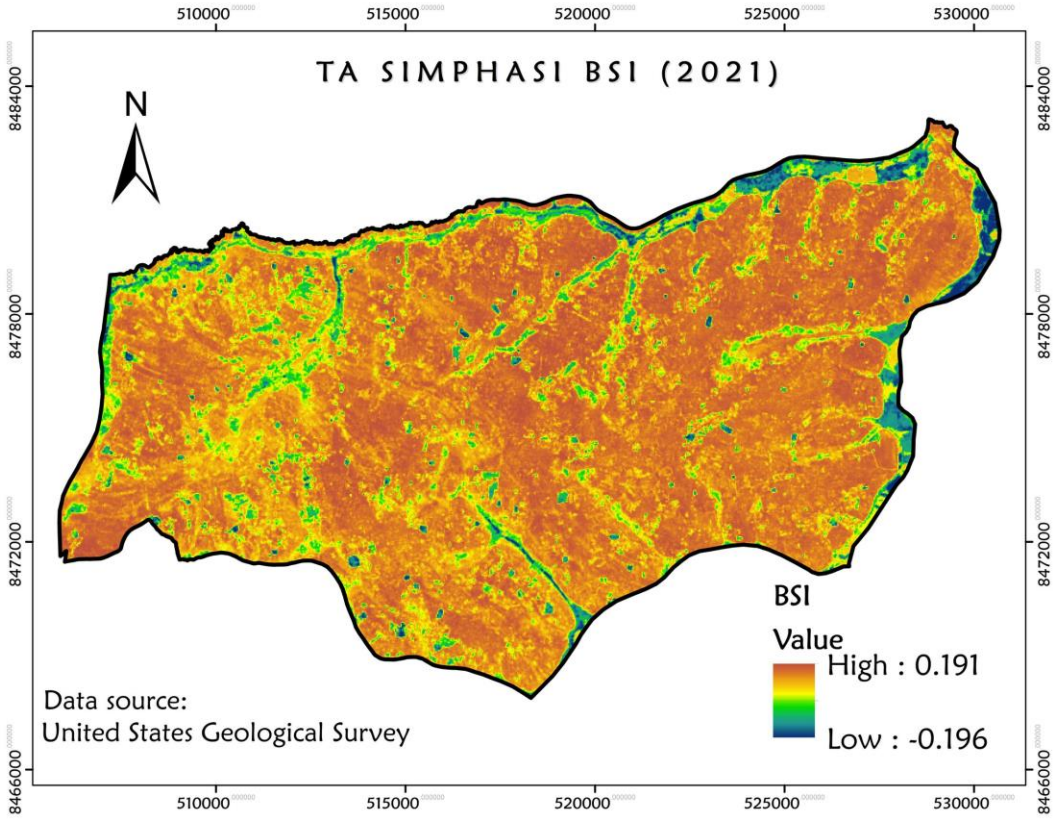


Figure 12: :2021 Land Degradation Map of T/A Simphasi, Mchinji District

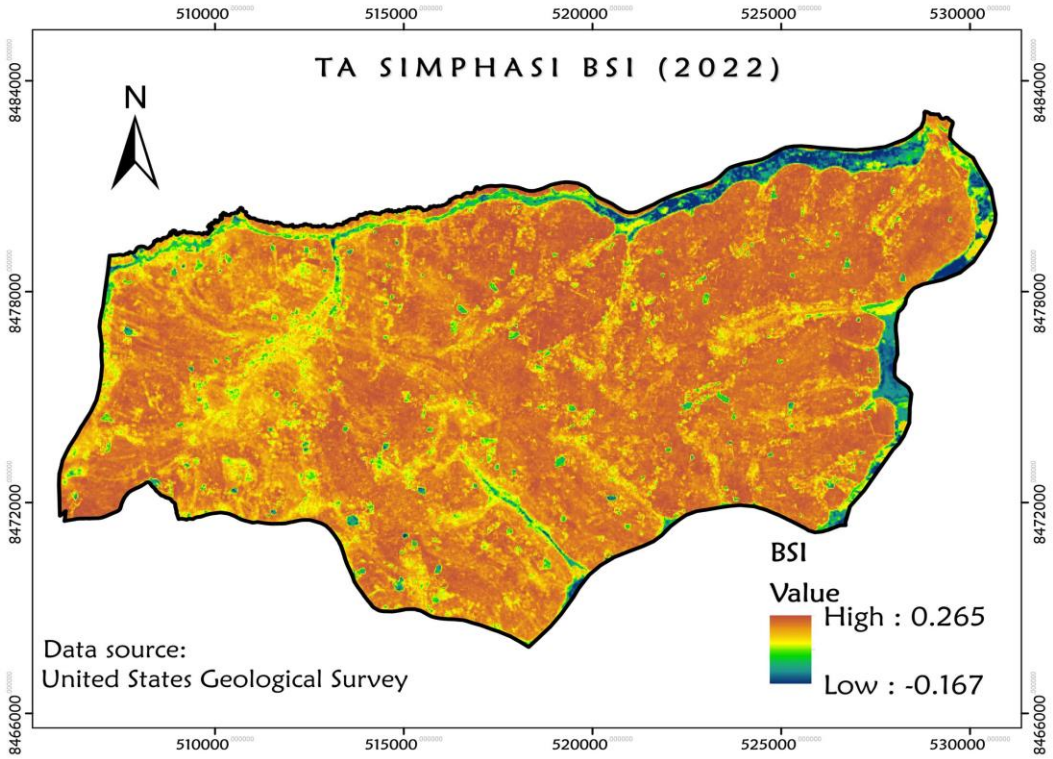


Figure 13 : 2022 Land Degradation Map of T/A Simphasi, Mchinji District

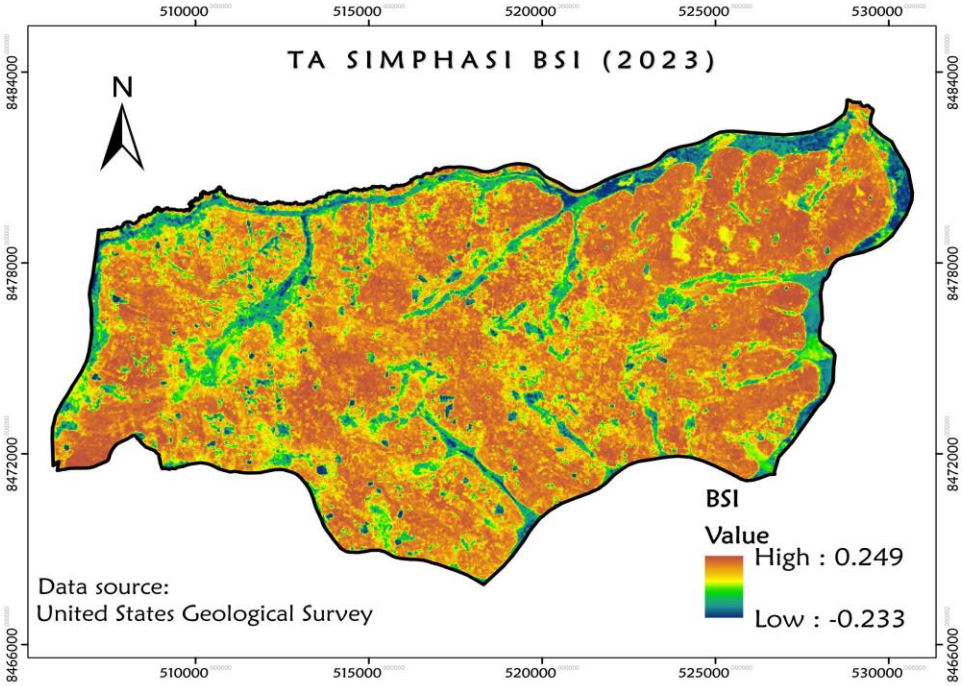


Figure 14: 2023 Land Degradation Map of T/A Simphasi, Mchinji District

The land degradation/soil change severity maps for 2021, 2022 and 2023 reveal a clear intensification of moderate to severe degradation (primarily sheet and gully erosion) concentrated on sloping farmlands and areas near the Bua River. In 2021 the map shows moderate degradation already present in several zones. By 2022 the severity increased in the same areas, and by 2023 large portions of the study area had shifted into the severe category, with the severity classification and overlays of LULC and NDVI layers confirming that these degraded zones closely coincide with the cropland expansion and NDVI decline hotspots observed in Figures 4.2 and 4.3. In these expanding severe zones, soil loss reduced fertility and water-holding capacity, directly contributing to the 88.6 % crop loss and 84.1 % food shortage reported by respondents during both the wet 2022/23 and dry 2023/24 seasons. The severity maps therefore demonstrate that land degradation

acted as a compounding factor that intensified the impacts of the rainfall variability (CV 48.6 %) on rain-fed agricultural systems across the three years (Objective 2). They also highlight a major gap in the current district DRM and CCA plans, which lack routine integration of degradation severity data for targeted soil and water conservation measures (Objective 1). The validated year-by-year severity classification and spatial patterns thus provide actionable evidence for the proposed integrated CCA-DRR framework (Objective 3), enabling the prioritisation of interventions such as contour bunding, agroforestry, and gully rehabilitation precisely in the moderate-to-severe zones and riverine overlays that worsened between 2021 and 2023 to rebuild soil health, strengthen adaptive capacity, and progressively reduce aid dependency in T/A Simphasi.

4.4 Socio-Demographic Profile of Respondents

The household survey conducted in T/A Simphasi targeted 44 respondents, calculated using Yamane's formula with a 15% margin of error. This section presents the socio-demographic characteristics of the respondents, which provide important context for understanding vulnerability levels and adaptive capacities in the study area.

Table 4: Key Socio-Demographic Characteristics of Household Respondents (n=44)

Indicator	Category	Frequency	Percentage (%)
Sex	Male	25	56.8
	Female	19	43.2
Age Group	18–30	9	20.5

	31–45	18	40.9
	46–60	12	27.3
	Above 60	5	11.4
Marital Status	Single	6	13.6
	Married	29	65.9
	Widowed	7	15.9
	Divorced	2	4.5
Education Level	None	2	4.5
	Primary	24	54.5
	Secondary	16	36.4
	Tertiary	4	9.1
Household Size	Mean (persons)	5.3	—
Main Livelihood	Farming	37	84.1
	Business	3	6.8
	Casual labour	3	6.8
	Formal employment	1	2.3
	Other	0	0.0

The socio-demographic characteristics presented in Table 4.4 highlight a population that is highly exposed to climate-related risks due to its heavy dependence on rain-fed agriculture and limited human capital. The extremely high proportion of

households engaged in farming (84.1%) means that the livelihoods of the vast majority are directly tied to rainfall patterns and seasonal conditions. Any disruption caused by floods, dry spells, or droughts immediately threatens food production and income, leaving little room for diversification.

Low levels of formal education further constrain resilience. Although primary education is common (54.5%), the limited presence of secondary (36.4%) and tertiary (9.1%) education suggests that many households have restricted capacity to access, interpret, and apply technical information on climate-smart agriculture, early warning systems, or improved farming techniques. This educational profile likely reduces the effectiveness of extension services and makes it more difficult for households to shift from traditional practices to more adaptive strategies.

The average household size of 5.3 persons increases the burden on available resources, especially during periods of crop failure or food shortage, when more people must be fed from reduced yields. The presence of older household heads (11.4% above 60) and widowed respondents (15.9%) may further limit physical labour capacity and decision-making flexibility during emergencies. The gender distribution, with a slight male majority, also suggests that many households may have significant female involvement in agricultural labour and household management, which can affect how disasters are experienced and managed.

Taken together, these socio-demographic factors create a situation in which climate hazards are likely to have amplified and prolonged effects. High dependence on farming, combined with moderate education levels and larger household sizes, results in low adaptive capacity and greater sensitivity to rainfall variability and extreme weather events. This profile helps explain why even moderate climate shocks can lead to widespread crop loss, food insecurity, and increased reliance on external support in T/A Simphasi

4.5 Climate and Disaster Experience

This section presents the hazards experienced by households and the associated impacts reported during the survey. These findings provide direct evidence of how climate variability translates into real livelihood disruptions in T/A Simphasi.

Table 5 :Hazards Experienced and Associated Impacts Reported by Households

Hazard / Impact	Frequency	Percentage (%)
Hazards Experienced		
Drought	32	72.7
Floods	35	79.5
Dry spells	38	86.4
Storms	19	43.2
Crop pests / diseases	28	63.6
Impacts Experienced		
Crop loss	39	88.6
Food shortage	37	84.1
Income loss	34	77.3
House damage	22	50.0

Health problems	18	40.9
School disruption	15	34.1

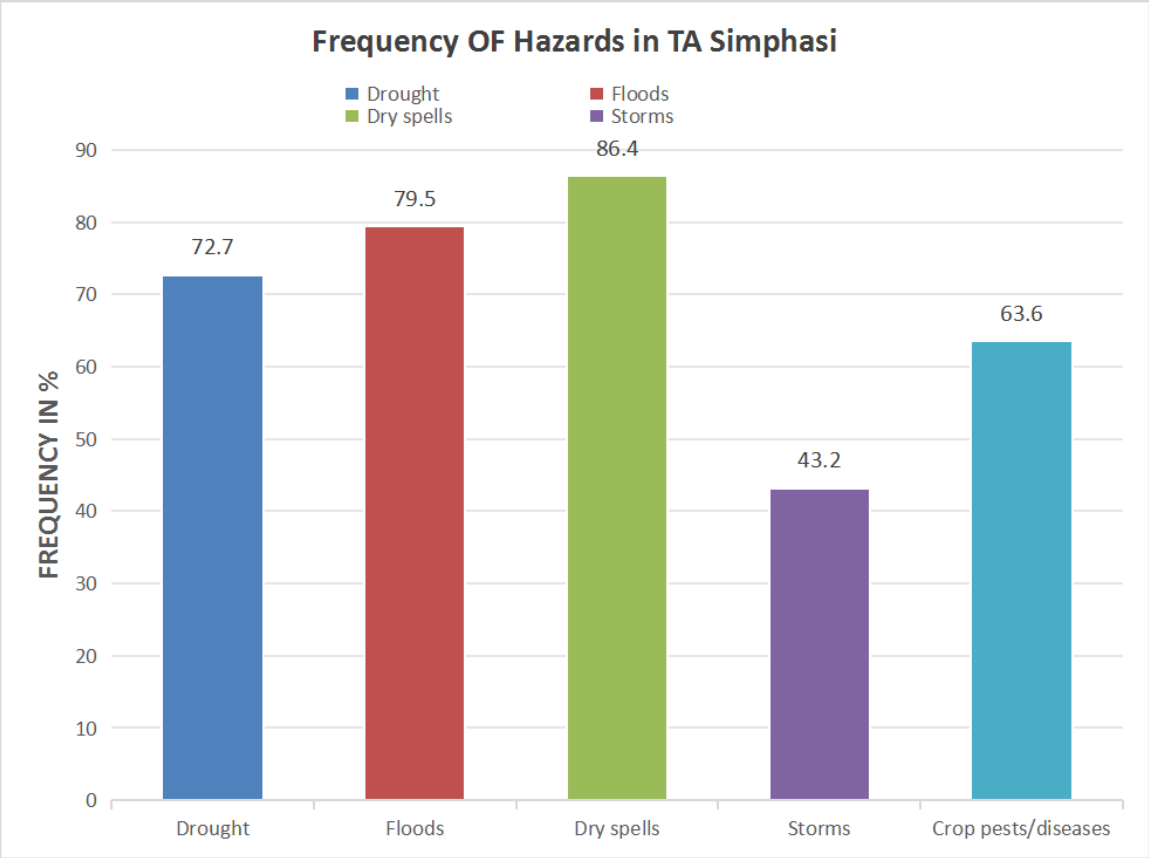


Figure 15: Frequency of Disasters and Most Serious Hazard Reported

The results in Table 4.5 and Figure 4.5 provide compelling evidence of the intense and repeated exposure of households in T/A Simphasi to climate hazards. Floods, droughts, and dry spells dominate the hazard profile, while crop loss and food shortage stand out as the most widespread and immediate impacts. The exceptionally high frequency of disasters — with nearly two-thirds of respondents experiencing them every year — combined with the severity of their consequences,

demonstrates how even moderate climate events can have devastating and long-lasting effects on rain-fed agricultural systems.

This pattern is not accidental. It is closely linked to the extreme rainfall variability shown in section 4.2, where seasonal totals swing dramatically between critically low amounts (such as 474.2 mm in 2023/24) and excessively high totals (1,805.2 mm in 2022/23). The biophysical degradation documented in section 4.3 — including loss of riparian vegetation, declining NDVI, and widespread soil erosion — further intensifies these impacts by reducing the landscape's natural capacity to absorb heavy rains or retain moisture during dry periods. As a result, households face a compounding cycle: erratic rainfall damages crops, degraded land worsens the damage, and limited protective infrastructure leaves communities with few effective defences.

The recurrent nature of these hazards and their severe consequences on crop production, food security, and household income reveal deep underlying vulnerability. Most households possess few buffers against shocks, leading to rapid asset depletion, increased food insecurity, and greater dependence on external assistance. This situation highlights the limitations of current coping mechanisms and the inadequacy of existing disaster risk reduction and climate adaptation efforts at the local level. Despite the existence of national policies and frameworks, the persistent gap between hazard exposure and effective local response leaves communities trapped in a cycle of shock, partial recovery, and renewed vulnerability.

These findings underscore the urgent need for a more integrated and proactive approach to disaster risk management and climate adaptation. An effective framework must combine improved early warning systems linked to real-time climate data, climate-informed land-use planning, targeted support for sustainable adaptation practices, and strengthened community-level infrastructure. Only

through such deliberate integration can the cycle of repeated shocks and aid dependency be broken, allowing households in T/A Simphasi to build genuine long-term resilience rather than merely surviving from one disaster to the next.

4.6 Vulnerability Factors

This section examines the key factors that increase or reduce household vulnerability to climate hazards in T/A Simphasi, based on responses from Section C of the household survey.

Table 6: Vulnerability Factors Reported by Respondents

Vulnerability Factor	Category / Response	Frequency	Percentage (%)
Dependent on rain-fed farming	Yes	41	93.2
Access to irrigation	Yes	6	13.6
	No	38	86.4
Receive climate information	Yes	19	43.2
	No	25	56.8
Sources of climate information	Radio	12	27.3
	Extension worker	8	18.2
	Phone	5	11.4
	Community meetings	7	15.9

Distance to nearest health facility	Less than 2 km	9	20.5
	2–5 km	18	40.9
	More than 5 km	17	38.6
Member of a savings / support group	Yes	14	31.8
	No	30	68.2

The vulnerability factors presented in Table 4.6 reveal a community that is structurally exposed and poorly equipped to cope with climate shocks. Near-total dependence on rain-fed farming (93.2%) makes households extremely sensitive to variations in rainfall timing and intensity. The very low access to irrigation (13.6%) means there is little protection during dry spells or droughts, while the limited receipt of climate information (43.2%) restricts the ability to anticipate and prepare for upcoming hazards. When information is available, it tends to come through less reliable or timely channels, reducing its usefulness for decision-making.

Long distances to health facilities (38.6% more than 5 km) further compound vulnerability, as health problems arising from disasters (such as waterborne diseases after floods or malnutrition during droughts) become harder to address promptly. Low participation in savings or support groups (only 31.8%) indicates weak social and financial safety nets, leaving households with fewer resources to fall back on when crops fail or income is lost.

Taken together, these factors create a situation in which even moderate climate events can quickly escalate into major livelihood crises. The combination of high dependence on rain-fed systems, poor access to protective infrastructure and

information, and limited social support networks explains why disasters have such widespread and severe impacts in T/A Simphasi. This profile underscores the importance of addressing both the environmental risks and the underlying socio-economic constraints that amplify vulnerability

4.7 Coping Strategies and Adaptive Capacity

This section analyses the coping strategies used by households during disasters and the level of adaptive capacity, based on responses from Sections D and E of the household survey.

Table 7: Common Coping Strategies and Perceived Sustainability

Coping Strategy	Frequency	Percentage (%)	Perceived as Sustainable (%)
Reduce meals	31	70.5	12.9
Sell assets (livestock, tools)	26	59.1	8.0
Borrow food or money	29	65.9	15.4
Depend on external relief/aid	33	75.0	18.2
Move to relatives	14	31.8	25.0
Casual work / migration	22	50.0	36.4

This table shows the most common coping strategies employed by households when disasters occur (e.g., reduce meals, sell assets, borrow food/money, depend on relief, move to relatives, casual work) and the proportion of respondents who

consider these strategies sustainable. The results indicate that most coping mechanisms are short-term and erosive of long-term household resources.

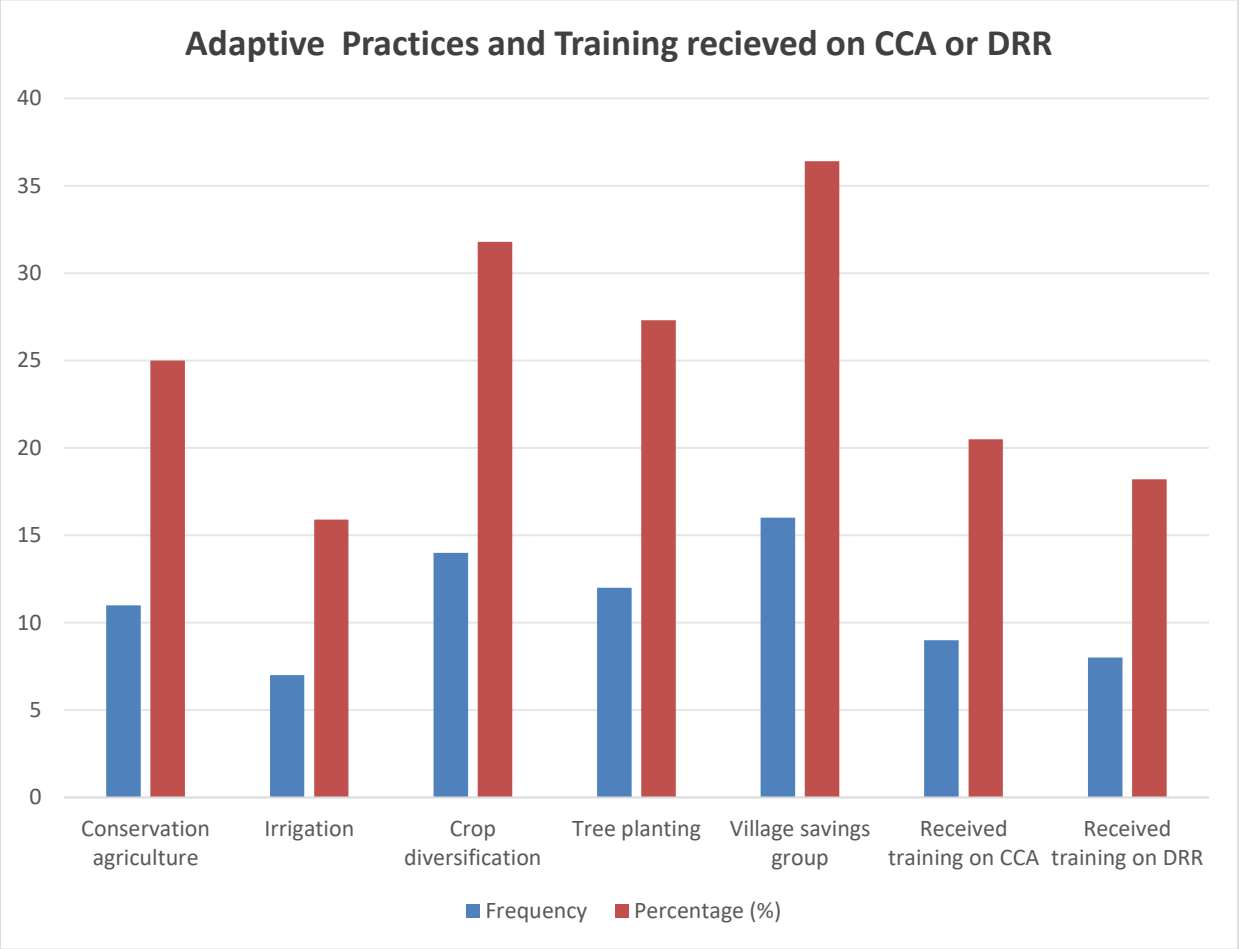


Figure 16: Adaptive Practices and Training Received

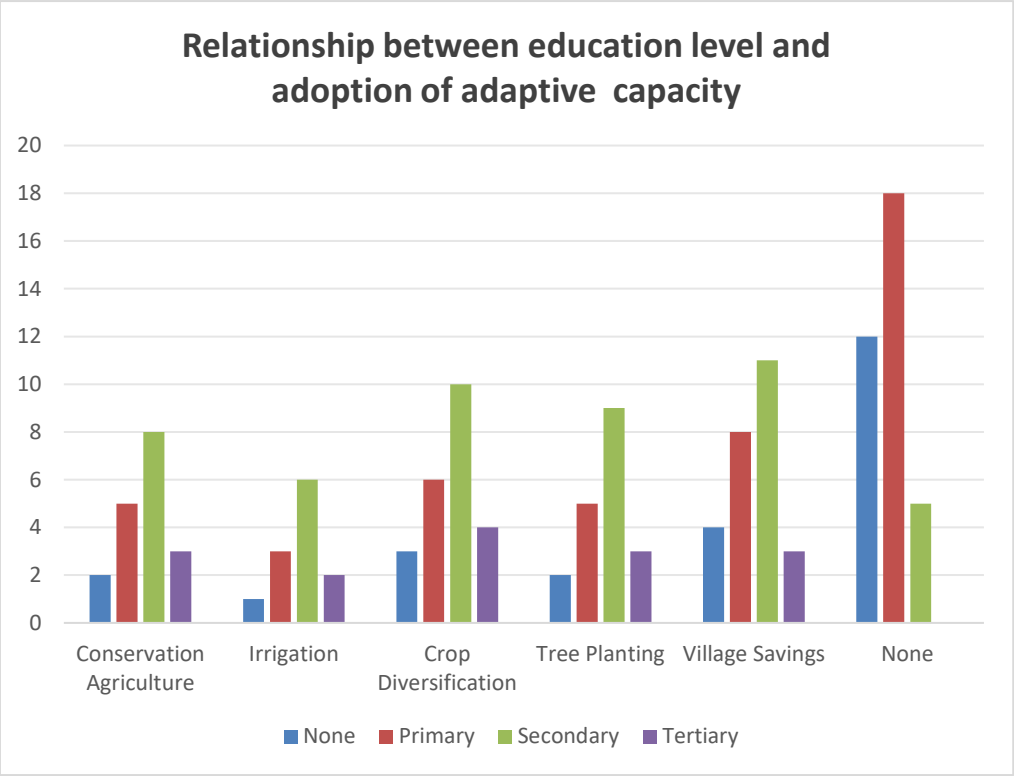


Figure 17: Relationship Between Education Level and Adoption of Adaptive Practices.

The results in Table 4.7,Figure 4.6 and Figure 4.7 reveal a community that is predominantly reliant on short-term, erosive coping strategies. Reducing meals, selling assets, borrowing, and depending on external relief are the most common responses to disasters. These measures are widely perceived as unsustainable because they deplete household assets, increase debt, and undermine long-term food security. The low uptake of proactive adaptive practices (e.g., irrigation at 15.9%, conservation agriculture at 25.0%) and the very limited receipt of training on CCA and DRR (under 21%) indicate a serious gap in adaptive capacity.

The strong relationship shown in Figure 4.6 between education level and adoption of adaptive practices is particularly revealing. Households with higher education are better able to understand and implement sustainable techniques, while those with lower education levels remain trapped in reactive coping. This educational divide

exacerbates vulnerability and slows the transition from short-term survival to long-term resilience.

Overall, the findings demonstrate that current coping mechanisms are insufficient and often counterproductive, perpetuating a cycle of asset depletion and aid dependency. They highlight the urgent need for more effective capacity-building, training, and support systems that address both immediate coping needs and the development of sustainable adaptive practices at the household level

4.8 Perceptions on DRR–CCA Integration

This section examines community perceptions regarding the existence and integration of disaster preparedness and climate change adaptation activities, based on responses from Sections F and G of the household survey.

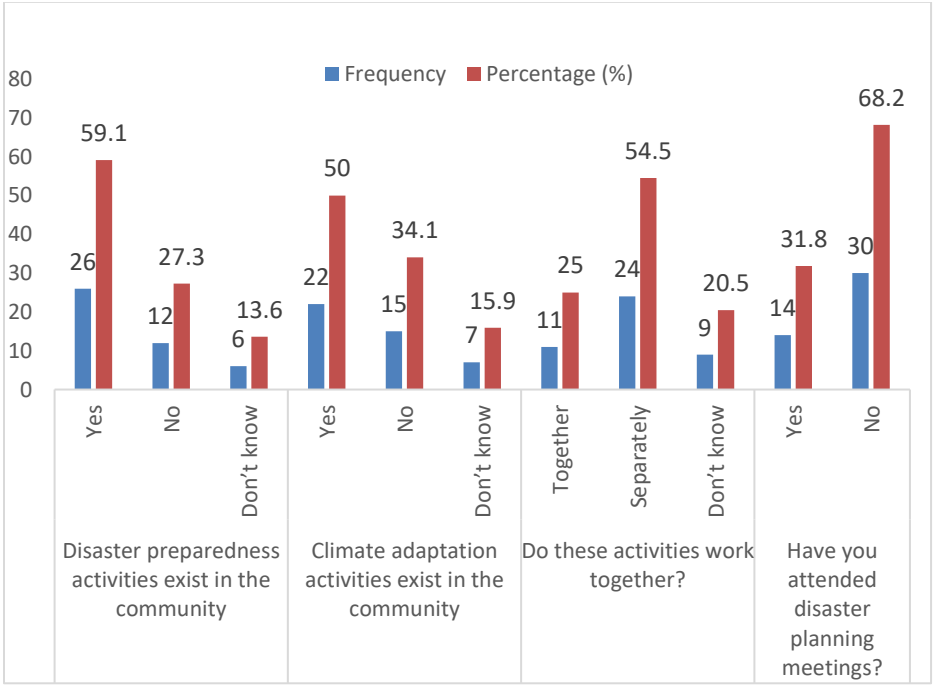


Figure 18: Perceptions on Existing Preparedness and Adaptation Activities and Their Integration

The perceptions captured in Figure 4.10 reveal a fragmented approach to disaster risk reduction and climate change adaptation in T/A Simphasi. Although some activities exist, they are largely implemented in isolation, with more than half of respondents perceiving DRR and CCA efforts as operating separately. This lack of integration leads to duplication of efforts, inefficient use of resources, and missed opportunities for synergistic benefits. The low attendance at disaster planning meetings (only 31.8%) further suggests limited community involvement in decision-making processes, which weakens ownership and effectiveness of interventions.

These findings illustrate the practical consequences of poor coordination on the ground. Households experience climate hazards frequently, yet the support systems meant to help them prepare and adapt remain disconnected. This fragmentation contributes to the persistent vulnerability observed in earlier sections and explains why reactive coping strategies continue to dominate. The data point to the need for better alignment between existing activities so that preparedness and adaptation efforts reinforce each other rather than compete or remain siloed

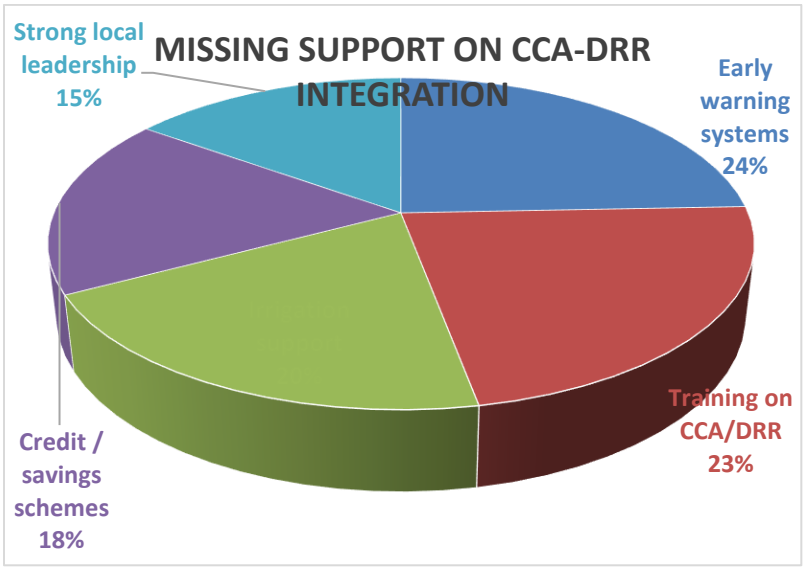


Figure 19:Missing Support on DRR–CCA Integration

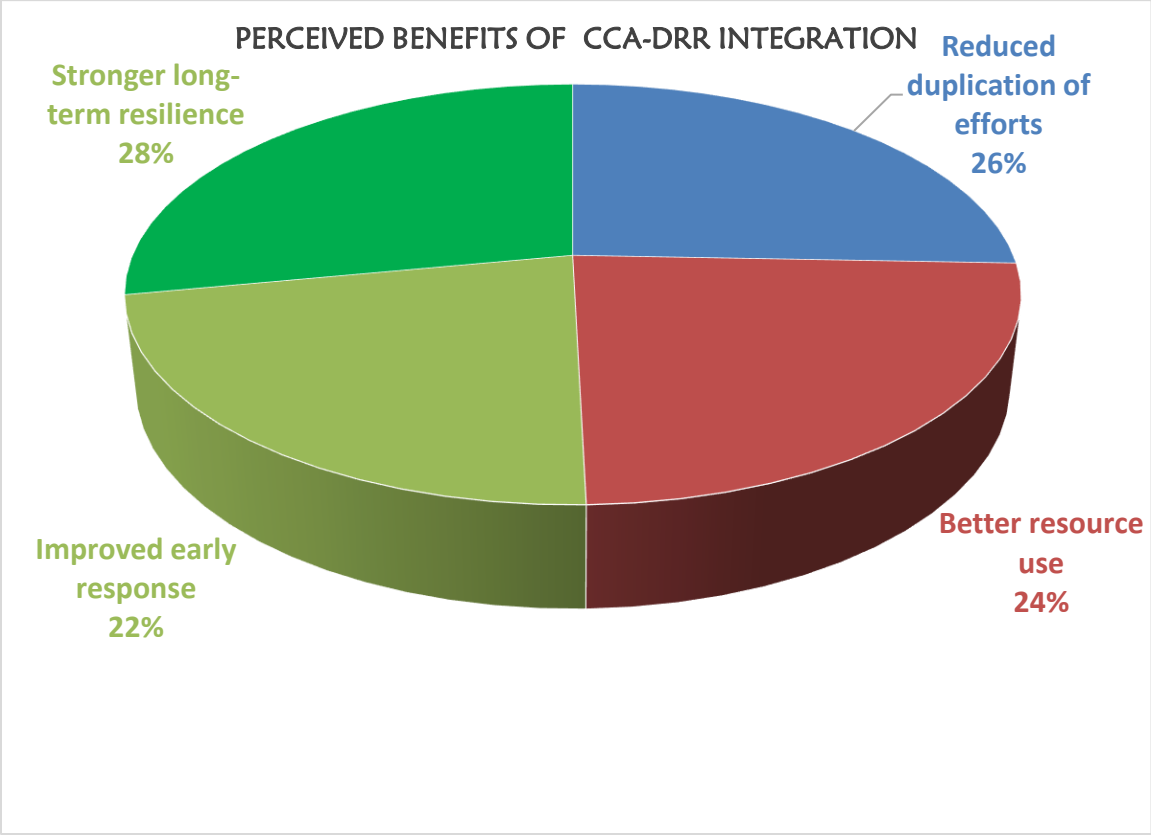


Figure 20: Perceived Benefits of DRR–CCA Integration

The perceptions captured in Table 4.9 and Figure 4.7 reveal a fragmented approach to disaster risk reduction and climate change adaptation in T/A Simphasi. Although some activities exist, they are largely implemented in isolation, with more than half of respondents perceiving DRR and CCA efforts as operating separately. This lack of integration leads to duplication of efforts, inefficient use of resources, and missed opportunities for synergistic benefits. The low attendance at disaster planning meetings (only 31.8%) further suggests limited community involvement in decision-making processes, which weakens ownership and effectiveness of interventions.

The strong demand for early warning systems, training, irrigation infrastructure, and credit facilities (Figure 4.7) indicates that current interventions are insufficient to meet local needs. Respondents clearly see the value of integration, believing it

would reduce duplication, improve early response, and strengthen long-term resilience. These perceptions align with the recurrent hazards and severe impacts documented in section 4.5, and the low adaptive capacity shown in section 4.7.

The findings illustrate the practical consequences of poor coordination on the ground. Households experience climate hazards frequently, yet the support systems meant to help them prepare and adapt remain disconnected. This fragmentation contributes to the persistent vulnerability observed throughout the chapter and explains why reactive coping strategies continue to dominate. The data point to the need for better alignment between existing activities so that preparedness and adaptation efforts reinforce each other rather than compete or remain siloed.

4.9 Analysis of District Plans and Key Informant Perspectives

This section presents the findings from the documentary review of the Mchinji District DRM Plan, Contingency Plan, and Preparedness Plan, triangulated with insights from Key Informant Interviews (KIIs) conducted with officials from DoDMA, DCCMS, the District Council, and NGOs.

Table 8: Gap Analysis of Mchinji District DRM, Contingency, and Preparedness Plans

Criterion	DRM Plan (2019–2024)	Contingency Plan (2025–2026)	Risk Profile (2024–2025)	Overall Gap Level
Explicit integration of CCA and DRR	Weak	Very weak	None	High
Joint budgeting for CCA-DRR activities	None	None	None	High

Use of scientific tools (GIS,NDVI,modelling)	None	Limited	None	High
Community participation in planning	Moderate	Moderate	Low	Medium
Monitoring and evaluation mechanisms	Basic	Basic	None	High
Early warning system linkage to CCA	Weak	Weak	None	High
Long-term adaptation measures (irrigation, crop diversification, ecosystem restoration)	Limited	None	None	High

This table systematically identifies the strengths and weaknesses of the existing district plans. It shows that while the plans adequately describe hazard profiles and response strategies, they lack explicit integration between CCA and DRR components, joint budgeting, routine application of scientific tools, and strong community involvement mechanisms.

Table 9: Emergent Themes from Key Informant Interviews

Theme	Sub-theme	Key Points / Anonymised Quotes
Hazard Profile & Climate Risks	Increasing climate hazards	"Floods, dry spells, and strong winds remain the most frequent hazards in T/A Simphasi." (DDMO)
	Changing hazard patterns	"Rainfall now starts late and ends early; temperatures are higher than before." (DEO)
Community Vulnerability & Impacts	Livelihood vulnerability	"Once rains delay, the entire growing season collapses." (AEO)
	Weak coping capacity	"People sell goats, burn charcoal, or reduce meals." (VDRMC)
Current DRR Practices & Gaps	Reactive DRR system	"Most of our DRR work is reactive; we respond after disasters occur." (DDMO)
	Weak early warning	"Members do not understand early warning messages." (ADRMC)

Current CCA Practices & Gaps	Low CCA adoption	"Adoption is less than 40% due to limited demonstrations and input shortages." (AEO)
	Fragmented CCA interventions	"Once projects end, everything collapses." (ADRMC)
Integration between DRR & CCA	Lack of integration	"DRR is emergency work; CCA is development work." (AEO)
	Funding fragmentation	"Donors finance DRR and CCA separately, forcing us to run parallel programs." (CICOD)
Governance & Coordination	Weak institutional coordination	"Sector departments share information late." (DDMO)
	Underperforming committees	"We are only called for disaster issues, not climate issues." (VDRMC)
Capacity & Technical Support	Limited resources	"We do not have adequate resources to support resilience programmes." (DDMO)

	Need for joint training	"Integration starts with information flow." (AEO)
Identified Gaps	No unified framework	"There is no operational framework guiding integration." (CDO)
	Poor data integration	"Climate data does not feed into DRR plans." (DEO)
Recommendations for Framework	Harmonised planning	"We need a single framework guiding both DRR and CCA." (DDMO)
	Strengthen committees	"We want to be trained on climate adaptation as well." (VDRMC)

The gap analysis in Table 4.10 and the KII themes in Table 4.11 clearly demonstrate that although the Mchinji District plans contain basic hazard profiles and response strategies, they treat CCA and DRR as largely separate domains rather than complementary approaches. There is minimal explicit linkage between the two, such as shared early warning protocols, joint budgeting, or routine use of scientific tools like GIS, NDVI monitoring, or hydrological modelling. The plans focus heavily on immediate response (e.g., contingency planning for water-logging, cholera, and fall armyworm) but give very little attention to long-term adaptation measures such as irrigation development, crop diversification, ecosystem restoration, or climate-smart land-use zoning. Community participation is mentioned in the plans but

remains superficial in practice, as evidenced by low attendance at planning meetings and limited functionality of many Village Civil Protection Committees.

Key informants confirmed these shortcomings, highlighting overlapping mandates between DoDMA and DCCMS, severe resource constraints at district level, and weak translation of national policies into effective local action. The KII matrix also revealed that current DRR efforts are largely reactive ("we respond after disasters occur"), while CCA adoption remains low due to limited demonstrations and input shortages. Funding fragmentation was repeatedly cited as a major barrier, with donors financing DRR and CCA separately, forcing parallel programmes.

These findings expose a critical disconnect between national policy intentions and district-level implementation. The absence of a unified framework that harmonises CCA and DRR means that interventions remain fragmented, resources are duplicated or underutilised, and communities receive inconsistent support. This fragmentation is particularly damaging in T/A Simphasi, where high rainfall variability, land degradation, and low adaptive capacity already create compounded risks.

The evidence strongly points to the necessity of a harmonised framework that integrates CCA and DRR at the district level through joint coordination mechanisms, shared budgeting, integration of scientific data with local knowledge, and meaningful community participation. Such an integrated approach would reduce duplication, improve resource efficiency, strengthen early warning and adaptation measures, and ultimately help break the cycle of repeated shocks and external aid reliance in the study area. The KII recommendations for a single operational framework and joint training further validate the need for the practical, community-based integrated model proposed in this study.

4.10 Overall Discussion

The integrated findings presented in this chapter demonstrate that T/A Simphasi, Mchinji District, is characterised by high climate variability, progressive biophysical degradation, predominantly reactive coping strategies, and fragmented institutional arrangements between Climate Change Adaptation (CCA) and Disaster Risk Reduction (DRR). The rainfall analysis (section 4.2) revealed extreme inter-annual variability with a coefficient of variation of 48.6%, alternating between critically dry seasons that cause drought stress and excessively wet seasons that trigger flash flooding along the Bua River. These climatic patterns interact directly with the geospatial changes documented in section 4.3, where rapid LULC conversion, declining NDVI values, and moderate-to-severe land degradation have reduced natural buffers, lowered soil fertility, and diminished the landscape's capacity to absorb or retain water.

The household survey results further illustrate the human dimension of this vulnerability. The socio-demographic profile (section 4.4) confirmed heavy dependence on rain-fed smallholder agriculture and relatively low education levels, while sections 4.5 and 4.6 showed recurrent exposure to floods, droughts, and dry spells, with most households relying on short-term, erosive coping strategies such as reducing meals, selling assets, and depending on external relief. Adaptive practices remain limited, and training on CCA and DRR is insufficient. Community perceptions (section 4.8) and the analysis of district plans combined with KIIs (section 4.9) consistently highlighted fragmentation: existing activities operate in silos, with weak coordination between DoDMA and DCCMS, limited use of scientific tools, and poor translation of national policies into local action. The socio-economic vulnerability map (section 4.10) visually synthesised these findings, revealing clear spatial disparities with higher vulnerability concentrated in degraded, riverine, and low-adaptive-capacity zones.

Collectively, these results provide robust empirical support for all three objectives of the study. They expose critical structural and implementation gaps in existing policies and institutional arrangements at the district level, demonstrate how biophysical hazards, land degradation, and socio-economic constraints interact to shape high community vulnerability and low adaptive capacity, and offer a solid foundation for the design of a practical, community-based integrated CCA-DRR framework. Without this integration, communities in T/A Simphasi will remain trapped in cycles of recurrent shocks, food insecurity, and aid dependency.

The findings align with broader literature on climate impacts in rain-fed agricultural systems in Malawi and Southern Africa, confirming that moderate hazards produce disproportionate effects when adaptive capacity is weak and institutions are fragmented. By bridging biophysical, socio-economic, and institutional dimensions, this chapter establishes a clear evidence base for moving from fragmented responses to a cohesive, resilience-building approach.

4.11 Limitations of the Study

This study has several limitations that should be acknowledged. Limited time for fieldwork constrained the use of advanced hydrological modelling tools such as the HEC-RAS, which could have provided suitable maps projecting potential riverine flooding along the Bua River and adjacent areas when the water level in Bua rivers rises.Financial constraints also resricted travel to remote areas locations,leading to possible underrepresentation of highly vulnerable communities and causing delays in primary data collection due to logistical challenges.In addition, processing GIS techniques to obtain maps with suitable spartial resolution was challenging due to internet bundle limitations and unstable network connectivity which further delays data acquistion and anallysis. Rainfall data were obtained from only three monitoring stations serving the Traditional Authority, which may not fully capture micro-level spatial variations in rainfall patterns within T/A Simphasi. Furthermore,

the cross-sectional nature of the household survey captures perceptions and experiences at a single point in time and may not fully reflect long-term trends or seasonal dynamics. Despite these limitations, the use of mixed methods and triangulation across rainfall records, geospatial data, survey responses, FGDs, and KIIs significantly enhances the reliability and validity of the findings. The results remain context-specific to T/A Simphasi but offer valuable transferable lessons for other rain-fed agricultural districts in Malawi facing similar climate and institutional challenges.

CHAPTER 5 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This study set out to develop an integrated framework that harmonises Climate Change Adaptation (CCA) and Disaster Risk Reduction (DRR) to strengthen resilience in T/A Simphasi, Mchinji District. Through a comprehensive analysis of multi-year rainfall data, geospatial maps (LULC change, NDVI, and land degradation), a household survey of 44 respondents, Focus Group Discussions, Key Informant Interviews, and review of district plans, the research has clearly demonstrated that T/A Simphasi faces escalating climate hazards characterised by extreme rainfall variability (CV of 48.6%), progressive land degradation, predominantly reactive coping strategies, and fragmented institutional arrangements between CCA and DRR.

The findings confirm that moderate climate hazards produce disproportionate impacts due to heavy dependence on rain-fed agriculture, limited adaptive capacity, low education levels, and poor coordination between national policies and local implementation. Existing national frameworks provide a foundation, but significant gaps persist at the district level, including weak inter-agency collaboration, limited

use of scientific tools, and insufficient community participation. The socio-economic vulnerability map further visualised these compounded risks, identifying clear spatial hotspots that require targeted interventions.

Overall, the study successfully achieved its three specific objectives and provides a robust empirical foundation for a practical, community-based integrated CCA-DRR framework. The evidence underscores the urgent need to move beyond fragmented approaches toward harmonised planning that integrates scientific data with local knowledge, promotes sustainable adaptive practices, and reduces long-term aid dependency. This research contributes to the broader discourse on climate resilience in Malawi and offers a transferable model for other vulnerable districts in Southern Africa.

5.2 The Proposed Integrated CCA-DRR Framework (Main Objective)

Based on the empirical findings presented in Chapter 4, this study proposes a practical, district-level Integrated CCA-DRR Framework to strengthen resilience in T/A Simphasi, Mchinji District. The framework was developed in direct response to the key gaps revealed by the research: fragmentation between CCA and DRR institutions, limited integration of scientific tools (rainfall data, NDVI, and GIS) into local planning, poor translation of national policies to the district and community levels, progressive biophysical degradation (rapid LULC expansion, declining NDVI, and increasing land degradation), high dependence on rain-fed agriculture (93.2%), reactive coping strategies, and persistent cycles of crop loss (88.6%), food insecurity (84.1%), and aid dependency.

The framework establishes a single, unified system that harmonises Climate Change Adaptation (CCA) and Disaster Risk Reduction (DRR) at the district level while delivering tangible, community-focused solutions. It shifts from the current reactive, siloed approach to a proactive, integrated, and evidence-based resilience-building

model. The structure is anchored in national policies but operationalised through strong district coordination and meaningful community participation.



Figure 21:The Integrated CCA-DRR Framework

Structure of the Framework

National Policies (Foundational Level)

The framework is grounded in Malawi's existing national policies, including the National Climate Change Management Policy (2016), the Disaster Risk Management Act (2023), and the National Resilience Strategy (2018–2030). These policies provide the legal and strategic foundation for integration. However, as demonstrated in the gap analysis of district plans and KII findings, these policies remain fragmented at the implementation level, with overlapping mandates and weak coordination between DoDMA and DCCMS. The framework uses these national policies as the guiding umbrella but ensures they are translated into actionable district-level mechanisms rather than operating in isolation.

District CCA-DRR Coordination Committee (Central Coordinating Mechanism)

At the heart of the framework is the District CCA-DRR Coordination Committee, chaired by the District Commissioner. Membership includes representatives from DoDMA, DCCMS, Agriculture, Water, Forestry, the District Council, VDRMCs/ADRMCs, and relevant NGOs like CICOD. The committee meets quarterly to harmonise planning, budgeting, and implementation. This single body directly resolves the institutional fragmentation and duplication of efforts identified in the study, ensuring that CCA and DRR activities are planned, funded, and implemented together rather than in parallel programmes.

The Six Core Operational Components

The framework operates through six interconnected components that integrate scientific evidence with community knowledge:

1. **Joint Coordination Mechanism:**This component ensures all sectors work collaboratively under the District Committee. It eliminates the current silos between emergency response (DRR) and long-term adaptation (CCA), creating a unified governance structure at district level.

2. **Integrated Risk Assessment and Planning:** Scientific tools (multi-year rainfall monitoring, NDVI vegetation analysis, and GIS vulnerability mapping) are systematically combined with participatory vulnerability and capacity assessments conducted with communities. The result is a single annual **Integrated Risk Profile** that informs both contingency planning and long-term adaptation strategies. This component directly addresses the limited use of the LULC, NDVI, and land degradation maps generated in this study and ensures that biophysical evidence drives local decision-making.
3. **Community-Based Early Warning and Adaptation System** :DCCMS climate information is linked directly to trained Village and Area Disaster Risk Management Committees (VDRMCs &ADRMCs). Early warnings no longer trigger only emergency response; they automatically activate anticipatory actions in form of adaptation an preparedness actions such as crop diversification, conservation agriculture, small-scale irrigation, and riparian tree planting. This integration solves the disconnect between early warning and anticipatory actions (adaptation and preparedness actions) that was evident in the community perceptions and survey results.
4. **Capacity Building and Education** :Joint training programmes are developed for VDRMCs, extension workers, and community members, with special emphasis on low-education groups. Training uses simple, visual, and local-language materials to build knowledge and skills in both CCA and DRR. This component tackles the low uptake of adaptive practices and the educational barriers identified in the socio-demographic profile of respondents.
5. **Sustainable Livelihood and Infrastructure Support** :Interventions are prioritised in the high-vulnerability zones identified in the socio-economic vulnerability map. Targeted actions include small-scale irrigation, soil and water conservation, village savings groups, and promotion of climate-resilient crop varieties. This component directly reduces the 93.2%

dependence on rain-fed agriculture and addresses the specific degraded and riverine areas shown in the LULC, NDVI, and land degradation maps.

6. **Monitoring, Evaluation, and Learning** Shared indicators are established (e.g., reduced crop loss, increased adoption of adaptive practices, and decreased aid dependency). Annual joint reviews are conducted with full community participation to assess progress and make necessary adjustments. This creates a continuous learning loop that prevents the "project ends, everything collapses" problem highlighted by key informants.

Expected Outcomes and Community Solution

Through the implementation of this framework, the following outcomes are anticipated:

- Reduced duplication of efforts and more efficient use of scarce resources
- Stronger community ownership and significantly improved adaptive capacity
- Decreased frequency and severity of livelihood shocks from floods and droughts
- Progressive reduction in long-term aid dependency
- Proper disaster risk management governance
- Strengthened and more effective disaster risk management governance at the district and community levels

At the community level, the framework delivers concrete solutions: protected riparian zones and restored vegetation (addressing LULC expansion and NDVI decline), reduced flood and drought damage through timely integrated early warning and adaptation actions, diversified and climate-resilient livelihoods, and stronger local ownership that breaks the cycle of asset depletion and external aid reliance.

Integration of climate change adaptability and disasters framework in strengthening resilience in malawi. A case study of Mchinji district.

This framework is practical, scalable, and firmly grounded in the empirical evidence generated by this study. It transforms national policy intentions into effective district-level action and provides a transferable model for other vulnerable districts in Malawi facing similar climate and institutional challenges.

5.3 Recommendations

The following recommendations are made to facilitate the effective implementation of the proposed Integrated CCA-DRR Framework and to address the key gaps identified in this study:

1. The Mchinji District Council should officially adopt and pilot the proposed community -based Integrated CCA-DRR Framework within its financial year.It should be incorpolated into the DRM plan,Preparedness plan ,and Contingency plan to ensure research findings are applied toward practical ,district-level resilience building.
2. DoDMA and DCCMS should provide technical and financial support for the establishment and operationalisation of the District CCA-DRR Coordination Committee, including facilitation of quarterly meetings and joint training programmes.
3. Development partners and NGOs should align their funding and interventions with the integrated framework rather than continuing separate CCA or DRR projects, thereby reducing duplication and enhancing resource efficiency.
4. Sectoral representatives to the District CCA-DRR Coordination Committee should be carefully selected based on seniority, expertise, and commitment. These representatives must actively participate in all meetings and activities related to their sector to ensure effective decision-making and ownership.
5. A dedicated WhatsApp group should be established for the District CCA-DRR Coordination Committee to facilitate real-time sharing of critical

information, including early warnings, NDVI alerts, rainfall forecasts, and progress updates, thereby strengthening coordination between formal quarterly meetings.

6. Village Disaster Risk Management Committees (VDRMCs) and Area Disaster Risk Management Committees (ADRMCs) should be strengthened through joint CCA-DRR training programmes and given clear, well-defined roles within the framework to enhance community-level implementation and ownership.
7. Future research should conduct a rigorous evaluation of the Integrated CCA-DRR Framework's effectiveness in Mchinji District over a 2–3 year period, focusing on key outcomes such as reduced crop loss, increased adoption of adaptive practices, improved community resilience, and decreased reliance on external aid.

Implementation of this integrated framework will bridge institutional silos, enhance community resilience, reduce aid dependency, and contribute meaningfully to Sustainable Development Goals 2, 11, and 13 in Mchinji District and beyond.

APPENDIX

Accuracy GIS tables

ClassValue	Vegetation	Water	Built-up	Breland	Total	U_Acc
Vegetation	18	1	0	1	20	
Water	3	14	3	0	20	
Built-up	1	0	19	0	20	
Breland	0	0	3	17	20	
Total	22	15	25	18	80	
P_Accuracy	0.818181818	0.933333333	0.76	0.944444444	0	
Kappa	0	0	0	0	0	

ClassValue	Vegetation	Water	Built-up	Breland	Total	U_Ac
Vegetation	20	0	0	0	20	
Water	1	18	1	0	20	
Built-up	0	0	19	1	20	
Breland	1	0	1	18	20	
Total	22	18	21	19	80	
P_Accuracy	0.909090909	1	0.904761905	0.947368421	0	
Kappa	0	0	0	0	0	

ClassValue	Vegetation	Water	Built-up	Breland	Total	U_A
Vegetation	18	1	1	0	20	
Water	2	17	1	0	20	
Built-up	0	1	19	0	20	
Breland	1	1	1	17	20	
Total	21	20	22	17	80	
P_Accuracy	0.857142857	0.85	0.863636364	1	0	
Kappa	0	0	0	0	0	

Pictures taken during field data collection for the household survey and Focused Group Discussion (FGD)











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