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**IMPACTS OF CLIMATE CHANGE RELATED EVENTS ON VULNERABLE GROUPS
IN MAZOWE DISTRICT, ZIMBABWE**

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DEDICATION

To my son Tinayeishe and family.

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The glory and honour to the almighty God who strengthened me during this study. My gratitude goes to Dr. L Mujuru for her support through establishment of strong groundwork and for helping in the project process. My heartfelt thanks also goes to my father Chamunorwa Shereni, my mother Mace Shereni and my husband Aaanel Hondomi for emotional and physical support.

ABSTRACT

Climate change, characterised by long-term shifts in weather patterns and global temperatures, is a pressing global issue that has raised significant concerns among scientists, policymakers, and communities worldwide. This study assessed the effects of climate change-related events on vulnerable groups in Mazowe district, Zimbabwe. The specific objectives were to identify the socio-economic effects of climate-related events, determine the coping strategies employed by vulnerable groups, and identify the challenges that influence the effectiveness of these strategies. Data were collected through questionnaires and key informant interviews from a sample of 60 vulnerable individuals representing women-headed households, elderly-headed families, child-headed households, and households with disabled individuals. There were significant differences between the vulnerable groups on loss of agriculture crops ($p=0.01$), food insecurity ($p=0.02$), access to clean water ($p=0.03$), health issues ($p=0.03$) and loss of income and employment opportunities ($p=0.01$). Coping strategies employed by the vulnerable groups include planting of drought-tolerant maize, crop diversification, and reduced meal consumption from three meals to two meals per day. Migration, asset disposal, and menial labour were common coping mechanisms for income generation. Challenges include limited financial resources and social barriers, with climate change uncertainties and unpredictability as significant concerns. There is need for targeted interventions to address challenges faced by vulnerable communities and enhance the ability to cope with climate change related events.

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CHAPTER ONE

INTRODUCTION

1.1 Background

Climate change, characterised by long-term shifts in weather patterns and global temperatures, is a pressing global issue that has raised significant concerns among scientists, policymakers, and communities worldwide (Ofoegbu, 2017). It is primarily caused by human activities, particularly the emission of greenhouse gases, which trap heat in the Earth's atmosphere, leading to a rise in average temperatures. This phenomenon has far-reaching consequences for ecosystems, natural resources, and human societies, making it one of the greatest challenges of this millennium (Khine & Langkulsen, 2023).

According to Balasubramanian (2020), vulnerable groups, including marginalised communities, indigenous populations, women, children, the elderly, and those living in poverty, bear the brunt of climate change impacts. These groups often lack the resources, adaptive capacity, and access to information necessary to effectively cope with and adapt to changing climatic conditions (Chersich, 2018). They are disproportionately affected by extreme weather events, such as droughts, floods, hurricanes, and heatwaves, which can lead to displacement, food and water shortages, increased vulnerability to diseases, and loss of livelihoods (Toimil et al., 2020).

In the African and Sub-Saharan region, vulnerable groups are particularly susceptible to the adverse effects of climate change (Khine & Langkulsen, 2023). Limited infrastructure, high levels of poverty, dependence on rain-fed agriculture, and inadequate social support systems exacerbate their vulnerability. These groups often rely heavily on natural resources for their livelihoods, making them highly sensitive to changes in temperature, precipitation patterns, and ecological disruptions caused by climate change (Gitz, 2016). Moreover, they face additional challenges related to limited access to healthcare, education, and economic opportunities.

In the context of Zimbabwe, climate change-related events have become increasingly frequent and intense in recent years. The country, located in Southern Africa, is highly vulnerable to climate change impacts due to its reliance on rain-fed agriculture, limited water resources, and high levels of poverty (Ndlovu & Mjimba, 2021). Droughts, floods, and erratic rainfall patterns

have severely affected agricultural productivity, leading to food insecurity, increased poverty rates, and the displacement of rural communities. Mazowe district, located in the Mashonaland Central Province of Zimbabwe, is one of the regions significantly affected by these climate change-related events, given its agricultural nature and reliance on rainfall for farming activities.

Despite the growing recognition of climate change impacts on vulnerable groups, there remains a research gap regarding the specific effects of climate change-related events on vulnerable groups in Mazowe District, Zimbabwe. This study aims to bridge this gap by providing an in-depth analysis of the effects of climate change-related events on vulnerable groups in Mazowe District, contributing to the existing knowledge base and informing targeted adaptation and resilience strategies.

1.2 Problem Statement

Numerous studies have been conducted to examine the impacts of climate change on vulnerable groups globally, as well as in the African and Sub-Saharan region (Hallegatte et al., 2016; Singer, 2018; Lloyd & Hales, 2019; Khine & Langkulsen, 2023). However, there is no documentation of the specific effects of climate change-related events on vulnerable groups in Mazowe district, Zimbabwe. While broader studies have explored the national and regional implications of climate change, localised and context-specific research focusing on Mazowe district remains limited. Existing research has primarily focused on other areas in the country and on the broader impacts of climate change in Zimbabwe, such as agricultural productivity, water resources, and national adaptation strategies (e.g. Manyeruke et al., 2013; Dodman & Mitlin, 2015; Chanza, 2018). The limited research available on the effects of climate change-related events (Mujere & Mazvimavi, 2012; Mavhura et al., 2021) in Mazowe district has often been fragmented and lacks a comprehensive understanding of the multi-dimensional impacts on vulnerable groups. The studies have primarily focused on specific aspects, such as agriculture or health (Khine & Langkulsen, 2023), without providing a holistic analysis of the socio-economic, health, and environmental consequences experienced by vulnerable communities in the district. However, these studies often failed to capture the unique challenges faced by vulnerable groups where the reliance on rain-fed agriculture and limited access to resources exacerbate their vulnerability. Consequently, there is a need for research that delves into the localised effects of climate change-

related events on vulnerable groups in Mazowe district. This study therefore assessed into the impacts of climate related events on the vulnerable in Mazowe district.

1.3 Aim

The main objective of the study is to assess the effects of climate change related events on the vulnerable groups and coping mechanisms in Mazowe district.

1.3.1 Specific Objectives

- To identify the socio-economic effects of climate related events to the vulnerable groups in Mazowe district
- To determine the coping strategies employed by vulnerable groups in Mazowe district to deal with the effects of climate change related events
- To Identify the challenges influencing the effectiveness of coping strategies employed by vulnerable groups in the face of climate change related events in Mazowe district

1.4 Research Questions

1. What are the socio-economic effects of climate-related events on vulnerable groups in Mazowe district?
2. What are the coping strategies employed by vulnerable groups in dealing with the effects of climate change-related events in Mazowe district?
3. What are the challenges that affect the effectiveness of coping strategies employed by vulnerable groups in the face of climate change-related events in Mazowe district?

1.5 Justifications

These results of the study provides valuable results for multiple stakeholders. It is a valuable learning experience. The university benefits from strengthening its expertise in addressing climate change and attracting funding for future project. Climate-related stakeholders such as Non-Governmental Organisation and the civil protection unit- can use the findings to inform targeted interventions, improving the effectiveness of their initiatives. The government and policy makers can make informed decisions by utilising evidence-based insights to develop policies and strategies that promote climate resilience and social equity. Overall, the study's

results contribute to knowledge, inform decision-making, and facilitate interventions to mitigate the impacts of climate change-related events on vulnerable groups in Mazowe District.

1.6 Limitations

The study faced limitations concerning cost, time, and geographic scope. Limited financial resources were addressed by sampling and focusing only on one district and just a few wards. Time constraints were overcome by employing efficient data collection methods and prioritising research objectives. The geographic scope was limited to Mazowe district, but the research acknowledged the context-specific nature of the findings and suggested future studies to expand the scope. Despite these limitations, the study provided valuable insights into the impacts of climate change on vulnerable groups and their coping strategies in Mazowe district, with efforts made to mitigate the limitations and ensure the study's relevance and applicability.

1.7 Delimitations

The study has certain delimitations that should be acknowledged. Firstly, the research focused specifically on the impacts of climate-related events on vulnerable groups in Mazowe district, thereby excluding other regions or districts. Consequently, the findings may not be directly applicable to different geographic contexts. Secondly, the study primarily examined the perspectives and experiences of vulnerable groups, such as women-headed households, elderly-headed families, child-headed households, and households with disabled individuals. Other perspectives from non-vulnerable groups were not extensively explored. Furthermore, the study's scope was limited to assessing the socio-economic effects, coping strategies, and challenges faced by vulnerable groups, while aspects related to environmental, psychological, and cultural dimensions were not examined. Lastly, the study relied on self-reported data from respondents, which may be subject to recall bias or social desirability bias. These delimitations provide a clear understanding of the study's boundaries .

CHAPTER TWO

LITERATURE REVIEW

2.1 Background of Climate Change and Vulnerability

Climate change refers to long-term shifts in weather patterns and global temperatures, primarily caused by human activities, such as the burning of fossil fuels and deforestation (Pearson & Newman, 2019). The consequences of climate change are far-reaching and pose significant challenges for societies worldwide. One of the key concerns is the vulnerability of certain groups and communities to the impacts of climate change. According to Asrat and Babiso (2020), vulnerability is the degree to which a system, such as an individual, community, or ecosystem, is susceptible to harm from climate change due to its characteristics, exposure, and adaptive capacity. Vulnerable groups, such as women, children, the elderly, and disabled individuals, are often disproportionately affected by climate change due to their limited resources, social exclusion, and dependency on natural resources for their livelihoods (Zougmore et al., 2016). Understanding the background of climate change and vulnerability is crucial for comprehending the unique challenges faced by these groups and designing effective adaptation strategies to mitigate the adverse impacts they experience.

The study by Toimil et al., (2020) showed that climate change vulnerability is influenced by various interconnected factors, including social, economic, and environmental dimensions. Social factors include demographic characteristics, cultural practices, and social networks that shape the vulnerabilities of different groups. Saraswat and Kumar (2016), added that economic factors encompass income levels, access to resources, and livelihood patterns that determine the ability of communities to adapt and recover from climate-related events. Environmental factors involve geographic location, exposure to hazards, and ecological sensitivity, which can amplify the vulnerabilities of certain regions or ecosystems. The background of climate change and vulnerability highlights the complex interactions between these dimensions and the need for comprehensive and context-specific approaches to address the challenges faced by vulnerable groups (Pretty et al., 2017).

2.2 Conceptualising Vulnerability to Climate Change:

Conceptualising vulnerability to climate change involves understanding the multidimensional nature of vulnerability and its dynamic interactions with climate-related hazards and stressors. Vulnerability is not solely determined by exposure to climate risks but also influenced by socio-economic factors, institutional capacities, and adaptive strategies. It encompasses both the potential for harm and the capacity to adapt and recover from climate-related impacts. Vulnerability assessments often consider three key components: exposure, sensitivity, and adaptive capacity. Exposure refers to the degree to which a system is exposed to climate hazards, such as extreme weather events or changing precipitation patterns (Benevolenza & DeRigne, 2019). Sensitivity captures the system's susceptibility to these hazards, considering its characteristics, resources, and dependencies. Adaptive capacity refers to the ability of the system to adjust, learn, and respond effectively to climate change, including access to resources, institutional support, and community resilience (Filiberto et al., 2009).

According to Rühlemann and Jordan, (2021) understanding vulnerability in the context of climate change goes beyond assessing the impacts of specific events and acknowledges the broader social, economic, and environmental factors that shape vulnerability and influence outcomes. It recognises that vulnerability is not static but can change over time due to factors such as social dynamics, economic development, and policy interventions. Additionally, vulnerability is often unevenly distributed, with marginalised groups and communities experiencing higher levels of vulnerability due to pre-existing inequalities, discrimination, and limited access to resources (Lynn et al., 2011). By conceptualising vulnerability to climate change, researchers and policymakers can develop targeted strategies and interventions that address the underlying drivers of vulnerability, enhance adaptive capacity, and promote more equitable and sustainable outcomes in the face of climate change impacts.

2.3 Socio-economic Impacts of Climate Change on Vulnerable Groups

Understanding the socio-economic impacts of climate change on vulnerable groups is crucial for developing effective policies and interventions to support adaptation, resilience, and sustainable development (Akerlof et al., 2015). By comprehending these impacts, policymakers and practitioners can design targeted strategies that address the specific needs and vulnerabilities of these groups, promote inclusive economic growth, enhance access to social services, and strengthen community resilience in the face of climate change challenges (Kreslake et al., 2016).

Hossain et al., (2012) highlighted that climate change poses significant challenges to the livelihoods and income sources of vulnerable groups. Changes in temperature, precipitation patterns, and extreme weather events can directly affect agricultural productivity, leading to reduced crop yields, livestock losses, and disrupted farming cycles (Haq & Ahmed, 2017). For subsistence farmers, who heavily rely on agriculture for their sustenance, these impacts can result in food insecurity, poverty, and increased vulnerability. Moreover, climate-related events can damage infrastructure, such as roads and irrigation systems, further hindering economic activities and access to markets. Vulnerable groups face limited alternative livelihood options, making them highly dependent on natural resources, exacerbating their susceptibility to climate change impacts on their livelihoods and income (Sevoyan, 2013).

Climate change has profound implications for food security and nutrition among vulnerable groups. Changes in rainfall patterns and increased frequency of extreme weather events can lead to crop failures, reduced agricultural productivity, and diminished availability of diverse and nutritious food sources (Wesenbeeck et al., 2016). Vulnerable populations, including women, children, and the elderly, are particularly at risk of malnutrition and food insecurity. Limited access to food, coupled with rising food prices, can further exacerbate these challenges. Climate change impacts on food security and nutrition have long-term consequences on the health, well-being, and development of vulnerable groups, perpetuating cycles of poverty and vulnerability (Leichenko & Silva, 2014).

Climate change also has far-reaching health consequences for vulnerable groups. Extreme heat events can lead to heat-related illnesses and increased mortality rates, particularly among the elderly and those with pre-existing health conditions. Wesenbeeck et al., (2016) highlighted that changes in rainfall patterns and temperature can facilitate the spread of vector-borne diseases, such as malaria and dengue fever, and water-borne diseases like cholera. Vulnerable communities may lack access to adequate healthcare services and infrastructure, making them more susceptible to health risks associated with climate change. Additionally, disruptions in healthcare systems and infrastructure caused by climate-related events can further exacerbate health vulnerabilities, impeding the provision of essential healthcare services (Haq & Ahmed, 2017).

Climate change-induced impacts, such as floods, droughts, and sea-level rise, can trigger displacement and migration among vulnerable groups. Displacement often leads to the loss of homes, assets, and social networks, forcing communities to seek refuge in unfamiliar and often overcrowded areas (Hossain et al., 2012). Displaced individuals face increased vulnerabilities, including limited access to basic services, inadequate housing, and heightened social and economic marginalization. Migration as an adaptive response to climate change can also present numerous challenges, including social integration difficulties, economic hardships, and potential conflicts over resources in host communities (Kreslake et al., 2016). The social vulnerability of displaced and migrating populations is a critical concern, as they face multiple intersecting risks, including poverty, discrimination, and a loss of cultural identity.

2.4 Coping strategies employed by Vulnerable groups

According to Ogunpaimo et al., (2021) coping strategies are the actions and mechanisms adopted by vulnerable groups to mitigate the adverse impacts of climate change and build resilience. These strategies aim to enhance the ability of individuals and communities to adapt, recover, and maintain their well-being in the face of climate-related challenges. Coping strategies can be categorised into various types, including agricultural and livelihood strategies, food security and nutrition strategies, community-based health interventions, social networks and support systems, and migration coping strategies (Chen et al., 2021). These diverse approaches highlight the range of adaptive responses employed by vulnerable groups to manage and minimise the negative consequences of climate change on their lives.

Vulnerable groups employ climate-resilient agricultural practices to adapt their farming systems to changing climatic conditions (Atanga & Tankpa, 2021). These practices include the use of drought-tolerant crop varieties, water-conserving irrigation techniques, agroforestry, and soil conservation methods. By implementing these strategies, farmers can enhance their agricultural productivity, reduce vulnerability to crop failures, and secure their livelihoods against climate-related risks.

To reduce their dependence on climate-sensitive activities, vulnerable groups often engage in income diversification and seek alternative livelihood options (Jamshidi et al., 2018). This may involve exploring non-farm income sources, such as small-scale businesses, handicraft production, and microenterprises. Income diversification allows individuals and communities to

have multiple income streams, thereby reducing their vulnerability to climate-related shocks and enhancing their economic resilience (Mutsvangwa, 2019).

Vulnerable groups employ various food storage and preservation techniques to ensure food availability during periods of scarcity or climate-related disruptions (Tazeze et al., 2012). This includes methods such as drying, canning, fermentation, and the construction of improved storage facilities. By preserving food, households can maintain adequate supplies and reduce their reliance on external food sources, enhancing their food security and resilience.

Community gardens and urban agriculture initiatives are coping strategies employed by vulnerable groups to improve their access to fresh and nutritious food (Brown et al., 2012). These initiatives involve cultivating vegetables, fruits, and herbs in communal spaces or urban areas with limited access to traditional agricultural land. Community gardens not only provide a sustainable source of food but also foster social cohesion, knowledge sharing, and skill development within the community.

Vulnerable groups rely on social networks and support systems to cope with the health consequences of climate change (Karki, 2021). These networks provide emotional support, information sharing, and access to resources, enabling individuals to better navigate health challenges. Strong social ties within communities contribute to the development of resilient health systems and the promotion of community well-being.

In response to the impacts of climate change, vulnerable groups may employ migration as a coping strategy (Rühlemann & Jordan, 2021). Migration can involve both temporary and permanent movements to seek alternative livelihoods, access resources, or escape from climate-related hazards. This coping strategy allows individuals and communities to adapt to changing environmental conditions and find opportunities for improved living conditions. However, migration also presents its own set of challenges, including social integration, displacement issues, and potential conflicts over resources in receiving areas.

2.5 Barriers to Coping Strategy Adoption and Implementation

One of the primary barriers to the adoption and implementation of coping strategies among vulnerable groups is limited access to essential resources and services (Akerlof et al., 2015). Economic constraints, such as lack of financial capital and limited access to credit, hinder the

ability of vulnerable individuals and communities to invest in climate-resilient technologies, inputs, and infrastructure. Additionally, inadequate access to basic services such as water, sanitation, healthcare, and education further restricts their capacity to effectively implement coping strategies and adapt to climate change impacts.

Institutional and policy constraints also pose significant barriers to the adoption and implementation of coping strategies by vulnerable groups (Lynn et al., 2011). Weak governance structures, lack of coordination among relevant institutions, and limited support mechanisms impede the development and implementation of effective adaptation policies and programs. Inadequate legal frameworks, limited access to information, and bureaucratic hurdles create obstacles for vulnerable communities in accessing necessary resources, services, and support to implement coping strategies.

Social and cultural factors can influence the adoption and implementation of coping strategies. Wade and Jennings (2016) stated that, traditional gender roles, social norms, and power dynamics within communities may limit the participation and decision-making power of certain vulnerable groups, particularly women and marginalised populations. Cultural beliefs and practices may hinder the acceptance and uptake of new coping strategies, as they may conflict with existing traditions and customs (Kifle et al., 2022). Furthermore, lack of social cohesion, trust, and cooperation within communities can also impede collective action and hinder the successful implementation of coping strategies (Savage et al., 2021).

Limited knowledge and awareness about climate change and its impacts pose significant challenges to the effective implementation of coping strategies. Dakurah, (2018) argued that lack of information about climate risks, available adaptation options, and their potential benefits may hinder vulnerable groups from making informed decisions and taking appropriate actions (Chitongo, 2019). Addressing knowledge gaps through targeted awareness campaigns, capacity building programs, and knowledge-sharing platforms is crucial for enhancing the effectiveness of coping strategies.

Insufficient capacity and skills among vulnerable groups can undermine the effectiveness of coping strategies. Inadequate technical knowledge, limited access to training opportunities, and insufficient skills in areas such as sustainable agriculture practices, natural resource management, and entrepreneurship can hinder the successful implementation of adaptive measures (Sverdlik et

al., 2019). Building the capacity and skills of vulnerable individuals and communities through training, education, and skill development programs is essential for enhancing the effectiveness and long-term sustainability of coping strategies.

According to Zinyemba et al., (2018), external shocks, such as natural disasters and economic crises, can significantly impact the effectiveness of coping strategies. Sudden and unpredictable climate events can undermine the resilience of coping measures, causing setbacks and disruptions. Moreover, the changing climate dynamics and increased frequency and intensity of climate-related hazards may require constant adaptation and modification of coping strategies to remain effective over time. Continuous monitoring, evaluation, and flexibility in the design and implementation of coping strategies are necessary to respond to evolving climate challenges and maintain their effectiveness.

CHAPTER THREE

METHODOLOGY

3.1 Description of Study Area

The study was carried out in Mazowe district, ward 2 located in the Mashonaland Central province of Zimbabwe, Southern Africa. Mazoe is situated approximately 40 kilometres north of the capital city, Harare and is predominantly rural, characterised by a mixture of communal, small-scale farming, and resettlement areas (Basera et al., 2016). The district is known for its agricultural activities, with a significant reliance on rain-fed farming for livelihoods. The climate in Mazowe district is characterised by hot summers and cool winters, with an average annual temperature of 20°C with an annual mean minimum and maximum temperature of 12°C and 27°C respectively. The area receives an average annual rainfall of about 800 mm, which supports the growth of forests and vegetation in the area (Scoones et al., 2018).

Mazowe District has a diverse range of soil types, dominated by sandy loam, clay loam, and sandy clay soils. These soils vary in fertility, drainage capacity, and water-holding capacity, influencing agricultural productivity in the area. Farmers in the district employ various soil management practices to optimise crop production, including soil conservation techniques and the use of organic fertilisers (Basera et al., 2016). The vegetation in Mazowe district comprises a mix of natural grasslands, woodlands, and cultivated lands. The natural vegetation consists of savannah grasslands with scattered trees, while the woodlands are dominated by species such as *Brachystegia spiciformis*, *Julbernardia globiflora*, and various *Eucalyptus* species. Agricultural activities have resulted in the conversion of some forests into cultivated lands, mainly for maize, small grains, and horticultural crops.

3.2 Research design

The study adopted a descriptive research design. The descriptive research design involves collecting data on the effects of climate related events to describe and explain the characteristics, effects, and experiences of vulnerable groups in Mazowe district in relation to climate change-

related events. The reason for using the descriptive research design is to fulfil the primary objective of offering a thorough and detailed depiction of the present circumstances and conditions of vulnerable populations within the study area (Bostley, 2019). This research design relies on a blend of quantitative and qualitative data collection methods to gather information effectively (Marczyk et al., 2015). By employing this approach, the research aims to provide a comprehensive understanding of the characteristics, behaviours, and experiences of the vulnerable populations under study. It enables them to collect and analyse data from various sources and perspectives, ensuring a comprehensive account of the current situation and conditions of these populations. The descriptive research design relies on a combination of quantitative and qualitative data collection methods to gather information.

3.3 Population and sampling

The population of the study included the households with vulnerable individuals which are in ward 2 of Mazowe district. This ward has a total of 1295 households according to the 2022 National census. This includes women (423) and child headed households (56), the disabled (110), the elderly and other vulnerable groups headed households (101) in the area. The study also focused on those with technical knowledge on the issues of climate change and vulnerable groups. The Key Informant Interviewees (KIIs) were identified from information given by the civil protection unit in the district. Ten KIIs included four government officials, two representatives from the civil society and four community leaders.

Ward 2 of the district has a communal setup with population more vulnerable and susceptible to climate change related events such as floods and droughts more than the other wards. Four villages of ward 2 (village 1, 3, 6 and 8) was purposively selected as guided by the Civil protection unit in the district and the Ministry of Social Welfare. A total of 60 respondents were selected for the study and they account for over 5% (Pawar 2020) of the entire population of 485 households. By including more than 5% of the population as respondents, this ensures a diverse and comprehensive representation of the households in the villages. Snowball purposive sampling approach was used where one respondent would refer the next household supported by ministry of social welfare.

3.4 Data collection procedure

A Questionnaire (Appendix 1) and Key Informant Interview guide (Appendix 2), served as the primary data collection tools. The questionnaire was designed to incorporate both closed-ended and open-ended questions, aiming to gather comprehensive information regarding the impacts of climate change-related events on vulnerable groups in Mazowe district. The closed-ended questions provided structured response options, facilitating efficient data analysis, while the open-ended questions allowed respondents to express their perspectives and experiences more freely (Ames et al., 2019).

The Key Informant Interviews were conducted through a structured and interactive process. After identifying key informants who possess specialised knowledge and expertise in climate change-related events and their impacts on vulnerable groups in Mazowe district, interview appointments were scheduled. The interviews were conducted face-to-face in a suitable and convenient location for the key informants. Detailed notes or recordings were made during the interviews to capture the responses accurately.

To ensure the effectiveness of the data collection tools, a pilot study was conducted using 10 questionnaires administered to respondents who are not part of the actual study. This is supported by Pawar (2020), who highlighted that the pilot sample size should at least be above 5% of the actual research sample size. The purpose of the pilot study was to assess the questionnaire's clarity, comprehensibility, and overall effectiveness. Furthermore, the pilot study helped identify and rectify any grammar or spelling errors that may have been overlooked (Marczyk et al., 2015).

After the piloting phase, the finalised questionnaires were administered in the field through face-to-face interactions with the selected respondents to ensure that the questionnaires are completed, accurately and comprehensively. The face-to-face approach enabled clarification and rectification of any uncertainties and collect detailed information while building rapport with the respondents.

3.5 Data Analysis

The collected quantitative data from the questionnaires were entered into a statistical software (SPSS version 21 and Microsoft Excel) for organisation and cleaning. Descriptive statistics, such as frequencies and percentages, were calculated to summarise the characteristics of the

vulnerable groups and the socio-economic effects, coping strategies, and capacities related to climate change-related events in Mazowe district. One-way ANOVA was used to analyse the significance difference of effects of climate related events on the different vulnerable groups. 5-Likert scale was used in the study to determine the Mean scores of the severity of these effects as perceived by the respondents in the different vulnerability groupings.

3.6 Ethical Considerations

Several ethical considerations were involved in conducting this study to ensure the protection of participants' rights and the integrity of the research. First and foremost, informed consent was obtained from all participants, both for the questionnaire surveys and the Key Informant Interviews. Participants were provided with comprehensive information about the study's purpose, procedures, potential risks and benefits, and their voluntary participation. Confidentiality and anonymity were strictly maintained by assigning unique identifiers to participants and keeping all data securely stored. Data were used only for research purposes and reported in aggregate form to ensure individual privacy. Participants were told that they had the right to withdraw from the study at any time without consequences. Additionally, efforts were made to minimise any potential harm or distress to participants by using sensitive and appropriate language in the questionnaires and interviews. The research complied with relevant ethical guidelines and regulations to uphold the principles of respect, beneficence, and justice throughout the study process. Ethical approval was obtained from the appropriate institutional review board or ethics committee before the commencement of data collection.

CHAPTER FOUR

RESULTS

4.1 Effects of droughts and floods on vulnerable groups

Table 4.1 shows mean rankings of the perception of the severity of the effects drought and floods on the different groups. There were significant differences between these weights amongst the vulnerable groups (women, the disabled, child-headed, and the elderly). There were significant differences between the vulnerable groups on loss of agriculture crops ($p=0.01$), food insecurity ($p=0.02$), access to clean water ($p=0.03$), health issues ($p=0.03$) and loss of income and employment opportunities ($p=0.01$). Women had their livelihoods heavily disrupted amongst other vulnerable groups (2.81) whilst the elderly were the least affected (1.37). The disabled had their health greatly affected (3.5) whilst women were the least affected (2.57). Women had their income and employment opportunities were greatly affected by climate change related events whilst the disabled were least affected (1.73). The elderly faced the highest severity and had the highest mean score due to loss of agricultural crops with the disabled having the highest food insecurity due to climate change related events (3.33). In addition, the elderly (3.89), faced the greatest challenge of accessing water followed by the child headed families.

Table 4. 1: Effects of climate related event on vulnerable groups (mean response (SD))

Effects of Climate Change	Vulnerable Groups				Sig*
	Women	Disabled	Child-headed	Elderly	
	Mean(SD)	Mean(SD)	Mean(SD)	Mean(SD)	
Loss of agricultural crops	2.23(1.03)	3.22(1.3)	3.14(1.77)	3.64(1.15)	0.01*
Destruction of infrastructure	3.5(1.03)	3.44(0.88)	3.71(1.25)	3.67(0.94)	0.08
Disruption of livelihood	2.81(0.98)	2.33(0.87)	2.02(0.58)	2.79(1.37)	0.56
Increased food insecurity	3.08(1.09)	3.33(0.87)	2.86(1.46)	2.86(1.23)	0.02*
Decreased access to clean water	2.81(1.13)	3.12(1.05)	3.33(1.41)	3.89(1.34)	0.03*
Health issues	2.57(1.15)	3.5(0.61)	2.96(0.98)	2.93(1.27)	0.03*
Loss of income and employment opportunities	3.42(1.21)	3.01(1.73)	2.86(1.07)	3.36(1.28)	0.01*

Increased debt or financial burden 2.88(1.25) 3.31(1.12) 3.31(1.25) 2.95(1.23) 0.92

4.2 Coping strategies employed by the vulnerable groups

Table 4.2 shows that the majority of the respondents (83.3%) planted drought tolerant maize as one of the coping strategies. A total of 76.7% practiced crop diversification whilst only 26.7% used supplementary irrigation.

Table 4. 2:Food Production coping strategies

Production Response	Frequency	Percentage
Planting drought tolerant maize	50	83.3
Planting small grains	24	40.0
Practicing early planting	30	50.0
Practicing late planting	37	61.7
Supplementary irrigation	16	26.7
Diversifying into small livestock	46	76.7
Staggering planting	26	43.3
Crop diversification	46	76.7

Figure 4.1 shows that the majority of the respondents (70%) changed diets as a consumption coping strategy followed 58.3% who reduced meals and 51.7% who rationed food. Meals were reduced from three meals per day in the household to two with one in the morning and the other in the evening. The rationing was done by equitable distribution among members in the family basing on the vulnerability. Changing diets involved looking for cheaper substitutions such as soya mince for meat and focusing on wild vegetables and dried vegetables in place of fresh vegetables. Children the elderly and the disabled were fed first before women and men. The least implemented coping strategy in the study according was supplementary feeding using wild fruits and vegetables.

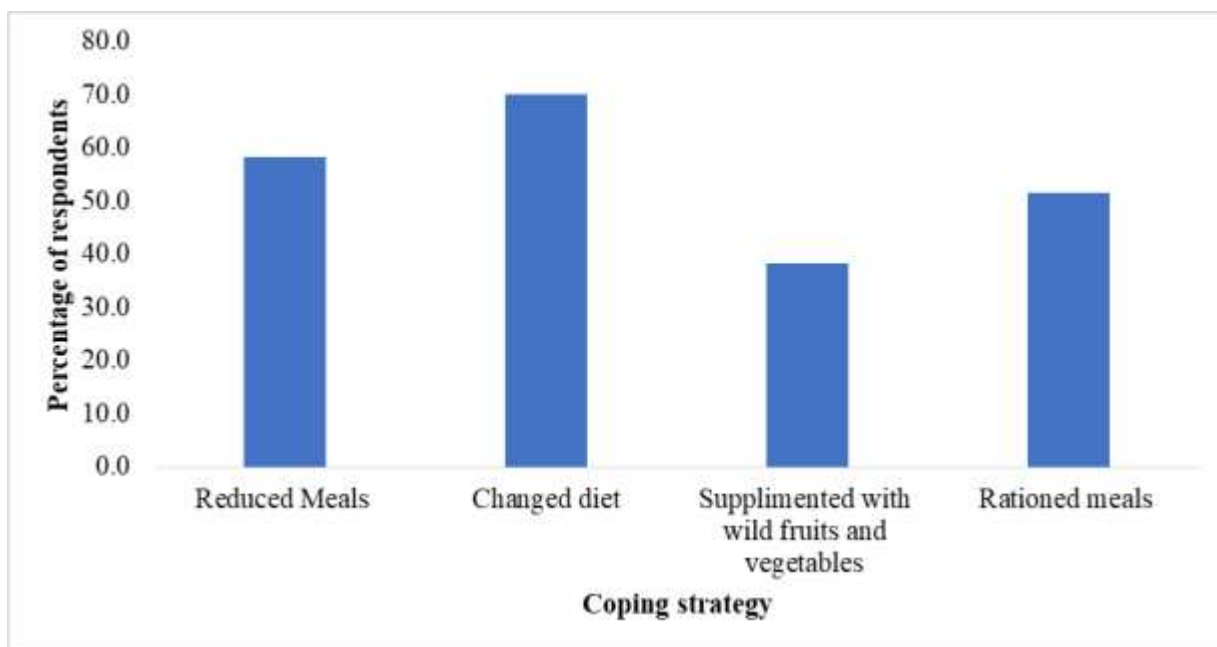


Figure 4. 1: Food Consumption coping strategies

About 70% of the respondents had some members migrating from their households. Table 4.3 shows that the majority of the respondents (51.7%) had members migrating in search of jobs after floods and droughts whilst 40% migrated in search of food. Others (13.3%) migrated to visit relatives.

Table 4. 3:Reasons for migration as a coping strategy

Reason for migration	Frequency	Percentage
Search for food	24	40.0
Search for jobs	31	51.7
Visit relatives	8	13.3

Majority (78.1%) of the respondent disposed their assets to generate income, 70.3% engaged in menial labour whilst 67.2% engaged in small livestock enterprises. Gardening was also an income generating strategy (Figure 4.2). Gardening was done for a limited period when the

plains had water which was the three months after the rains. Tomatoes and vegetables were grown and sold within the community and in designated market place. Low value assets were disposed first such as chickens and rabbits and then goats and then lastly high value assets such as cattle and scotch carts.

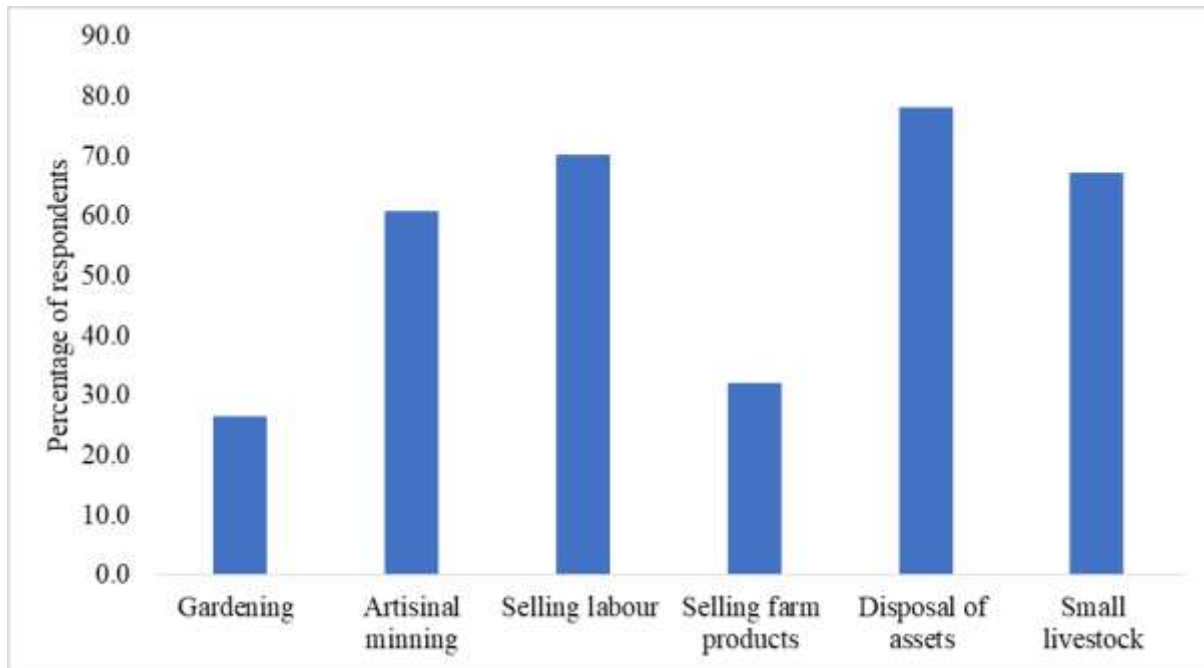


Figure 4. 2 Income generation coping strategies

Table 4.4 indicates that the majority of the respondents (81.7%) participated in community seed banks and Farmer’s clubs (70%). Disaster Risk Reduction Committees and early warning systems were used by 68.3% and 18.3% of the respondent respectively. Examples of the early warning systems mentioned by the respondents include, observation of animal behaviour, looking at the quantity of tree fruits for example (*Uacapa kirkiana*). They also listened to radios and televisions weather updates as well as their mobile phones. Community meetings are also used as platforms for discussion of hazardous weather events and seasonal forecasts.

Table 4. 4: Community Based coping strategies

Community Based coping mechanisms	Frequency	Percentage
Community seedbanks	49	81.7
Disaster Risk Reduction committees	41	68.3

Community safe houses	21	35.0
Community Early Warning Systems	11	18.3
Farmer's Clubs	42	70.0

The coping strategies implemented were less effective despite the efforts to cope with climate change related events, as they still faced loss of income and livelihood options, diseases and increased vulnerability. There were high statistical significant differences in the effectiveness of coping strategies ($p=0.043$). Amongst the vulnerable groups, those households with disabled members had a mean score of 2.23 indicating that their coping strategies were least effective (Table 4.5)

Table 4. 5: Effectiveness of coping strategies

Effectiveness of coping strategies	Vulnerable Groups				Sig*
	Women	Disabled	Child-headed	Elderly	
	Mean(SD)	Mean(SD)	Mean(SD)	Mean(SD)	
	3.89(1.03)	2.23(1.33)	3.14(1.77)	3.22(1.15)	0.043*

4.3 Challenges in the implementation of Coping Strategies

The biggest challenge faced across all the vulnerable groups was lack of financial resources affecting 80.8%, 78.6%, 66.7% and 71.4% of women, disabled, child-headed and the elderly respectively (Table 4.6). The social barriers included limited access to climate information and resource, disparities in financial resources and decision making power, and cultural and traditional beliefs which cause people to resist adoption of new effective climate management technology. Climate change uncertainties and unpredictability was the most common challenge amongst the elderly as well as women. The elderly still relied on vegetation and animal behavior as part of the indigenous knowledge, however in the light of the new climate events these methods needed reinforcement with the current technology to come up with effective climate monitoring and forecasting. Limited community participation and engagement was the least

common challenge as well as lack of community participation and engagement. The communities were reluctant to participate in climate change initiatives due to lack of information and knowledge of the extent of how their livelihoods are being affected by climate related events.

Table 4. 6: Challenges of effective implementation of coping strategies

Challenges in implementing coping mechanisms	Women %	Disabled %	Child-headed %	Elderly %
Lack of financial resources	80.8	78.6	66.7	71.4
Limited access to technology and information	65.4	64.3	44.4	42.9
Lack of institutional support and policy	50.0	57.1	44.4	42.9
Inadequate infrastructure	53.8	50	66.7	28.6
Social barriers	73.1	64.3	55.6	71.4
Limited community participation and engagement	42.3	50	33.3	14.3
Inequality and inequity in accessing resources	46.2	35.7	55.6	42.9
Climate change uncertainties and unpredictability	73.1	42.9	66.7	85.7

CHAPTER FIVE

DISCUSSION

5.1 Effects of climate related events of vulnerable groups

The results show differential impacts of climate-related events on various vulnerable groups in Mazowe district (Table 4.1). These findings are similar to the findings of Chitongo (2019), who indicated that the impacts of climate change are not uniformly distributed among vulnerable populations, emphasising the need for targeted interventions and tailored support.

Among the vulnerable groups, the elderly was most severely affected. This finding aligns with results of Dakurah, (2018) who found elderly individuals vulnerable to environmental changes with potential disruption to their main sources of income and food security.

The disabled population in this study was highly vulnerable to food insecurity. This suggests that climate-related events exacerbate their already limited access to resources and livelihood opportunities. It is crucial to recognise and address the specific challenges faced by disabled individuals in adapting to climate change, such as limited mobility and access to adaptive technologies. Ensuring adequate access to clean water is crucial for vulnerable groups, as it directly impacts their health, sanitation, and overall quality of life (Asrat & Babiso, 2020).

5.2 Coping strategies for climate related events

The results showed the coping strategies adopted by vulnerable groups in response to climate-related events, as well as their effectiveness in dealing with the impacts (Table 4.2). The findings shed light on various aspects, linked to production and consumption coping strategies, migration patterns, income generation coping mechanisms, and community-level adaptation strategies.

The findings emphasises the importance of adopting climate-resilient crop varieties to enhance agricultural productivity and resilience to drought (Mujeyi et al., 2021). Furthermore, crop diversification is effective for minimising the risks associated with climate variability and ensuring food security (Myeni & Moeletsi, 2020).

The severity of food shortages and the need for households to adjust their food consumption patterns to manage limited resources can be done through reduction of meals (Chitongo et al., 2019) and food rationing.

The primary reasons for migration were the search for jobs after floods and droughts and the search for food. This reflects the adverse impacts of climate-related events on livelihoods and the need for households to seek alternative opportunities and resources elsewhere (Ojo & Baiyegunhi, 2021).

In terms of income generation coping mechanisms, the majority of respondents resorted to disposing of their assets, indicating the financial distress caused by climate-related events (figure 4.2). These results underscore the importance of diversifying income sources and exploring alternative livelihood options in the face of climate-related challenges (Zinyemba et al., 2018). Gardening was the least selected income-generating coping strategy, due to potential limitations of access to land and resources for horticultural activities by vulnerable groups.

The adoption of community early warning systems was relatively low, suggesting potential gaps in early warning dissemination and awareness within vulnerable communities.

This results also highlighted the need for continuous evaluation and improvement of coping mechanisms to ensure their appropriateness and efficacy in addressing the specific challenges posed by climate-related events.

5.3 Challenges affecting effective implementation of coping strategies

The results revealed challenges faced by vulnerable groups which included lack of financial resources and social barriers. These results emphasising the economic vulnerability of these groups and their limited access and to financial resources to cope with the impacts of climate change. Insufficient financial resources can hinder their ability to invest in adaptive measures and access necessary resources to mitigate the effects of climate-related events.

Social barriers may include gender-based discrimination, stigma towards disability, and age-related biases, which can limit their access to resources, services, and opportunities for adaptation (Chitongo, 2019). Such social barriers can further exacerbate the vulnerabilities of these groups and hinder their capacity to effectively respond to climate change impacts.

Climate change uncertainties and unpredictability were particularly challenging for the elderly, being the most common challenge identified by this group, suggesting that the elderly face heightened concerns and difficulties in adapting to the dynamic and uncertain nature of climate-related events. The unpredictability of weather patterns and the increased frequency of extreme events can have severe implications for their livelihoods, health, and overall well-being (Filiberto et al., 2009).

Although results did not provide specific reasons or implications, it is important to recognise the potential value of community participation and engagement in enhancing resilience and adaptive capacity. Active involvement of communities in decision-making processes, resource allocation, and the design of adaptation strategies can foster ownership, empowerment, and collective action (Saraswat & Kumar, 2016). Further exploration is needed to better understand the factors contributing to limited community participation and the potential implications for vulnerable groups.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The results provide valuable insights into the impacts of climate-related events on vulnerable groups in Mazowe district and the coping strategies employed by these groups. There are differential effects of climate change on various vulnerable groups, emphasising the need for targeted interventions and tailored support.

Different vulnerable groups experienced varying levels of severity in terms of the effects of climate-related events with the elderly facing the greatest impact in terms of the loss of agricultural crops, while the disabled experienced higher food insecurity. This underscores the importance of recognising the unique challenges faced by different groups and developing context-specific strategies to address their needs.

The coping strategies adopted by vulnerable groups include a range of coping strategies, including crop diversification, reduced meal consumption, migration, asset disposal, and community-level adaptation measures. However, some strategies were more commonly employed than others, indicating potential gaps in access and effectiveness.

Challenges affecting implementation of the coping strategies include lack of financial resources and social barriers emerged as significant challenges across all groups. Climate change uncertainties and unpredictability were particularly pronounced among the elderly and women. These findings underscore the need for targeted support to address these challenges and promote resilience among vulnerable populations.

Overall, the findings emphasise the importance of adopting a holistic and inclusive approach to climate change resilience. It is crucial to consider the unique needs and vulnerabilities of different groups and develop targeted interventions that address their specific challenges. Enhancing access to financial resources, addressing social barriers, improving adaptive capacity, and promoting community participation are key areas that require attention to enhance the resilience of vulnerable groups in the face of climate-related events. By integrating these findings

into policy and decision-making processes, we can work towards building a more inclusive and resilient future for all members of society.

6.2 Recommendations

The following recommendations can be made to address reduce vulnerability to climate change in Mazowe district

It is crucial to provide targeted financial support through Initiatives such as microcredit programs, grants, and subsidies that specifically cater to the needs of vulnerable households.

Recognising the social barriers faced by vulnerable groups, efforts should be made to promote inclusivity and equal opportunities by addressing gender-based discrimination, stigma towards disability, and age-related biases.

Training programs and knowledge-sharing platforms that provide information on climate-smart agricultural practices, water management techniques, and other adaptive strategies are needed to equip vulnerable groups with the necessary knowledge and skills to enhance their ability to respond to climate-related challenges effectively.

Strengthen community early warning systems, community seedbanks and farmer's clubs.

Create platforms for dialogue, encouraging participatory approaches, and empowering community members can foster ownership and collective action towards building resilience.

One area for further study could be to explore the long-term impacts and effectiveness of the coping strategies adopted by vulnerable groups in Mazowe district.

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APPENDICIES

Annexure 1: Research Questionnaire

Dear Participant,

My name is Nancy Shereni I am a final year student at Bindura University of Science Education carrying out a study on the socio-economic effects of climate-related events on vulnerable groups in Mazowe District. Your input is valuable in understanding the challenges faced by vulnerable communities and developing effective strategies for resilience. Please answer the following questions to the best of your knowledge and experiences. Your responses will be kept confidential and used solely for research purposes.

Section 1: Demographic information (Kindly circle the appropriate response)

1. Gender

a) Male

b) Female

c) Prefer not to say

2. Age:

a) 18-25 years

b) 26-35 years

c) 36-45 years

d) 46-55 years

e) 56 years or above

3. Education level

- a) No formal education
- b) Primary school
- c) Secondary school
- d) Vocational training
- e) University or higher

4. Marital status:

- a) Single
- b) Married or in a committed relationship
- c) Divorced or separated
- d) Widowed

5. Occupation:

- a) Agriculture
- b) Business/Entrepreneurship
- c) Formal employment
- d) Informal employment
- e) Student
- f) Retired
- g) Other (please specify): _____

6. Household size:

- a) 1-3 members

- b) 4-6 members
- c) 7-9 members
- d) 10 members or more

7. How many years have you been residing in Mazowe District?

- a) Less than 5 years
- b) 5-10 years
- c) 11-20 years
- d) More than 20 years

8. Are you a member of any vulnerable group? (e.g., women, children, elderly, persons with disabilities)

- a) Yes
- b) No

Section 2: Socio-economic Effects (Kindly circle the appropriate response)

9. How have climate-related events (e.g., floods, droughts) affected your livelihood?

- a) Loss of agricultural productivity
- b) Damage to infrastructure and property
- c) Disruption of business activities
- d) Reduced access to clean water and sanitation
- e) Other (please specify): _____

10. Has climate change impacted your access to food security?

a) Yes

b) No

11. In what ways have climate-related events influenced the health of vulnerable groups?

a) Increased incidence of waterborne diseases

b) Malnutrition and food-related health issues

c) Mental health challenges (e.g., stress, anxiety)

d) Increased prevalence of vector-borne diseases

e) Other (please specify): _____

Section 2: Capacity of Vulnerable Groups

12. How would you rate the level of knowledge and awareness within your community regarding climate change-related events?

a) High

b) Moderate

c) Low

d) Not sure

13. Have you received any training or support in building resilience to climate change-related events?

a) Yes

b) No

14. How prepared do you feel in dealing with climate change-related events?

a) Very prepared

b) Somewhat prepared

c) Not prepared at all

d) Not sure

Section 3: Challenges in Coping Strategies

15. What are the main challenges that affect the effectiveness of coping strategies employed by vulnerable groups?

a) Lack of financial resources

b) Limited access to technology or information

c) Lack of supportive policies or institutional support

d) Inadequate infrastructure

e) Social or cultural barriers

f) Other (please specify): _____

16. How do you perceive the availability and accessibility of support systems during climate change-related events?

a) Adequate

b) Inadequate

c) Uncertain

d) Not applicable

17. Are there any specific coping strategies that have been successful in your community? If yes, please describe.

18. What additional support or resources do you believe would enhance the effectiveness of coping strategies for climate change-related events?

Thank you for your participation! Your insights will contribute to understanding the socio-economic effects, capacity, and challenges faced by vulnerable groups in Mazowe District.

Annexure 2: Interview Guide

Key Informant Interview Guide

Introduction

Thank you for agreeing to participate in this key informant interview. The purpose of this interview is to gather in-depth information and insights regarding the effects of climate change-related events on vulnerable groups in Mazowe District. Your expertise and experience will provide valuable insights for our research. Please note that your responses will be kept confidential and used solely for research purposes.

Section 1: Background and Expertise

1. Can you please provide a brief overview of your background and expertise in relation to climate change and its impacts on vulnerable groups?

Section 2: Understanding the Effects of Climate Change-Related Events

2. From your perspective, what are the main climate change-related events that have affected vulnerable groups in Mazowe District?

3. In your experience, what are the specific socio-economic effects that vulnerable groups in Mazowe District have faced as a result of these climate change-related events?

Section 3: Capacity of Vulnerable Groups

4. How would you describe the capacity of vulnerable groups in Mazowe District to deal with the effects of climate change-related events?

5. What factors contribute to the capacity of vulnerable groups to adapt and respond to climate change-related events in Mazowe District?

6. Are there any specific initiatives or programs in place to enhance the capacity of vulnerable groups in Mazowe District? If yes, please provide examples.

Section 4: Coping Strategies Employed by Vulnerable Groups

7. What coping strategies have you observed or are aware of that vulnerable groups in Mazowe District employ to mitigate the effects of climate change-related events?

8. Are there any particular coping strategies that have been more effective or successful than others? If yes, please elaborate.

9. What are the challenges or barriers that vulnerable groups face in implementing effective coping strategies for climate change-related events in Mazowe District?

Section 5: Recommendations

10. Based on your expertise, what recommendations would you provide to improve the support and resilience of vulnerable groups in Mazowe District in the face of climate change-related events?

Conclusion

Thank you for sharing your valuable insights and expertise during this interview. Your contribution will greatly contribute to our understanding of the effects of climate change-related events on vulnerable groups in Mazowe District. Your responses will be treated with utmost confidentiality, and we appreciate your time and cooperation.