

EFFECTIVENESS OF FLOOD RESPONSE MECHANISMS FOR ENHANCING RESILIENT LIVELIHOODS IN TSHOLOTSHO DISTRICT OF ZIMBABWE

By

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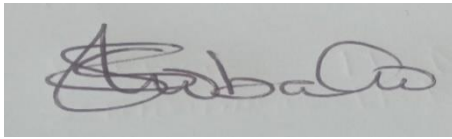
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DECLARATION

I, Simbarashe Sibanda, hereby declare that this thesis for the degree of Doctor of Philosophy in Rural Development submitted to the Faculty of Science, Engineering and Agriculture at the University of Venda, has not been submitted previously for any degree at this or another university. It is original in design and in execution and all reference material contained therein has been duly acknowledged.

Signature



Date 08/08/2025....

Simbarashe Sibanda

To my beloved wife, Kudzanai Loreen Sibanda

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ABBREVIATIONS

CAT	Continuity Assistance Tool
DDC	District Development Coordinator
DCP	Department of Civil Protection
DCPC	District Civil Protection Committee
DRR	District Risk Reduction
EUC	European Union Commission
FDG	Focus Group Discussion
FEMS	Flood Emergency Management Systems
IMBSPSS	International Business Machines Statistical Product and Service
IPCC	Intergovernmental Panel on Climate Change
MDGs	Millennium Development Goals
MCEER	Multidisciplinary Centre for Earthquake Engineering Research
NGO	Non-Governmental Organisation
PDC	Provincial Development Coordinator
PRA	Participatory Rural Appraisal
RMI	Risk Management Index
SADC	Southern African Development Community
SLF	Sustainable Livelihoods Framework
UN	United Nations
UNISDR	United Nations International Strategy for Disaster Reduction
UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs
USA	United States of America
WHO	World Health Organisation
ZIMSTAT	Zimbabwe National Statistics Agency

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ABSTRACT

Flooding is a recurrent natural disaster that disrupts livelihoods, damages infrastructure and affects economic stability, particularly in vulnerable communities. Due to geographical and environmental factors, Tsholotsho District in Zimbabwe is highly susceptible to flooding. This study aimed to evaluate the effectiveness of flood response mechanisms for enhancing resilient livelihoods in Tsholotsho and provide actionable insights for policymakers and rural development practitioners. The research used an exploratory sequential mixed methods design, combining qualitative (semi-structured interviews, focus group discussions and document analysis) with quantitative methods (closed-ended questionnaires). This approach gave a understanding of flood response challenges by triangulating findings from various sources. The study focused on flood victims who received aid from organizations, as well as key stakeholders in disaster response, including government departments, NGOs and community leaders. The study specifically targeted wards 6, 7 and 8, in the district which all have a history of severe flooding. Tsholotsho's vulnerability is heightened by its location on the low-lying Gwayi River, the prevalence of Kalahari and clay soils and the lack of water storage infrastructure. These environmental factors, coupled with climate variability, have resulted in recurrent floods, severely impacting livelihoods. Key findings included significant barriers to effective flood response, such as inadequate financial and technical resources. Government departments struggled to implement proactive measures and an overreliance on donor aid and centralized national funding mechanisms weakened preparedness and delayed recovery efforts. Institutional gaps, including poor coordination among stakeholders and the absence of context-specific disaster management policies, also undermined flood resilience. The study highlighted the need for localized, participatory approaches that integrate both indigenous knowledge and scientific expertise. Key recommendations included the establishment of resilient infrastructure, such as water storage facilities and the enhancement of early warning systems. Strengthening institutional capacity through improved coordination and capacity-building efforts was identified as critical for sustainable flood response. The study emphasized the importance of improving the capacity of local institutions, as government departments often lack the resources and expertise to implement disaster risk reduction strategies effectively. Additionally, better coordination between government, NGOs and communities is essential to ensure that flood response mechanisms are effective and equitable. The research underscored the role of community participation in disaster management. The lack of community involvement in decision-making has led to interventions that do not fully address local needs. Therefore, empowering communities to actively engage in disaster planning, response and recovery is crucial for long-term resilience. Through integrating local knowledge into flood risk management strategies, communities can contribute

valuable insights that enhance disaster response effectiveness. This study challenges top-down disaster management approaches, advocating for inclusive, bottom-up frameworks that empower local communities. The proposed framework stresses the importance of integrated strategies that combine community participation and institutional strengthening. The findings provide valuable insights for flood-prone rural areas globally, offering a roadmap for transforming flood response mechanisms into sustainable development tools. The research contributes to rural development theory by highlighting the intersection of environmental vulnerability, institutional capacity and community participation in disaster resilience, offering a foundation for future research and policy innovation in disaster management.

CHAPTER ONE: INTRODUCTION OF THE STUDY

1.1 Introduction

The chapter provides a clear introduction to aspects that form the basis of this study. These aspects include the background which presents literature on facets that motivate this study. The chapter also provides a concise statement of the problem under investigation. This section is followed by an outline of the research objectives and hypothesis, a justification of the study, a description of the study area as well as an outline of the thesis structure. Flooding continues to pose a persistent threat to livelihoods and human settlements worldwide. This challenge is expected to remain a significant concern, particularly in countries like Zimbabwe, where disaster risk management capacity is limited (Dube, 2019). The increasing frequency and intensity of flood-related disasters in recent years have intensified human suffering. In Zimbabwe, Tsholotsho District is particularly vulnerable to flooding due to its flat, low-lying terrain and inadequate infrastructure for flood mitigation. On a global scale, climate change is worsening the occurrence and severity of extreme weather events, such as floods, which have devastating effects on vulnerable communities, (Dube and Munsaka, 2018), including those in Tsholotsho District. In countries such as Zimbabwe, where limited capacity for disaster risk management exists, the recurring threat of flooding continues to impact livelihoods, infrastructure and social cohesion. The devastating effects of floods highlight the urgent need to effectively and efficiently respond to mitigate the negative impacts (Dube and Munsaka, 2020, Ndung'u, et al, 2023). Therefore, the study was carried out to address the gaps in current response strategies and enhance the resilience of grassroots communities in Tsholotsho District to future flood events.

1.2 Background

Flooding has long been recognised as one of the most destructive environmental hazards worldwide, affecting human settlements, infrastructure and livelihoods with increasing severity. It occurs in multiple forms including flash floods, coastal inundations, river overflows and rural flooding where rivers or streams leave their natural channels and inundate otherwise dry land (Matsa and Mupepi, 2021; Bwanali and Manda, 2023). Rural communities tend to face more severe impacts because poverty, limited infrastructure and scarce healthcare services leave them ill-equipped to cope with repeated flood events. The loss of natural, physical, human, financial and social capital undermines years of progress and reduces resilience against future hazards (Maskrey, 1999; Szoenyi, 2013; Tshuma, 2021). In addition to these structural vulnerabilities,

climate change has intensified rainfall variability, increasing the frequency and intensity of flood events in many regions. Globally, damages are measured in billions of US dollars each year, yet the human toll loss of life, displacement and long-term disruption to communities remains the most pressing concern (Kumar *et al.*, 2016). The need to strengthen disaster risk management is therefore urgent, especially in countries where such systems are still in formative stages.

The social and economic consequences of flooding are not uniform across the globe. In many developing nations, recurrent floods reinforce cycles of poverty by wiping out assets, disrupting education and severing access to essential services. Anielle and Marie-Ange (2015) observe that recurrent flooding deepens poverty and erodes livelihoods in ways that can be difficult to reverse without targeted interventions. While recovery efforts often aim to restore infrastructure and services, they may not sufficiently consider the differentiated impacts on various population groups. Older persons, children, women and people with disabilities are often disproportionately affected due to pre-existing inequalities in access to resources, mobility and decision-making (Pal *et al.*, 2020). These realities make it imperative that flood management strategies not only focus on physical defences but also address the social dimensions of vulnerability.

1.2.1 Global Experiences

Around the world, both catastrophic and smaller-scale floods have reshaped communities and economies. In the United States, events such as Hurricane Katrina in New Orleans (2005), Superstorm Sandy in New York (2012) and Hurricane Harvey in Houston (2017) have been marked by large-scale displacement, massive property destruction and prolonged recovery periods (Kumar *et al.*, 2016; Mngumi, 2020). The heaviest burdens often fall on low-income residents, racial minorities and the elderly who face multiple barriers to recovery including lack of insurance, limited mobility during evacuation and restricted access to aid (Pal *et al.*, 2020). In 2022, flash flooding in Jackson, Mississippi, caused the city's main water treatment plant to fail, leaving 150,000 residents without safe water. This event demonstrated how existing weaknesses in infrastructure, combined with economic inequality, can magnify the effects of flooding on already vulnerable communities.

In South America, the 2003 Santa Fe flood in Argentina killed 23 people directly and claimed over 100 more lives in the months that followed. The disaster displaced thousands and caused deep economic losses, highlighting the long-term nature of flood impacts (Kumar *et al.*, 2016). In Asia, urban flooding has become increasingly common, with China reporting that between 2008 and 2010, 62% of its cities experienced flood events (Thompkins *et al.*, 2019). The urban economic

losses have exceeded those in rural areas due to the concentration of infrastructure and economic activity. In South Asia, about 300 million people in India and Bangladesh live in areas prone to regular inundation. These populations face recurrent outbreaks of waterborne diseases such as malaria and typhoid in the aftermath of floods, compounding the disaster's impact on public health.

1.2.2 European Approaches to Flood Management

Across Europe, flood management has evolved to balance prevention, preparedness and recovery in ways that reflect the region's economic capacity and governance frameworks. Countries such as England, France and Poland have embedded flood risk management into both national and local policy, often with legal provisions that require inter-agency coordination and community engagement (Gilissen *et al.*, 2016). In England, multi-agency flood plans have been standard for more than six decades, with Local Resilience Forums coordinating between emergency responders, local councils and the public to ensure preparedness. France integrates flood planning into broader disaster risk frameworks, enabling municipalities to use voluntary civil protection reserves during emergencies. Poland's model splits responsibility between central and local governments, ensuring that local authorities take the lead during response while central budgets partly reimburse expenses (Proverbs and Ahadzi, 2011; Mitheu, 2023). These systems are underpinned by early warning technologies, public education and flood defence infrastructure such as levees, reservoirs and weirs that aim to limit the impact of high water events.

The European Union's flood risk management directives encourage a combination of proactive and reactive measures, recognising that no single approach can eliminate flood hazards entirely (European Union, 2014). Proactive measures include hazard mapping, land-use regulation and green infrastructure projects to absorb floodwaters, while reactive measures focus on recovery, reconstruction and financial compensation. In the Netherlands, for instance, flood management is considered a matter of national survival due to the country's low-lying geography, leading to extensive investment in storm surge barriers and integrated water management systems. However, even with these robust mechanisms, European policymakers increasingly acknowledge the influence of climate change in altering rainfall patterns and intensifying storm events, necessitating adaptive strategies that combine engineering solutions with social resilience building (Wolff *et al.*, 2021).

1.2.3 African Experiences

Floods in Africa continue to exact a high human toll, with 96% of global flood-related deaths occurring in developing countries (Proverbs and Ahadzi, 2011). The impacts are felt across rural

and urban settings, but rural communities often face greater hardship due to reliance on climate-sensitive livelihoods and limited access to formal safety nets. In Ghana, recurring floods have caused repeated displacement and loss of life over the past three decades. Notable events include the 1995 flood that killed 26 people, the 1999 disaster that claimed 56 lives and the 2007 floods that affected over 260,000 people (Proverbs and Ahadzi, 2011). Mozambique has also endured severe flooding, particularly along the Limpopo and Zambezi rivers. The National Institute for Disaster Management (INGC) coordinates preparedness and response, working through local disaster committees to implement early warning systems and evacuation plans. This decentralised model has been effective in mobilising communities but continues to be challenged by resource limitations and the increasing unpredictability of weather patterns.

Elsewhere in Southern Africa, floods have repeatedly undermined development gains by damaging transport links, destroying schools and clinics and disrupting agricultural production. In Malawi, the 2015 floods displaced more than 230,000 people and destroyed over 64,000 hectares of crops (World Bank, 2016). In Botswana, seasonal floods in the Okavango Delta bring both ecological benefits and economic disruption, requiring careful management to balance conservation with community needs. These experiences underline the reality that African flood risk management must be context-specific, drawing on both scientific forecasting and indigenous knowledge to ensure relevance and uptake. While national agencies coordinate responses, much of the practical work happens at community level, where local leaders, NGOs and residents mobilise to protect lives and property. Strengthening these grassroots capacities remains a priority for building resilience across the continent.

1.2.4 Flooding in Zimbabwe

In Zimbabwe, flooding has long been a recurring hazard, particularly in the low-lying regions of the Zambezi basin, Limpopo basin and the south-eastern Save-Runde catchment. Events such as Cyclone Eline in 2000, which killed around 700 people and displaced over half a million, illustrate the devastating potential of flood disasters (Gwimbi, 2009). More recent events include the 2014 Tokwe Mukosi floods, which caused large-scale displacement and Cyclone Idai in 2019, which damaged infrastructure, destroyed crops and left thousands homeless (Government of Zimbabwe, 2019). Flooding in the country is often linked to tropical cyclones, prolonged rainfall and dam overflows, with impacts that extend beyond immediate loss of life to longer-term disruptions in livelihoods, education and healthcare access. Rural districts such as Tsholotsho in Matabeleland North are particularly vulnerable due to their flat terrain, sandy soils and limited flood protection infrastructure (Chenje, 2018).

Despite policy frameworks under the Civil Protection Act and coordination through the Civil Protection Unit (CPU), challenges remain in forecasting accuracy, communication of warnings and enforcement of land-use regulations (Manyena, 2013). Limited investment in hydro-meteorological infrastructure restricts real-time monitoring and even when warnings are issued, many rural households cannot access or interpret the information effectively. Post-disaster recovery often relies on external assistance from NGOs and development partners, yet these interventions are sometimes short-term and fail to address underlying vulnerabilities. This underscores the importance of localised strategies that combine modern disaster risk reduction measures with indigenous practices and community-led planning. Enhancing local disaster committees, improving access to resilient infrastructure and integrating flood risk management into district development planning are crucial steps toward reducing the long-term impacts of flooding in Zimbabwe.

1.2.5 Rural Development Implications of Flooding

Flooding can reverse years of rural development progress by dismantling the physical, social and economic foundations of communities. Agriculture, the backbone of rural economies, is highly susceptible to flood damage as crop fields are submerged, soils eroded and planting schedules disrupted. The loss of livestock, destruction of irrigation infrastructure and contamination of water sources compound these challenges, creating food insecurity and loss of income (FAO, 2020). Reconstruction efforts often divert scarce resources from long-term development priorities, prolonging recovery and entrenching poverty. In areas with weak governance or limited institutional capacity, recovery is further slowed, leaving communities vulnerable to future hazards.

At the same time, flooding can act as a catalyst for rethinking rural development strategies. Investments in flood-resilient housing, elevated roads and community shelters can simultaneously serve disaster preparedness and broader development objectives. Programmes that promote wetland restoration, reforestation and sustainable land use strengthen natural flood defences while supporting biodiversity and ecosystem services. Social cohesion, underpinned by community networks and local leadership, plays a critical role in recovery by facilitating mutual aid, information sharing and coordinated action. Strengthening local early warning systems and embedding disaster preparedness into community education can empower residents to respond effectively when floods occur. These measures highlight the need for an integrated approach where flood risk reduction is not treated as a stand-alone agenda but as an essential element of sustainable rural development planning.

1.3 Statement of the Research Problem

The persistent occurrence of devastating floods in Tsholotsho District of Matabeleland North Province, Zimbabwe, poses a significant threat to livelihoods, infrastructure and social cohesion. Although various response mechanisms have been implemented to counter this threat (DCP, 2017), effectiveness of the strategies in mitigating the impacts of flooding and promoting resilient livelihoods remains unclear (Dube and Munsaka, 2018). Lack of a understanding of the typologies of damage that flooding causes (Dube, 2015; DCP, 2017), the factors that influence response mechanisms and functionality of institutional arrangements (Mavhura, 2016; Dube and Munsaka, 2018), hinders the development of effective flood management strategies tailored to the local context. Despite the rising frequency and severity of floods, no impact assessment has been conducted to examine the socio-economic effects on people's livelihoods and identify the underlying causes of their vulnerability. In the absence of detailed data and information, flood response measures have remained reactive and uncoordinated. All assessments conducted so far have been largely short-term responses to the immediate impacts of flooding.

Since the 2000s, Tsholotsho District has experienced recurrent flooding, with significant events occurring in 2001, 2005, 2011, 2013, 2014 and 2017. These floods have caused widespread damage over the years. For example, the January 2013 floods affected approximately 270-300 households (DCP, 2017). In February 2017, flooding displaced 2,000 people, with nearly 855 relocated to the Sipepa Rural Health Centre. The Zimbabwean government, in collaboration with other stakeholders, has implemented various response mechanisms to manage these floods (Dube, 2019). However, flooding persists and the evidence suggests that even in areas where response measures are in place, the impacts remain severe. The natural environment is disrupted and significant economic losses occur (Dube and Munsaka, 2018; OECD, 2024). This raises concerns about the effectiveness of the existing response mechanisms. The experiences of grassroots communities in Tsholotsho District (DCP, 2017), who bear the brunt of flood-induced disasters, are crucial because they inform the design of sustainable and community-centered resilience-building strategies. Thus, it is crucial to evaluate the effectiveness of flood response mechanisms in Tsholotsho District, taking into account the grassroot community experiences. This would enhance disaster risk management, reduce vulnerabilities and strengthen resilient livelihoods when faced with recurrent incidences of floods.

1.4 Aim, Specific Objectives and Hypotheses of the Study

The aim of the study is to evaluate the effectiveness of flood response mechanisms in Tsholotsho District of Matabeleland North Province, Zimbabwe. To achieve the aim, the following overarching hypothesis is tested. The specific objectives, hypotheses and variables that underpinned the study are presented in table 1.1.

Table 1.1: Specific objectives, hypotheses and variables underpinning the study

Objective	Null Hypothesis (H_0)	Alternative Hypothesis (H_1)
1. Examine damage typologies caused by flooding in Tsholotsho District.	H_0 : Flooding does not vary by typology across natural resources and social infrastructure.	H_1 : Flooding varies by typology across natural resources and social infrastructure.
2. Determine factors influencing the effectiveness of flood response mechanisms in Tsholotsho District.	H_{02} : No factors significantly influence the perceived effectiveness of flood response mechanisms.	H_{12} : Certain factors significantly influence the perceived effectiveness of flood response mechanisms.
3. Assess the functionality of existing institutional arrangements for managing flood-induced disasters in Tsholotsho District.	H_{03} : Institutional arrangements are not functionally associated with improved flood management outcomes.	H_{13} : Institutional arrangements are functionally associated with improved flood management outcomes.
4. Develop a localised flood response framework to enhance the resilience of livelihoods in Tsholotsho District.	<i>No statistical null hypothesis – objective is design-oriented and addressed qualitatively.</i>	H_{14} : A localised flood response framework can enhance the resilience of livelihoods in Tsholotsho District.

Source: Researcher's conceptualisation (2025).

1.4.1 The rationale behind the chosen objectives and hypothesis

It is important to examine the typologies of damage caused by flooding on natural environmental resources and social infrastructure especially in developing countries. This is because some of these areas are remote with limited access to resources hence the need to continuously provide relevant and up-to-date information that will seek to address problems related to flooding issues. It is also important to determine whether flooding does not cause different types of damage to natural environmental resources and social infrastructure in Tsholotsho District. This is achieved through hypothesis testing, which is one of the main focus of the study concepts.

Determining the factors that influence the effectiveness of flooding response mechanisms is important. This is because flood response mechanisms are important elements to reduce the risk

associated with flooding. To obtain success of any measure in response to a disaster or shock, there is a need to understand the factors that can either result in the proper institution of that particular aspect or those that may present major challenges and try to balance them so that the strategies become .

To fully understand the issues with flooding, there is a need to assess the functionality of existing institutional arrangements for managing flood-induced disasters. This is important in such research as this because it enables a detailed outlook in terms of who is involved in flood response and the strategies as well as the frequency of the visits and interaction. The research objectives encompassed a assessment of flood response mechanisms, including examining the typologies of damage that flooding caused, determining factors that influenced the effectiveness of the response, assessing the functionality of institutions and developing the framework to enhance efficiency of responses. Examining the complexities of flood-induced disasters and the subsequent impact on natural resources, social infrastructure and livelihoods was meant to provide valuable insights into the dynamics of disaster management. A cocktail of qualitative and quantitative methods was adopted to explore the effectiveness of existing response mechanisms, functionality of institutional arrangements and factors shaping response outcomes.

1.5 Justification and Rationale of the Study

1.5.1 Significance for Disaster Risk Reduction

Flooding remains one of the most destructive hazards affecting human settlements, infrastructure and natural systems, with rural districts such as Tsholotsho being particularly vulnerable due to their geographical location, socio-economic limitations and governance challenges. The recurrence of severe floods has shown that without robust and well-coordinated response mechanisms, losses to life, livelihoods and property escalate rapidly. Understanding how existing response mechanisms function and where they succeed or fail, is essential for improving disaster preparedness and ensuring that interventions are both timely and effective. This study responds to that need by critically evaluating the current flood response strategies in Tsholotsho District, linking the findings to practical measures for reducing vulnerability and enhancing resilience.

From a disaster risk reduction perspective, the research has clear life-saving implications, as more effective responses can significantly reduce exposure to hazards, limit the damage caused and enable faster recovery for affected communities. Economic resilience is equally central;

floods frequently destroy crops, disrupt income-generating activities and undermine rural infrastructure, leading to cycles of impoverishment. Through examining the efficacy of current mechanisms and identifying gaps, the study supports the development of targeted interventions that reduce these losses, safeguard critical assets and strengthen local capacities for self-recovery. In doing so, it aligns with Zimbabwe's national disaster management priorities and international frameworks such as the Sendai Framework for Disaster Risk Reduction, which emphasise the importance of preparedness, response efficiency and building back better after disasters (UNDRR, 2015; Satterthwaite *et al.*, 2020).

1.5.2 Relevance for Policy and Governance

The study has particular value for informing governance processes at both local and national levels. Tsholotsho's experience with flooding illustrates the weaknesses of overly centralised disaster management systems, where delays in decision-making and resource mobilisation often hinder timely action on the ground. Through generating empirical evidence on how local structures such as ward disaster committees, village assemblies and traditional leadership are currently integrated into the response system, this research enables policymakers to design governance arrangements that are better aligned with community realities. The findings are intended to guide the refinement of legal frameworks and operational procedures, highlighting the need for clearer role allocation, more predictable funding streams and enhanced coordination between governmental and non-governmental actors.

Furthermore, the study's emphasis on evaluating how grassroots adaptation has evolved in response to recurring floods offers valuable lessons for provincial and national disaster risk management strategies. Policy relevance extends to strengthening the devolution agenda, which calls for empowering local governments with both the authority and resources to respond to hazards effectively. This research will therefore assist key institutions, including Rural District Councils, District Development Coordinators, sector ministries and humanitarian agencies, in making evidence-based adjustments that improve the efficiency and equity of flood response efforts, ultimately reducing the reliance on delayed, top-down interventions that have historically limited preparedness in Tsholotsho.

1.5.3 Contribution to Rural Development and the SDGs

Beyond immediate disaster risk management, the study contributes directly to rural development objectives by examining the intersection between flood impacts, livelihood security and

sustainable development. Tsholotsho's economy is heavily reliant on agriculture, livestock rearing and natural resource use, all of which are highly sensitive to flood-related disruptions. Damage to fields, loss of stored grain, destruction of grazing lands and collapse of rural infrastructure can severely undermine household income and food availability, pushing families further into poverty. In line with the Sustainable Livelihoods Framework, the research assesses how flooding affects the five capitals human, social, natural, physical and financial and how effective response mechanisms can protect or restore these assets. This analysis supports the achievement of Sustainable Development Goals, particularly SDG 1 (No Poverty), SDG 2 (Zero Hunger), SDG 14 (Life Below Water) and SDG 15 (Life on Land). Through identifying interventions that protect agricultural productivity and ensure continuity of rural economies, the study addresses both immediate recovery needs and long-term poverty reduction strategies. In addition, the research underscores the importance of embedding indigenous knowledge and community-based practices into formal disaster management planning, thereby ensuring that interventions remain culturally grounded and locally sustainable. Such integration strengthens social cohesion, fosters community ownership of resilience-building processes and aligns with participatory development principles advocated in rural development theory.

1.5.4 Knowledge Generation and Academic Contribution

From an academic standpoint, the study fills a significant gap in literature on flood response in rural Zimbabwe by shifting the focus from broad national assessments to in-depth, district-level analysis. While previous research has tended to emphasise hazard mapping or post-disaster needs assessments, limited attention has been given to systematically evaluating the performance of local response mechanisms and their capacity to build resilience. This research therefore contributes to knowledge generation by applying theoretical models such as the Sustainable Livelihoods Framework and community resilience theory to a real-world rural hazard environment, generating findings that are both policy-relevant and academically rigorous.

In doing so, it also creates a foundation for future scholarly work, enabling other researchers to explore related questions in similar low-lying, hazard-prone districts. The development of a localised flood response framework as part of this study represents an original contribution, integrating lessons from international best practice with local socio-political and economic realities. This hybrid framework is designed to be adaptable, scalable and grounded in empirical evidence, making it valuable not only for Tsholotsho but also for other flood-prone rural districts in Zimbabwe and Southern Africa. Ultimately, this research stands to influence both theory and practice,

contributing to a more nuanced understanding of rural hazard management and offering practical tools for enhancing resilience in vulnerable communities.

1.6 Operational Definitions of Key Terms and Concepts

The study is delineated to issues around flooding and resilience building in a district that is prone to flood disasters. The idea is to promote sustainable livelihoods for the residents of Tsholotsho district. The study also focuses on response mechanisms that are put in place and test the effectiveness of the mechanisms. The following definitions of terms help delineate the scope of the study.

1.6.1 Flood

Flooding refers to the rising and overflowing of groundwater that submerges the ground that is usually dry. Floods may exist as flash, river, or coastal floods. In landlocked countries such as Zimbabwe, only river and flash floods are experienced. In this study, a disaster refers to a natural or man-made event that exceeds the coping capacity of societies and causes great suffering to humans, infrastructure and the environment (IPCC, 2013). When disaster strikes, response mechanisms are in place to deal with them. Among the expected results are saving lives, reducing health impacts, ensuring public safety and meeting the basic livelihood needs of affected people (Yardley, 2008). This is done through providing emergency services and assistance to the public during or immediately after a disaster.

1.6.2 Sustainable Livelihood

Livelihood refers to the skills, assets (including physical and social resources) and activities necessary to earn a living (DFID, 2010). Of interest in this study is resilient livelihoods. This concept helps improve the quality of life of people who manage and recover from stress and shocks, maintain or improve the set of skills and assets, ensuring that natural resources are not compromised (DFID, 2018).

1.6.3 Vulnerability

Vulnerability is susceptibility to harm. In the HFA, vulnerability is explained in the following way, “The conditions determined by physical, social, economic and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards” (UNISDR, 2015). This is the definition that the SFDRR is running with. So, vulnerability is not only brought about by the

hazard but by pre-existing conditions in a community, which make it more susceptible to the impact of a hazard.

1.6.4 Resilient livelihood

Resilient livelihoods are livelihood strategies that can withstand future losses. Communities need to build resilience to protect households and communities from future losses and avoid negative coping strategies in the face of disaster. The ability of communities to invest in resilience strategies and adaptation interventions is crucial to ensure vulnerable communities can cope with the impact of climate change and the increasing frequency of extreme weather events.

1.6.5 Resilience conceptual and analytical framework

When resilience is defined from a unidimensional (engineering or systems or socio-ecological) perspective, the importance of one set of factors (physical infrastructure or governance or human livelihoods) is given prominence over others (Davidson, 2010; Duit *et al.*, 2010; Methmann and Oels, 2015). Research indicates that human capital assets, such as gender (Llorente-Marrón *et al.*, 2020), population pressure (Donner and Havidán, 2008), health conditions (Weldegebriel and Amphune, 2017) and household interest in learning and implementing adaptive flood-based farming practices (Nguyen and James, 2013), are important factors that influence flood resilience in addition to physical infrastructure (built structures). A community resilience framework is necessary to address the conceptual issues that were shown by unidimensional frameworks, particularly those influenced by natural sciences (Cote and Nightingale, 2012; Kruse *et al.*, 2017).

The need for the implementation of a resilience framework has grown due to the rise in the frequency and severity of disasters, as well as the significance of bottom-up interventions at the community level where social capital is demonstrated by neighbours supporting one another during times of adversity and disaster adaptation. Resilience is promoted in these calls as a concept that could aid in integrating concerns about climate change adaptation, sustainable development and catastrophe risk management (Adger *et al.*, 2021; Bene *et al.*, 2012). In general, these theories contend that in order to comprehend the relationships between human, financial, natural, social and physical systems, a understanding of resilience is required. Martin-Breen and Anderies (2011) have responded to these requests with a three-part, multidimensional, interdisciplinary conceptual framework (Engineering resilience, Systems resilience and Resilience in complex-adaptive systems) that takes into account more than fifty years of actual experience with thorough community resilience assessments.

1.7 Outline of the thesis

Chapter 1

Chapter 1 of the thesis provides the background of the study, outlines the statement of the problem, presents the rationale for the study, defines the objectives and hypotheses and includes explanations of key terms and concepts. The chapter gives the background about the study subject area from a global to local scale, highlighting trends and key issues around the issue of flooding, their implications and how communities have responded to them. Added to the above, the chapter also outlines the problem that has motivated the undertaking of this study as well as outlining the intended achievements of this study. The rationale of the study is presented in terms of its scientific, societal and economic significance.

Chapter 2

In Chapter 2, the literature review was presented. The chapter presents a review of literature on response mechanisms to flooding for resilient livelihoods using a funnel approach as scenarios are demonstrated from a global, transboundary basin to the local level. The gaps and challenges in the implementation of response mechanisms were identified and policy development trajectory was assessed. The analysis in this chapter, therefore, provides a overview of what literature says on the study objectives and leveraging on this information exposed the knowledge gap to be pursued by the thesis. Among the key aspects covered in this chapter include flooding and its impact on livelihood, community resilience, resilience assessment and sustainable development as well as policy and legislation. This chapter also uncovers important aspects of previous research through literature analysis to expose the research gap.

Chapter 3

Chapter 3 outlines the research methodology. It includes a concise description of the research design, population sampling procedures, data collection tools, methods of data analysis and ethical considerations. Research is based upon fundamental philosophical assumptions which inform appropriate research methods to generate valid and reliable data. The research objectives of this study included both inductive and deductive aspects hence they presented a good platform for conducting the study. The study was based on the interpretivism research philosophy. This philosophy is based on the assumption that reality is subjective, multiple and socially constructed.

Therefore, in this study, it was important to understand the key stakeholders and local people's experience of flooding and the associated impact, based on their historical and social perspectives. This was key to further understand if the flood response mechanisms implemented over the past years were promoting resilient livelihoods in Tsholotsho District. A multi-pronged research design was used to ensure that it addressed the various components of the study objectives, triangulate the data and develop a robust understanding of the effectiveness of flood response mechanisms in Tsholotsho District. In this study, an exploratory case study research design incorporating both qualitative and quantitative approaches was used. Qualitative data were obtained using semi-structured interviews, focus group discussions, observations, document review and open-ended questions in a questionnaire. Quantitative data were obtained using closed-ended questions in a questionnaire.

Chapter 4

Chapter 4 of the thesis contains presentation of results derived from data obtained during field work. In chapter 4, results were presented according to specific objectives of the study. This chapter presents key results of the study focusing on the various types of response mechanisms being implemented by the communities in Tsholotsho district, including the ranking on the perceived effectiveness of these mechanisms. The framework for effective implementation of flooding response mechanisms is also presented in this chapter.

Chapter 5

Chapter 5 presents a discussion of the findings from the fieldwork. It also includes a comparative analysis with results from previous studies. The chapter provides a detailed and in-depth examination of the current study's results, offering a clearer understanding and critical insight into the findings and highlighting how they align or differ from those of related past research. The findings are organized according to the specific research objectives.

Chapter 6

Chapter 6 presents the conclusions and recommendations of the study. It summarizes the key discussions from the entire study, starting with a synthesis of the results obtained. The chapter concludes by outlining the recommendations based on the study's findings.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The chapter reviews the existing literature on flooding response mechanisms and their effectiveness in building resilient livelihoods at global, African and Zimbabwe scales. The gaps and challenges in the implementation of response mechanisms have been identified and future research and policy development trajectory are assessed. The analysis in this chapter, therefore, provides a overview of what literature says on the study objectives. Among the key aspects covered in this chapter include flooding and its impact on livelihood, community resilience, resilience assessment and sustainable development as well as policy and legislation.

2.2 Conceptualising flood disasters

Flooding is a natural disaster that occurs when water flows onto land normally causing damage to properties, infrastructure and the environment (Adger *et al.*, 2021). It is a major concern worldwide, affecting millions of people and causing significant economic losses in developed and developing nations (Bayntum, 2012; Ames *et al.*, 2019). The most common types of floods being experienced globally are namely; river flooding, coastal flooding, urban flooding and flash flooding. Understanding the causes, effects and consequences of flooding is crucial for developing effective strategies to reduce its impacts (Bene *et al.*, 2012; Bene, 2013; Bulti *et al.*, 2019). With the increasing frequency and severity of floods due to climate change, it has become a global concern for communities to reduce the impacts of floods through building resilient communities (Bursac *et al.*, 2008; Berkes and Ross, 2013; Baudoin *et al.*, 2014; Aslam *et al.*, 2019). As various definitions across major scientific disciplines clearly illustrate, flood events are multidimensional and have both natural and anthropogenic causes.

It is estimated that 1.47 billion people live in high-risk flood zones worldwide (Centre for Research on the Epidemiology of Disasters, 2019). Of them, 132 million or so make less than US\$ 1.90 per day to live below the poverty line. In the global context, Sub-Saharan Africa is unique. It makes up almost half of the world's impoverished who are at high danger of flooding, while it only makes up just over 10% of the population overall (Resilience Africa Network, 2017). These figures demonstrate the complex nature of poverty. In terms of monetary poverty indicators, Sub-Saharan Africa falls behind other regions; also, the impoverished are more exposed to and vulnerable to climate change hazards like flooding. Flooding is a severe event that occurs when streamflow

surpasses normal levels, leading to property damage and loss of life (Chambers *et al.*, 2014). Floods are increasingly becoming a global concern, affecting both developing and developed countries due to their rising frequency and severity in recent years. The escalation of flooding in Yoshiya city in 2009 highlights the urgent need for effective flood management solutions (Hallegatte *et al.*, 2013; Millie *et al.*, 2002; Winsemius *et al.*, 2016).

It is widely acknowledged that floods have a significant impact on lives and livelihoods, with their effects varying across different segments of society (Cheplyaka, 2017 Swanson. 2018). Research indicates that flood disasters tend to have increasingly severe consequences for impoverished communities, who often lack the resources to cope with the loss of property and capital caused by such events (Conry *et al.*, 2011; Conostas, Frankernberger and Hoddinott, 2013; Parvin *et al.*, 2016). Flooding exacerbates vulnerability by destroying livelihoods, leaving individuals with limited means to recover. According to Parvin *et al.* (2016), floods disrupt essential aspects of life, including agricultural land, water and sanitation and economic activities. Consequently, the cumulative impact on infrastructure, society and the economy makes communities' livelihoods more exposed to the destructive effects of flooding. This therefore frustrates efforts aimed towards the achievement of Sustainable Development Goals especially on ending poverty. There is need for joint collaborative efforts that will ensure resilient communities which will also benefit the local communities.

Floods have a broad range of devastating impacts on both urban and rural populations (Cote and Nightingale, 2012; Daramola *et al.*, 2016). However, rural areas are more vulnerable to flood damage than urban areas due to factors such as poverty, inadequate infrastructure, limited access to resources and insufficient medical services. Flooding not only destroys property and infrastructure but also exacerbates the challenges to accessing healthcare and essential services (Cortina, 1993; Curtin and Parker, 2014; Dewa *et al.*, 2021). The Intergovernmental Panel on Climate Change (IPCC) has highlighted that climate change is a primary driver of the rising flood risks globally. According to the 2014 World Disaster Report, floods continue to be the most prevalent natural disaster. Worldwide, the damage caused by floods to agriculture, housing, livelihoods, infrastructure and utilities accounts for the highest number of fatalities (Wong and Zhao, 2001; Dewa *et al.*, 2022).

Floods significantly impact agricultural production by damaging crops, which leads to food insecurity, while also causing infrastructure damage that disrupts business activities and heightens health risks within affected communities (Blaikie, Cannon, Davis and Wisner, 2014;

Dewa *et al.*, 2022). In addition to limiting access to healthcare, flood disasters also result in increased mortality and morbidity in the affected regions (Doorn, Gardon and Murphy, 2018). Floods often bring debris and waste into communities, contaminate local water sources and food supplies and elevate the risk of disease outbreaks such as cholera and diarrhoea. India, the second-most flood-prone country in the world after Bangladesh, is affected annually by floods that impact an average of 7.35 million hectares of land, resulting in the loss of 1,793 lives, the death of 85,599 cattle and the destruction of around 1,452,904 homes (Datta and Watts, 2010; Dewulf, 2019).

Floods can significantly disrupt and slow development in rural areas by destroying property and infrastructure such as roads, bridges, houses and trees, thus hindering the execution of development programs (Donner and Havidan, 2008; Dewulf, 2019). According to Dewulf (2019), floods may even result in a “new beginning” by posing health risks to rural populations and affecting human capital. Floods worsen poverty by destroying the livelihoods of the poor, impacting human, physical, natural, financial and social capital (DFID, 2000; Hegger *et al.*, 2016). They also lead to reduced agricultural productivity, damage transport systems, disrupt food supplies and contribute to food insecurity.

Zimbabwe has experienced floods for many years, with the most common types being river-related floods, rain-related floods, cyclone-related floods and those resulting from dam failures. River flooding predominantly affects low-lying areas near streams and rivers. Rainfall-induced flooding occurs when the ground becomes saturated, preventing water from being absorbed, leading to increased surface runoff and subsequent flooding. Cyclone-related floods occur due to tropical cyclones, such as Cyclone Eline in 2000, Cyclone Dineo in 2017 and Cyclone Idai in 2019. Additionally, in January and February 2014, heavy rains triggered landslides and caused the partial collapse of the Tokwe Mukosi Dam wall, leading to flooding in the Chivi District.

2.2.1 Community flood resilience and livelihoods

Response mechanisms for flooding are heavily dependent on the active involvement of local communities and their ownership of the process. Community participation in the planning, implementation and monitoring phases is essential for the success of these mechanisms. This engagement requires that vulnerable groups be included in decision-making and the execution of strategies. Literature suggests that effective disaster risk management in Tsholotsho district necessitates integrated approaches that combine both structural and non-structural measures.

The success of these response mechanisms is often contingent upon the extent of community participation and the level of government support (Arfiani *et al.*, 2021).

Community-Based Disaster Risk Management (CBDRM) is a key disaster response strategy that places the affected community at the heart of disaster risk reduction and management efforts. This approach has proven effective in minimizing the vulnerability of communities to flooding within the country. Through involving communities in planning and decision-making processes, CBDRM has enhanced resilience to floods (Islam *et al.*, 2018). The core idea is that when the affected communities take part in disaster risk reduction activities, their resilience to future flooding events increases. CBDRM has been widely used as a response mechanism to flooding in Malawi, resulting in the development of community contingency plans, construction of flood shelters and the provision of training in disaster risk reduction (Manda *et al.*, 2020).

The approach has proven to be effective in strengthening community resilience against floods. Similarly, Bangladesh employs a community-based disaster management system known as the Community-Based Flood Early Warning System (CBFEWS), designed for flood-prone areas. This system offers real-time flood forecasting and early warnings through a network of sensors and communication systems that relay flood alerts to communities well before the onset of flood events (Mondal *et al.*, 2020). CBFEWS has been effective in reducing flood-related damages, including loss of life, livelihoods and property. It is also vital to underscore the importance of involving vulnerable groups, such as women and children, in the planning and decision-making processes.

The management of flood risks and the livelihood of those who depend on natural resources, such floodplains, are closely related. This relation is because managing flood risks can positively impact public health, strengthen community resilience and advance sustainable development objectives. This is mostly due to the fact that the creation and use of resilience-building policies ought to be perceived as safeguarding livelihoods and advancing the welfare of those impacted, in addition to being consultative from a social justice and inclusive standpoint. Accordingly, international policy discourses currently concur that the water governance sector must adopt a transformative and resilient strategy to mitigate the negative impacts of climate change (Salinas Rodriguez *et al.*, 2014).

In order to capture the growing need for transformation in the water governance sector as it relates to drought and flood management and climate change adaptation, among other areas of focus

(Shin *et al.*, 2018; Xu and Kajikawa, 2017), Dewulf (2019) note that there is growing reference to community flood resilience and its cognate terms, such as water resilience (Erickson, 2015; Falkenmark and Rockstrom, 2010; Rockström *et al.*, 2014) and catchment resilience (Adger *et al.*, 2021). In spite of this apparent need for change, the water industry has come under fire for holding up the implementation of novel and revolutionary strategies to increase resilience, such as tolerating some degree of flooding on a regular basis (White *et al.*, 2016).

There are various approaches to resilience in the context of managing flood risk, ranging from a more inclusive conceptualization that emphasises socio-ecological factors in the context of complex adaptive systems to a narrower focus on maintaining the stability of physical infrastructure as it currently exists (White and O'Hare, 2014). Bulti *et al.*, (2019) define community flood resilience as the ability of a community and all of its socio-ecological and socio-technical networks across temporal and spatial scales to maintain or rapidly return to desired functions in the face of flood events, to adapt to change and to transform systems that affect the current and future adaptive capacity. This definition is hazard-specific and is informed by the latter conceptualization, which seems to accept transformation and change.

Communities that are resilient are able to minimize any disaster, making the return to normal life as effortless as possible. Through implementing a community resilience plan, a community can come together and overcome any disaster, while rebuilding physically and economically. Moreover, there are limited efforts to evaluate resilience methods that focus on specific hazards. (Bulti *et al.*, 2019, USAID, 2024). Only a few methods have attempted to fully characterise and assess community resilience due to the conceptual ambiguity and variances of both (Cutter *et al.*, 2014). Community resilience to floods can be assessed and measured using a resilience conceptual and analytical framework which identifies the link between flood resilience and community livelihoods.

2.2.2 Resilience conceptual and analytical framework

When resilience is defined from a unidimensional (engineering or systems or socio-ecological) perspective, the importance of one set of factors (physical infrastructure or governance or human livelihoods) is given prominence over others (Davidson, 2010; Duit *et al.*, 2010; Methmann and Oels, 2015). Research indicates that human capital assets, such as gender (Llorente-Marrón *et al.*, 2020), population pressure (Donner and Havidán, 2008), health conditions (Weldegebriel and Amphune, 2017) and household interest in learning and implementing adaptive flood-based farming practices (Nguyen and James, 2013), are important factors that influence flood resilience

in addition to physical infrastructure (built structures). A community resilience framework is necessary to address the conceptual issues that were shown by unidimensional frameworks, particularly those influenced by the natural sciences (Cote and Nightingale, 2012; Kruse *et al.*, 2017).

The need for the implementation of a resilience framework has grown due to the rise in the frequency and severity of disasters, as well as the significance of bottom-up interventions at the community level where social capital is demonstrated by neighbours supporting one another during times of adversity and disaster adaptation. Resilience is promoted in these calls as a concept that could aid in integrating concerns about climate change adaptation, sustainable development and catastrophe risk management (Adger *et al.*, 2021; Bene *et al.*, 2012). In general, these theories contend that in order to comprehend the relationships between human, financial, natural, social and physical systems, a understanding of resilience is required. Martin-Breen and Anderies (2011) have responded to these requests with a three-part, multidimensional, interdisciplinary conceptual framework (Engineering resilience, Systems resilience and Resilience in complex-adaptive systems) that takes into account more than fifty years of actual experience with thorough community resilience assessments.

The need for resilience assessment through this interdisciplinary spectrum of resilience has been stressed, looking at communities' ability to resist impacts and be ready for any disturbances in advance (Engineering resilience), deal with effects and keep functioning during the disturbance (Systems resilience) and then adapt and learn after the disturbance to boost future resilience (Complex adaptive systems; Martin-Breen and Anderies, 2011). This framework captures the aspects of hazard specificity, the significance of social aspects of risk management and the need for long-term adaptation to characterise how the two communities interacted with their ecological environment, which is aligned with the definition of community flood resilience adopted for this study. Martin-Breen and Anderies (2011) contend that while some components of resilience may be more desirable than others at any given time and on any given scale of assessment, resilience should be viewed as a multidimensional concept that encompasses all three paradigms. The World Food Programme of the United Nations (UN) concurs with this concept, stating that resilience is a capacity that is comprised of various dimensions (Constas, *et al.*, 2013, World Bank, 2024).

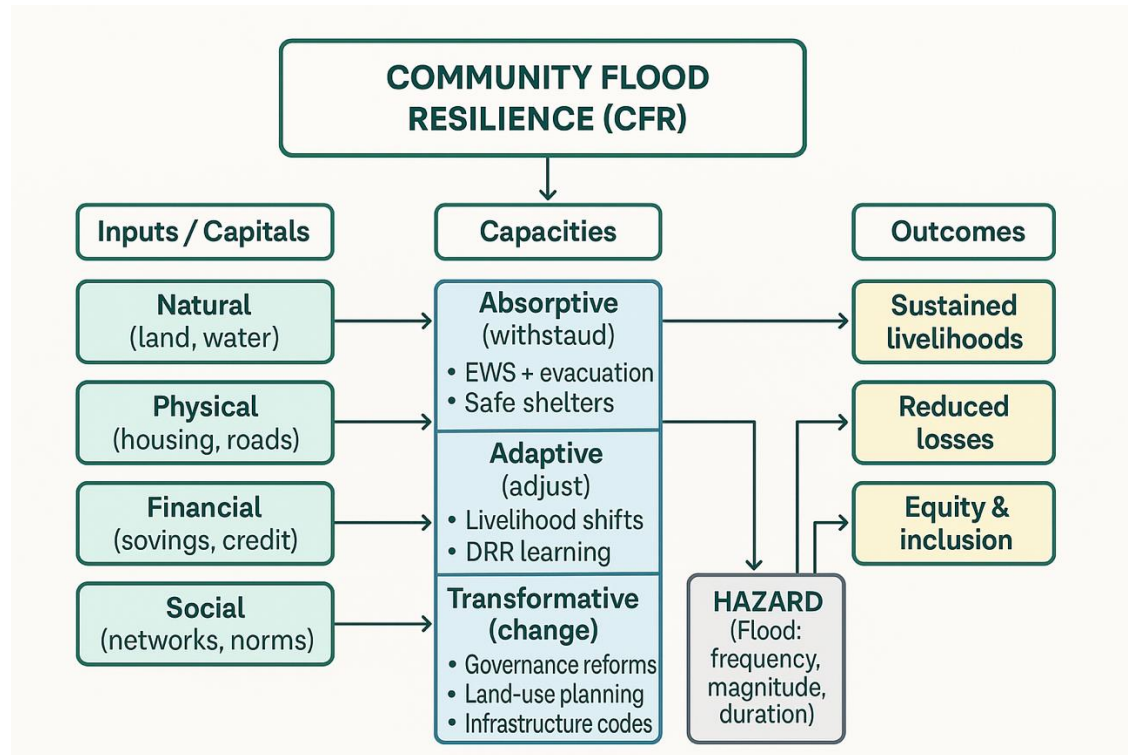


Figure 2.1: Conceptual framework for the study

Source researcher (2025).

2.3 Flooding and Damage Typologies

Flooding is widely recognised as one of the most frequent and destructive natural hazards, capable of causing severe disruption to livelihoods and infrastructure. It occurs when excess water inundates land that is normally dry, leading to losses across economic, environmental and social systems (Adger *et al.*, 2021). Globally, flooding manifests in multiple forms, including riverine, coastal, urban and flash floods, each driven by a combination of natural and human-induced factors (Béné, 2013; Bulti *et al.*, 2019). The increasing intensity and frequency of flood events, strongly linked to climate change, have amplified the urgency for developing strategies that can reduce their impact and build community resilience (Berkes and Ross, 2013; Baudoin *et al.*, 2014). The Centre for Research on the Epidemiology of Disasters (2019) estimates that 1.47 billion people currently live in high-risk flood zones, with over 130 million of them surviving on less than US\$ 1.90 a day.

In Sub-Saharan Africa, the convergence of poverty and flood exposure creates a particularly severe risk landscape. The region is home to almost half of the world's poorest people who face

high flood risk, despite representing just over 10 percent of the global population (Resilience Africa Network, 2017). Limited infrastructure, constrained healthcare access and inadequate financial buffers often mean that flood impacts are more severe in rural African settings compared to urban or wealthier contexts (Côte and Nightingale, 2012; Daramola *et al.*, 2016). Flood events in this region not only destroy property and social infrastructure but also erode agricultural productivity, disrupt markets and damage critical services such as schools, clinics and roads (Dewa *et al.*, 2021).

The damage caused by floods can be grouped into two main typologies: **impacts on natural resources** and **impacts on social infrastructure**. Natural resource damage includes soil erosion, contamination of water bodies, destruction of vegetation and loss of biodiversity (Blaikie *et al.*, 2014). This degradation undermines agricultural potential and increases long-term vulnerability to food insecurity. Social infrastructure damage, on the other hand, encompasses the destruction of housing, roads, bridges, schools, clinics and water and sanitation systems, often leaving communities cut off from essential services (Doorn *et al.*, 2018). In many rural areas, the collapse of such systems during floods heightens the risk of disease outbreaks, particularly waterborne illnesses such as cholera and diarrhoea.

Zimbabwe has experienced all major types of flooding, including riverine, rainfall-induced, cyclone-related and flood disasters caused by dam failure. River flooding typically affects low-lying areas adjacent to rivers and streams, while rainfall-induced flooding occurs when soils are saturated and can no longer absorb additional rainfall, resulting in rapid surface runoff. Cyclone-related floods, such as those from Cyclones Eline (2000), Dineo (2017) and Idai (2019), have caused widespread devastation across several provinces. In early 2014, heavy rains led to landslides and the partial collapse of the Tokwe-Mukosi Dam wall in Chivi District, displacing thousands and destroying homes and farmlands. These events illustrate the diversity of damage typologies that can be observed in the Zimbabwean setting, where both natural resources and social infrastructure face repeated and sometimes simultaneous threats from severe flooding.

2.3.1 Flood-induced economic and infrastructure damage

Flooding is a natural disaster that can have devastating economic impacts on communities and countries around the world (Ensor and Harvey, 2015). The global economic losses induced by flooding are significant and increasing due to climate change, urbanization and population growth (Dewulf, 2019). According to the United Nations, the annual economic losses caused by flooding

are estimated to be around \$50 billion. However, this number is expected to increase to \$1 trillion by 2050 if no action is taken to mitigate the effects of flooding (Hallegate, 2014; Hegger *et al.*, 2016). The economic losses induced by flooding can be categorized into two main types: direct and indirect losses. Direct losses include damage to property, infrastructure and agriculture, while indirect losses include loss of productivity, disruption of supply chains and impacts on tourism and recreation (Johannessen and Wamsler, 2017; Isa, 2018). Flooding can damage or destroy homes, businesses and infrastructure, leading to significant economic losses. Additionally, flooding can disrupt transportation and communication systems, leading to indirect losses (Laurien, Hochrainer-Stigler and Keating, 2020). For example, a flood event in Thailand in 2011 resulted in estimated economic losses of \$45 billion, with indirect losses accounting for around 70% of the total.

The global economic losses induced by flooding are not limited to developed countries. Developing countries are also vulnerable to flooding and the economic impacts can be devastating (Erickson, 2015; Keating *et al.*, 2016; Keating, *et al.*, 2018). For example, a flood event in Bangladesh in 2007 resulted in estimated economic losses of \$1.5 billion, which is equivalent to around 1% of the country's GDP (Islam and Walkerden, 2014). The economic losses induced by flooding can also have long-term impacts on communities and countries. Flooding can lead to displacement and migration, which can result in social and cultural impacts (Israel, 2013; Guiteras, Jina and Mobarak, 2015). Flooding can also lead to environmental degradation, including soil erosion and water pollution, which can have long-term impacts on ecosystems and human health.

To mitigate the economic impacts of flooding, it is essential to invest in flood risk reduction and management measures. This can include the construction of flood defences, the implementation of flood warning systems and the promotion of flood-resistant construction materials (Islam and Walkerden, 2014. Johannessen and Wamsler, 2017). Besides the aforementioned, governments and businesses can work together to develop and implement flood risk management plans, which can help to reduce the economic impacts of flooding (Hidalgo and Goodman, 2013). Flooding can cause significant damage to infrastructure, leading to devastating economic and social impacts on communities.

Flooding can damage or destroy roads and bridges, disrupting transportation and access to essential services, structural damage to buildings and homes, leading to costly repairs or demolition, destroy utility infrastructure, leaving communities without electricity, water, or

communication services (Mijoni and Izadkhah, 2009; Methmann and Oels, 2015; Nava 2022). More so, floodwaters can contaminate water sources and damage sewer systems, leading to public health concerns, destroy public buildings, such as hospitals, schools and government offices, disrupting essential services and destroy agricultural infrastructure, such as irrigation systems, barns and silos (Masterson, Enqvist, Stedman and Tengö, 2019). The damage to infrastructure induced by flooding can have long-term impacts on communities, including: displacement and migration, public health impacts, environmental impacts and increased vulnerability (Odukoya *et al.* 2015). Hence, it is essential to invest in flood risk reduction and management measures to mitigate the damage and build more resilient communities.

2.3.2 Climate change and extreme weather events

As the Earth's climate changes, it is impacting extreme weather across the planet. Global temperature and precipitation patterns are impacted by climate change (Kruse *et al.* 2017, OECD, 2024). Thus, extreme environmental phenomena like heat waves, hurricanes, forest fires, floods, droughts and storms have an impact on their frequency and intensity. Global research work has shown that those living in poverty are particularly vulnerable to climate shocks such as floods (Keogh *et al.*, 2011; Keating *et al.*, 2014; Kruse *et al.*, 2017). Climate change plays out through the water cycle - a warmer atmosphere holds more moisture. As such, the frequency and intensity of heavy rainfall events have increased since the 1950s and this is expected to continue (Laurien *et al.*, 2020).

Climate change is having a profound impact on flooding patterns worldwide. Rising global temperatures are leading to more frequent and intense flooding events, causing devastating consequences for communities and ecosystems (Lee *et al.*, 2009; Laurien *et al.*, 2020). Understanding the link between climate change and flooding is crucial for developing effective adaptation and mitigation strategies to reduce the impact of flooding and create a more resilient and sustainable future (Liao, 2014; Lumbroso, 2020). It is important to note that climate change impacts the severity, frequency and distribution of flooding events worldwide. Climate change is driving flooding through sea level rise.

As glaciers and ice sheets melt, sea levels are increasing, leading to more frequent and severe coastal flooding. This is particularly concerning for low-lying areas where even small increases in sea level can have devastating effects (Manyena, 2006; Mao *et al.*, 2017). A study by the National Oceanic and Atmospheric Administration found that sea level rise is projected to increase flooding frequency in coastal areas by 400% by 2050. Hence, this explains the risk, vulnerability and

likelihood of flooding to people in coastal areas and this suggest for reforms to mitigate the aforementioned risk of climate change.

Climate change is leading to more frequent and intense extreme weather events, such as hurricanes and typhoons which can cause catastrophic flooding (Masterson *et al.* 2019). For example, Hurricane Harvey in 2017 caused \$125 billion in damages, making it one of the costliest natural disasters in US history (Methmann and Oels, 2015; McClymont *et al.* 2020). Climate change can cause warming in oceans. Warmer oceans evaporate more water vapour leading to more intense rainfall and flooding. This is particularly concerning for urban areas, where adequate drainage infrastructure can exacerbate flooding. A study conducted by the International Governmental Panel on Climate Change (IPCC) found that urban flooding is projected to increase by 50% due to climate change (IPCC, 2020). Due to climate change in Venice, Italy, rising sea levels and intense rainfall caused unprecedented flooding in 2019 resulting in extensive damage of historic buildings and infrastructure. In India, Moonson rains in 2019 led to severe flooding in states like Kerala, Maharashtra displacing millions of people (Rentschler and Salhab, 2020).

The impact of flooding due to climate change are far reaching and devastating. Flooding can lead to loss of life, displacement and damage to infrastructure, homes and businesses (Norris *et al.*, 2008; Nava, 2022). It can have long term effects on mental health, social cohesion and economic instability. With this in mind, there is need for steps to be taken to mitigate and adapt to climate change impacts of flooding due to climate change. Sea walls, flood-resilient construction and early warning systems can help reduce the risk of flooding (Nillson, 2010; Ntontis *et al.*, 2018). In its strict sense, ecosystem restoration and conservation can also help mitigate the impact of flooding by preserving natural buffers like wetlands and mangroves. However, this requires multifaceted efforts which take into cognisance the views of all interested stakeholders thus enhancing the absorptive and resilience capacities of the local communities.

2.3.3 Flood disaster risk management and response mechanisms

Flood disaster risk management and response mechanisms involve a series of coordinated actions to mitigate, prepare for, respond to and recover from flood events (RAN, 2015; Patino and Ferreira, 2018). It involves mechanisms which are crucial for mitigating the impact of floods on communities. For effective flood disaster management, a combination of skills is required for long term recovery strategies. Effective flood disaster risk management and response require coordination and collaboration among stakeholders, community participation and engagement,

adequate resources and funding and integration of flood risk reduction into development planning (Ranganathan *et al.*, 2017, OECD, 2024). However, successes of the existing flood disaster risk management and response mechanisms are being challenged by factors such as, limited resources and funding, political and institutional constraints, limited public awareness and education, increasing frequency and severity of floods due to climate change (Odukoya *et al.*, 2015; Patel *et al.*, 2017). Hence, learning from successful examples of flood risk management and addressing challenges and limitations will allow communities to reduce flood risks and enhance resilience (Resilient Africa Network, 2016).

2.4 Factors Influencing the Effectiveness of Flood Response Mechanisms

The effectiveness of flood response mechanisms depends on a combination of institutional, technical, social and environmental factors that shape both the speed and quality of interventions. Globally, effective response systems are underpinned by timely early warning, strong coordination across agencies and clear decision-making authority (UNDRR, 2020; IFRC, 2021). Where these elements are absent or weak, even well-resourced operations can suffer delays or misallocation of relief. Literature from the Asia-Pacific region shows that communities with pre-established coordination structures and inclusive communication strategies recover more rapidly than those reliant on post-disaster improvisation (Gencer, 2013; Mercer *et al.*, 2014).

In Sub-Saharan Africa, the structural and operational constraints of disaster management systems present recurring barriers to effective flood response. Limited investment in hydrological monitoring, insufficient transport infrastructure and fragmented institutional mandates often delay relief operations (Few *et al.*, 2015; Adelekan *et al.*, 2020). In rural settings, poor road conditions and inadequate communication networks can prevent responders from reaching affected households within the critical first 72 hours. Furthermore, the sustainability of response mechanisms is often undermined by donor-dependency, with operations scaling back once external funding cycles end (Van Niekerk *et al.*, 2017).

The role of social capital and local governance is also a determining factor. Studies from Mozambique following Cyclone Idai highlight that communities with stronger engagement between traditional leadership, faith-based organisations and local disaster committees mobilised more quickly for evacuation and relief (Paul *et al.*, 2020). Conversely, weak trust between communities and state actors can lead to low uptake of early warning messages, reduced cooperation in evacuation efforts and resistance to resettlement plans (Manyena, 2006).

In Zimbabwe, a range of factors influence the effectiveness of flood response, particularly in rural districts such as Tsholotsho. Institutional fragmentation between the Civil Protection Unit, Rural District Councils and sector ministries often results in duplication of roles and delayed decision-making (Dube *et al.*, 2018). Infrastructural challenges, including seasonal inaccessibility of roads and limited public transport, hinder the rapid movement of relief supplies and personnel. In addition, the limited training and resourcing of ward-level Civil Protection Committees reduces their ability to undertake early evacuation and coordinate shelter management. Evidence from previous flood events in Tsholotsho shows that even when early warnings are issued, the absence of locally prepositioned relief items and transport facilities means that evacuation is delayed, increasing exposure to harm (Mavhura *et al.*, 2017). These factors combine to create a response environment where outcomes depend heavily on local improvisation rather than on a consistently reliable institutional system.

2.4.1 Integrated flood management

Several NGOs and governments have also attempted to draw on the concept of integrated flood management strategies in their flood response mechanisms (Rentschler and Salhab, 2020). Integrated flood management includes a combination of measures to reduce the impact of floods. European countries emphasize the diversification of Flood Risk Management Strategies (FRMS). Several strategies are applied simultaneously and linked together (European Commission, 2014; Rodina *et al.* 2017).

These strategies include being proactive, (or using proactive) measures to reduce damage before and after flooding (recovery from flooding). Developed countries implement Flood Emergency Management Systems (FEMS) to minimize the consequences of flood events (Rockstrom, 2003; Gillisen *et al.*, 2016). In England, a diversified approach to FEMS, which has proved to be the most effective, has existed for over 65 years. Thus, flood management has served as a crucial strategy for minimizing the consequences of flood events. Lessons learnt from South Africa point out that the adoption of an integrated flood management approach has been effective in reducing the impacts of flooding on communities. This approach involves a combination of structural and non-structural measures, including early warning systems, floodplain zoning and the development of flood management plans (Van Niekerk *et al.*, 2020).

Integrated flood management plans are also championed in different flood prone countries because they are effective in reducing the vulnerability of communities to flooding. This has been

the case in flood prone districts in the Philippines. Integrated flood management in the country's flood prone regions encompasses a combination of structural and non-structural measures, including floodplain zoning, the construction of flood control structures and the development of early warning systems (Cruz and Abad, 2020). This integrated system has been effective in reducing the number of lives that are lost and damage to property that are a result of flooding. In the Mozambican context, integrated flood management includes the development of flood hazard maps, the construction of flood control infrastructure and the promotion of community participation in flood risk management (Salomão and Nhantumbo, 2018C; USAID, 2024). Such integrated approaches have contributed to reducing the negative impacts of flooding on communities and reducing the vulnerability of aquaculture-based livelihoods.

The adoption of integrated flood management strategies is highly significant for rural development, particularly in flood-prone areas where livelihoods are predominantly reliant on natural resources (European Commission, 2019). Combining structural and non-structural measures such as early warning systems, floodplain zoning and community participation, these strategies not only mitigate the immediate impacts of flooding but also provide a foundation for sustainable rural development. For instance, the construction of flood control infrastructure and the development of hazard maps contribute to the protection of agricultural lands, infrastructure and settlements. This ensures that rural communities can continue their productive activities, such as farming and aquaculture, with reduced interruptions and lower vulnerability to economic losses caused by flooding. Furthermore, integrated flood management enhances the resilience of rural communities by promoting proactive planning and preparedness, which aligns with broader rural development goals of improving living standards and reducing poverty (USAID, 2024, World Bank, 2024).

Integrated flood management fosters stronger institutional and community linkages, which are critical for effective rural development. The promotion of community participation in flood risk management ensures that local knowledge and experiences are incorporated into planning and decision-making processes, leading to more contextually appropriate and sustainable interventions. Such engagement also strengthens social cohesion and empowers communities to take an active role in managing their resources and risks. In rural areas, where access to resources and institutional support is often limited, these participatory approaches are crucial for fostering self-reliance and building adaptive capacities (Mizutori, 2020, World Bank, 2024). Through linking disaster management with rural development planning, integrated flood management supports the creation of resilient rural systems that can withstand and recover from

environmental shocks, ultimately contributing to the achievement of sustainable development goals and long-term rural prosperity.

2.4.2 Early warning and flood monitoring systems

Lessons learned from other contexts indicate that an effective response mechanism requires the integration of early warning systems and flood monitoring technologies. The use of advanced technologies in early warning systems has been recognized as one of the most effective practices in disaster management worldwide. In India, the adoption of early warning systems alongside mobile technology has proven effective in reducing the impact of floods on communities. These systems enable communities to respond quickly to flood warnings, while mobile technology provides real-time updates on flood conditions (Khan and Ahmad, 2020). Furthermore, effective communication systems, such as flood alert messaging and early warning systems, are essential for improving preparedness and response. This approach allows for the timely evacuation of communities in flood-prone areas, thereby reducing property damage and loss of life. Flood early warning systems are capable of saving lives and minimizing damage; however, their effectiveness depends on factors such as data accuracy, communication systems and community preparedness. For instance, Japan's flood early warning system, which combines rain gauges, water level sensors and weather forecasts, has been credited with reducing damage through successful evacuations.

2.4.3 Ecosystem-based approaches

Adopting an ecosystem-based approach can be a highly effective strategy for reducing community vulnerability to flooding. Such approaches, including the restoration of wetlands and the implementation of sustainable land management practices, can enhance ecosystem resilience while offering multiple benefits like flood mitigation and improved livelihoods (Gumindoga *et al.*, 2021). Through integrating ecosystem-based strategies with traditional response mechanisms, the resilience of communities in Tsholotsho district to flooding could be strengthened. Ecosystem-based approaches have demonstrated effectiveness in minimizing the impacts of flooding on communities. In South Africa, for example, natural systems such as wetlands are utilized to mitigate flooding effects (Kok *et al.*, 2019).

2.4.4 Financing of Disaster Response Management

Ensuring the long-term sustainability of flood response mechanisms is crucial, requiring adequate funding to support both structural and non-structural measures. Financial resources should also

be allocated to community-driven initiatives aimed at promoting sustainable livelihoods and enhancing local resilience to flooding. In the United States, the Federal Emergency Management Agency (FEMA) has developed a flood management program, which includes risk assessments, floodplain mapping, flood insurance and community outreach and education. A key element of this program is the National Flood Insurance Program (NFIP), which provides affordable flood insurance to property owners in flood-prone areas (Dipasquale and Ebel, 2019). The NFIP has played a pivotal role in minimizing the impacts of flooding on households and businesses, thereby enhancing community resilience.

In South Africa, the government has implemented various flood management strategies, including the construction of levees, stormwater drainage systems and wetland restoration. Additionally, disaster management centers have been established to coordinate responses to natural disasters such as flooding (Mafongoya *et al.*, 2020). Several community-based initiatives, such as the Flood Forum, a network of community-based organizations, focus on raising awareness of flood risks and building local resilience (Mafongoya *et al.*, 2020). These initiatives have significantly contributed to reducing the impacts of flooding and strengthening the resilience of communities in South Africa.

2.4.5 Floods and community livelihood

Living circumstances and livelihoods are significantly impacted by climate change related hazards like flooding. These circumstances include having access to land, other assets and natural resources and ecosystems (Shin *et al.*, 2018). Another factor contributing to the susceptibility of communities and livelihoods to climate change is the availability of essential infrastructural services like electricity, roads, telecommunications and water and sanitation (Tabachnick and Fidell, 2007; Shin *et al.*, 2018). The major hazards to a livelihood include losses in agricultural production, effects on human health and food security, house demolition and income loss. Fisheries and cattle that are essential to livelihoods are also at risk (Taber, 2018). Added to the hazards of more complicated disasters, certain groups and ways of subsistence are especially vulnerable to obstacles in development and permanent losses.

2.5 Institutional Functionality in Flood Disaster Management

Institutional functionality in disaster management refers to the ability of relevant organisations and governance structures to perform their designated roles in a coordinated, timely and accountable manner. Globally, well-functioning institutions in flood management systems are characterised by clear legal mandates, established coordination mechanisms and the capacity to mobilise resources rapidly during emergencies (UNDRR, 2019; Comfort *et al.*, 2020). Countries such as Japan and the Netherlands have demonstrated that when institutional responsibilities are clearly defined across national, regional and local tiers, response operations are faster and recovery more sustainable (Lumbroso *et al.*, 2016).

In much of Sub-Saharan Africa, institutional functionality is often constrained by overlapping mandates, inadequate funding and weak inter-agency collaboration (Van Niekerk *et al.*, 2017; Adelekan *et al.*, 2020). Disaster management authorities in several countries operate within fragmented policy environments, where sectoral ministries retain operational control over specific aspects of response, but without a unified command structure. This frequently leads to duplication of effort, inconsistent messaging and delays in resource allocation. Political influence in decision-making can also shift priorities away from immediate needs, reducing trust in the institutions responsible for disaster governance (Manyena, 2006).

Empirical work from Malawi, Mozambique and South Africa has shown that the functionality of institutions depends heavily on the strength of local governance and the presence of operational structures at the community level (Mercer *et al.*, 2014; Twigg, 2015). When ward and village-level committees are active and integrated into district disaster management frameworks, they serve as effective conduits between communities and higher-level authorities. However, where such linkages are weak or absent, national or provincial interventions often fail to reflect local realities, reducing the effectiveness of the overall system.

In Zimbabwe, the institutional arrangements for flood disaster management are anchored in the Civil Protection Act, which mandates the Civil Protection Unit (CPU) to coordinate all disaster-related activities. While this framework provides a legal basis for action, studies have noted persistent operational challenges, particularly in rural districts such as Tsholotsho (Mavhura *et al.*, 2017; Dube *et al.*, 2018). The CPU's coordination role is sometimes undermined by resource shortages, unclear lines of communication between different government departments and the absence of regular joint simulation exercises. Furthermore, at the district level, the Civil Protection

Committees often operate with minimal budgets, limited technical capacity and dependence on sporadic external support from NGOs. In practice, this means that the speed and quality of response rely heavily on the initiative of individual actors rather than on a robust and predictable institutional system. The lack of systematic monitoring and evaluation mechanisms further constrains learning from past flood events, making institutional improvement slow and inconsistent.

2.5.1 Policy and legislation framework for disaster management

Effective flood response mechanisms often rely on robust policy and institutional support. National and local flood risk management policies are essential in ensuring a structured response, including the allocation of resources for early warning systems, community mobilization and relief aid. In England, a dedicated flood emergency management policy, with multi-agency flood plans, is a standard practice (Salinas *et al.*, 2014; Rodina *et al.*, 2017; Shi *et al.*, 2018). Several formal legal mechanisms facilitate effective cooperation between emergency responders and the government, such as the duty to cooperate and the establishment of Local Resilience Forums (LRF). Additionally, some responders play a key role in enhancing community preparedness for floods (European Union Commission, 2017).

In the United States, the Federal Emergency Management Agency (FEMA) is responsible for responding to flood disasters. FEMA coordinates the federal government's efforts in prevention, mitigation, response and recovery from natural or man-made disasters. It also funds the training of emergency responders in the U.S. and its territories. Similarly, the National Flood Insurance Program (NFIP) in the United States has proven effective in reducing flood impacts on individuals and communities (Taber, 2018). The NFIP provides affordable flood insurance for homeowners and businesses in flood-prone areas and includes provisions for floodplain management, hazard mapping and emergency response (Flanagan and Hall, 2018). The NFIP has been successful in mitigating the financial consequences of flooding in the U.S.

In Poland, the central government plays a central role in flood control, working closely with local authorities (European Union Commission, 2014). Legal regulations in Poland delegate the responsibility for implementing and coordinating flood control to local governments. The central government also supports flood response activities through national and regional water management agencies (Ranganathan, 2020; Muzamhindo and Ndlovu, 2023). Local governments are tasked with covering the costs of flood-related activities, with support from police

and fire departments funded by the central budget. Thailand's Flood and Water Management Act, introduced in 2010, provides a framework for flood management.

The Act includes provisions for prevention, mitigation and emergency response while emphasizing the importance of community participation in flood risk management (Wongsopawiro and Nguyen, 2018). This legislative framework has helped reduce the impact of floods on communities in Thailand. In the Philippines, after the devastating effects of Typhoon Ketsana in 2009, the National Disaster Risk Reduction and Management Council was established to oversee disaster risk reduction and management. The council implemented various measures, including community-based early warning systems, flood warning stations and the construction of flood control structures such as dikes and dams (Lavell and Maskrey, 2014). These initiatives have substantially reduced flood impacts and improved community resilience.

Reviewed literature indicates that effective flood response mechanisms in Africa would similarly require policy and institutional backing (Resilience Africa Network, 2017). There is a pressing need to develop a legal and policy framework that provides clear guidelines for flood management (RAN, 2015; Resilience Africa Network, 2016). Furthermore, flood management institutional arrangements should be well-coordinated, involving stakeholders at various levels of government. Policy and legislative frameworks for disaster management are critical for fostering rural development, particularly in regions where floods pose a recurring threat to livelihoods and infrastructure.

Flood management policies that emphasize early warning systems, community mobilization and integrated response mechanisms significantly enhance the resilience of rural communities (Chambers and Conway, 1992, USAID, 2024). For instance, initiatives such as community-based early warning systems and localized flood risk management strategies directly benefit rural areas by reducing the loss of agricultural productivity, infrastructure and human lives. Such systems ensure that rural populations have timely access to critical information, enabling them to prepare and mitigate potential flood impacts. This proactive approach not only safeguards rural livelihoods but also contributes to broader rural development goals by minimizing disruptions to economic and social activities.

The integration of rural stakeholders in flood management frameworks strengthens the linkage between disaster management and sustainable development. Policies that mandate community participation, such as Thailand's Flood and Water Management Act, demonstrate the importance

of including rural populations in decision-making processes. Engaging rural communities fosters ownership of flood management initiatives, enhances local capacity and ensures that interventions are contextually relevant (OECD, 2024, OECD, 2024). In the African context, developing coordinated institutional arrangements for flood management can improve resource allocation and ensure that rural areas receive adequate support during and after flood events. Such frameworks, when effectively implemented, reduce vulnerabilities and promote equitable access to recovery and development resources, ultimately fostering rural resilience and sustainable development.

2.5.2 Community flood risk preparedness

Community flood risk preparedness is crucial for reducing and managing the impact of floods on communities. The concept of community preparedness is gaining attention in disaster management because disasters primarily affect local communities; they become the first responders to the event (Gaillard and Mercer, 2013; (Lenderink *et al.*, 2019). Therefore, it is crucial for communities to be proactive. Between 1985 and 2014, flooding in Nigeria affected more than 11 million lives with a total of 1100 deaths and property damage exceeding US\$17 billion (Nkwunonwo, 2016). Floods are one of the most common and devastating natural disasters, causing significant loss of property, life and mass displacement.

Effective community flood risk preparedness can help mitigate the impacts of floods and enhance community resilience. Community flood risk preparedness is a shared responsibility that requires the active participation of stakeholders (Kok *et al.*, 2019; Gumindoga *et al.*, 2021). Collaboration and partnership among government agencies, emergency services, Non-Governmental Organizations are critical in community flood preparedness. A unified response can help reduce duplication of efforts, enhance resource allocation and improve response effectiveness (Tabachnick and Fidell, 2007; Taber, 2018). Hence community flood risk preparedness involves, infrastructure design, emergency planning drills, flood plain management, flood risk mapping and education and awareness campaigns. Community risk preparedness can be enhanced through adoption of a community resilience framework. The framework guides communities on ways to effectively build their resilience against natural disasters.

2.5.3 The Community Resilience Framework

The Community Resilience Framework was developed with a particular emphasis on community development practice. Two potential methodologies can be paired with the framework to engage

communities, inform policy and build resilience. The Community Resilience Framework can be adopted to develop resilient communities. A resilient community is a social entity that can absorb and recover from shocks and adapt and manage change. It can transform itself in a way that its social cohesion is maintained and the basic needs of its members are met without compromising their long-term prospects (Zautra *et al.*, 2008; Ainuddin and Routray, 2012; Cafer *et al.*, 2019). The Community Resilience Framework outlines that, each community will make specific choices to reduce their risks according to capacities they have built by combining the external environmental factors (social, political, economic, natural, cultural, financial) (Mohanty *et al.* 2020) (Figure 2.1).

A Community Resilience Framework helps users understand how households and communities respond to shocks and stresses and their impact on livelihoods and well-being. It also identifies key leverage points for developing a theory of change to guide resilience-focused programming. (Frankenberger *et al.*, 2012; Jeans *et al.*, 2017). It enables policymakers and practitioners to have a understanding of the factors and processes influencing vulnerability and resilience at the household, community and higher-level systems (for example, government and ecosystem) (McGee *et al.*, 2016). Designing interventions to improve the absorptive, adaptive and transformative capacities that underlie resilience capacity starts with a thorough multi-hazard assessment of the social, economic, environmental and demographic conditions of the affected area.

The Community Resilience Framework plays a crucial role in advancing rural development by fostering resilience at the household and community levels. Rural areas are often disproportionately affected by shocks and stresses, such as natural disasters, economic downturns and climate change, due to limited access to resources and infrastructure (UNHCR, 2024, USAID, 2024). Through incorporating the principles of absorptive, adaptive and transformative capacities, the framework provides a roadmap for identifying vulnerabilities and leveraging local assets to build resilience. This approach ensures that rural communities are better equipped to recover from disruptions, maintain social cohesion and sustain livelihoods, thereby contributing to long-term rural development. Additionally, the framework emphasizes the importance of understanding and addressing the social, political, economic and environmental factors unique to rural areas, ensuring that interventions are tailored to local contexts and needs.

In the context of rural development, the application of the Community Resilience Framework enhances the design and implementation of policies and programs that strengthen rural

livelihoods. For example, integrating resilience-building strategies into rural development initiatives, such as sustainable agriculture, disaster risk reduction and community-based natural resource management, can mitigate the impact of external shocks while promoting economic growth and environmental sustainability (Mngumi, 2020). Furthermore, the framework's focus on multi-hazard assessments and participatory approaches enables rural communities to actively engage in decision-making processes, fostering a sense of ownership and ensuring the sustainability of development outcomes. Through aligning resilience-building efforts with broader rural development goals, policymakers and practitioners can create transformative pathways that enhance the well-being of rural populations and reduce their vulnerability to future challenges.

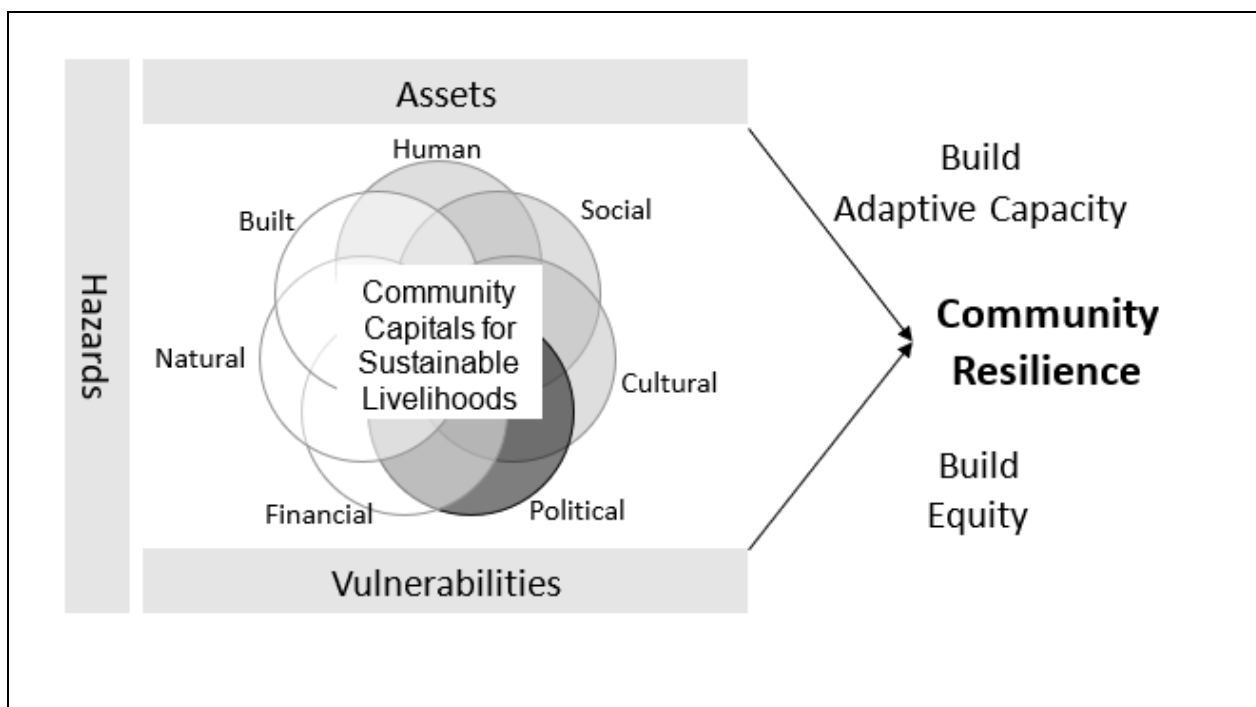


Figure 2.2: Community Resilience Framework

Source: Ellis *et al.*, (2022)

2.5.4 Risk assessment and mapping

Flood risk assessment and mapping involves identifying flood-prone areas, assessing the risk and mapping the areas to inform planning, infrastructure development and emergency

preparedness (Islam and Walker, 2018; Mafongoya *et al.*, 2020). The process involves identifying areas prone to flooding, assessing the risk and creating maps to visualize the information. The assessment process considers, topography and elevation, hydrological data, land use and land cover, soil type and permeability, infrastructure and urbanization. The resulting maps provide a visual representation of the flood risk, highlighting areas most vulnerable to flooding (Ursachi, *et al.*, 2015; Ulrichs *et al.*, 2019). Such information may be crucial for emergency preparedness and response, infrastructure design and construction. For example, the Bangladesh Water Development Board created a flood map to identify flood-prone areas and develop strategies for flood mitigation and the Dutch Government of Netherlands created detailed flood maps to identify areas at risk and developed advanced flood protection systems (Taber, 2018).

2.5.5 Infrastructure design

Infrastructure design plays a crucial role in flood risk management through ensuring the resilience and sustainability of communities. Buildings and infrastructure can be designed to withstand floodwaters, using materials and designs that resist water damage (White *et al.*, 2014; Weldegebriel and Amphune, 2017). It encompasses the planning, construction and maintenance of physical structures such as roads, bridges, buildings and utilities. Effective infrastructure design takes into account various factors including environmental impact, social needs and economic viability (White *et al.*, 2016).

A well-designed infrastructure can mitigate the effects of natural disasters, such as floods and earthquakes by incorporating features like flood-resistant construction and seismic design (Walker *et al.*, 2004; Ursachi, Horodnic and Zait, 2015). It can also promote sustainable development by incorporating green spaces, renewable energy sources and efficient water management systems. The use of materials that can withstand flood conditions such as stainless steel or concrete can help ensure infrastructure durability. Designing and prioritizing flood-resistant infrastructure design, communities can reduce the impact of floods and create a safer and resilient future. Infrastructure design for flood disaster management has been successfully implemented in various areas around the world. Netherlands is renowned for its innovative flood management infrastructure (Wood, 2007; Weldegebriel and Amphune, 2017). The Delta features a complex system of dams, sluices and storm surge barriers to protect the low-lying country from North Sea floods. Singapore constructed its Marina Barrage dam and reservoir system that regulates water levels and prevents flooding in the city (Tkaczynski, 2017)). These examples demonstrate how infrastructure design can effectively mitigate flood risks and enhance

community resilience. Through investing in innovative flood management solutions, countries, communities and stakeholders can reduce damage and ensure safety for residents.

2.5.6 Emergency planning drills

Flood emergency planning drills are essential for communities prone to flooding. These drills simulate flood scenarios, testing the readiness of emergency responders, evacuation procedures and communication systems (Arfiani *et al.*, 2021). Through conducting regular drills, communities can identify vulnerabilities, improve response times and enhance overall preparedness. Drills reveal weaknesses in emergency plans, allowing communities to address them before a real flood event. The effectiveness of these drills can be measured in several ways: Drills foster collaboration among emergency services, governments and stakeholders, ensuring a unified response (Wood, 2007; Xu and Kajikawa, 2017).

This coordination reduces confusion and improves overall response effectiveness, help allocate resources effectively, ensuring the right equipment and personnel are deployed, facilitate debriefing and analysis, leading to refined emergency plans and strategies (White and O'Hare, 2014). This continuous improvement ensures communities are better prepared for future flood events. Flood emergency planning drills are a vital tool for communities to prepare for flood events. Through conducting regular drills, communities can improve response times, coordination, public awareness, resource allocation, communication and overall resilience, ultimately reducing damage and losses.

Several countries have implemented flood emergency planning drills to prepare for potential flood disasters. These drills have proven to be effective in enhancing preparedness and response capabilities. For example, in Japan, flood drills are conducted regularly to prepare for typhoon-related flooding. The drills have improved evacuation times and response coordination among emergency services. Similarly, in Australia, flood drills have enhanced public awareness and preparedness, reducing the risk of flood-related damage. In the United States, the Federal Emergency Management Agency (FEMA) conducts regular flood drills to test preparedness and response plans. These drills have improved interagency coordination and communication, ensuring a more effective response to flood events. These countries have achieved significant improvements in flood emergency preparedness and response through regular drills and exercises. The drills have helped identify vulnerabilities, improve communication and coordination and enhance public awareness and preparedness. Through learning from these examples, other

countries can develop effective flood emergency planning drills to improve their own preparedness and response capabilities.

2.5.7 Flood plain management

Flood plains are areas surrounding rivers, lakes and coastal areas that are prone to flooding. Effective management of the flood plain is essential to reduce the risk of flood-related damage and loss of life (Hannam 2014; Medew 2014; Dewa *et al.*, 2022). It involves the process of managing and regulating human activities in flood-prone areas to minimize the risk of flood damage and promote sustainable development. Flood plain management involves a range of strategies, including; Flood risk assessment and mapping, Land use planning, flood control structures, flood plain restoration, public awareness and education (Ojo and Olomola, 2019). Effective flood plain management requires a collaborative approach, involving government agencies, local communities and stakeholders. The essence of flood plain management lies in its ability to balance human needs with environmental considerations, ensuring the safety of both people and the environment. The benefits of effective flood plain management include reduced flood risk, improved public safety, economic benefits and increased resilience (Wongsopawiro and Nguyen, 2018; Van Niekerk *et al.*, 2020). By implementing effective strategies and collaborating with stakeholders, communities can reduce flood risk, improve public safety and enhance environmental and economic benefits.

2.5.8 Education and awareness campaigns

Education and awareness campaigns are essential components of flood risk management. These campaigns play an important role in informing the public about flood risk, promoting flood safety and encouraging individuals to take proactive measures to mitigate flood damage (Hallegatte *et al.*, 2013; Winsemius *et al.*, 2016). Education and awareness campaigns for disaster management aims to inform and empower individuals and communities to prepare for, respond to and recover from disasters (Parvin *et al.*, 2016). It has been established that campaigns provide clear and concise information on disaster risks, safety tips and emergency procedures. In some areas, for both developed and developing countries, they are various communication channels such as social media, print media and community outreach. Such communication channels will be targeting to disseminate information to vulnerable populations (Simonyi, 2016).

2.5.9 Stakeholder engagement

Stakeholder engagement is an important aspect of effective flood management. It facilitates government agencies, local communities, Non-Governmental Organizations and private sector entities to share knowledge, resources and responsibilities to manage floods (Fatimah *et al.*, 2020; Bayala *et al.*, 2021). In order to improve public participation and facilitate policy discussions, stakeholder engagement is a helpful strategy for flood risk management. Best practices for stakeholder engagement may include, early engagement and participation, transparency and accountability, active listening and feedback, inclusive and diverse representation, flexibility and adaptability, building on existing networks and partnerships, using technology and social media and evaluating and improving engagement efforts (Feola, 2015; Mohanty, 2020). These are important elements that maybe useful for effective flood resilience in vulnerable communities.

Various management concerns can be considered, such as the objectives of disaster risk reduction and emergency management, the ways in which land-use planning interacts with the integration of flood risks and the necessary policies (Visvizi and Lytras, 2018; Zhang and Zhang, 2020). Stakeholder engagement is regarded as a crucial strategy for achieving more consensus and cohesiveness in flood management. Stakeholder engagement in flood management often results in a more complicated examination of the problem, which raises the bar for finding group solutions and lengthens the time it takes to do so (Jayne *et al.*, 2018). However stakeholder engagement for flood risk management can be affected by challenges such as; Lack of trust and communication, Limited resources and funding, Conflicting interests and priorities, Difficulty in reaching vulnerable populations, Limited awareness and understanding of flood risk (Deppisch and Hasibovic, 2013; Swart *et al.*, 2014).

2.6 Flood Response Frameworks for Resilient Livelihoods

The development of localised flood response frameworks has emerged as a critical strategy in disaster risk reduction, particularly in rural and resource-constrained settings. Unlike generic national frameworks, localised models are tailored to the socio-economic realities, governance structures and hazard profiles of specific communities (UNDRR, 2020; Jones *et al.*, 2021). These frameworks seek to decentralise decision-making, embed preparedness within everyday governance and harness locally available capacities to reduce dependence on delayed external interventions. Internationally, countries such as Bangladesh and the Philippines have successfully operationalised community-based disaster management models that integrate early warning

systems, evacuation protocols and post-disaster recovery plans into local governance processes (Shaw *et al.*, 2013; Alam and Collins, 2019).

In the African setting, research has shown that decentralised frameworks are particularly effective when they leverage indigenous knowledge and blend it with scientific methods (Mercer *et al.*, 2010; van der Waladt, 2020). For example, in Mozambique's Sofala Province, the post-Cyclone Idai recovery process demonstrated that empowering village committees to take leadership in early response, while aligning them with district disaster plans, reduced both the time to mobilisation and the extent of loss. Such experiences underline the value of multi-level linkages where local structures operate within a supportive policy and funding environment provided by higher tiers of government.

In Zimbabwe, the prevailing disaster management architecture remains largely centralised, with the Civil Protection Unit and sectoral ministries taking lead roles during emergencies. While this structure ensures some level of coordination, it has been criticised for its reactive posture and limited engagement with grassroots institutions (Mavhura, 2020; Dube and Munsaka, 2018). In districts like Tsholotsho, where floods are recurrent, the absence of an operational, locally anchored framework means that communities often rely on informal coping mechanisms. These mechanisms, while resourceful, remain vulnerable to being overwhelmed by high-magnitude flood events. The institutional gap creates an opportunity to design a model that not only recognises local actors such as ward disaster committees, traditional leaders and community-based organisations but also positions them as primary coordinators in the initial response phase.

A well-designed localised framework for Tsholotsho would therefore prioritise community ownership, use of low-cost but effective infrastructure and integration of indigenous knowledge systems with formal risk management protocols. It would establish clear operational stages early warning, evacuation, relief and recovery linked by feedback loops to enable continuous learning and adaptation. Embedding disaster readiness in local governance routines and securing predictable funding through mechanisms such as devolution allocations and district disaster funds, the framework could transform reactive responses into proactive resilience-building measures. This approach aligns with calls in contemporary disaster literature to shift from centralised control towards collaborative, multi-actor governance that empowers communities to lead in safeguarding their own livelihoods (Pelling and Dill, 2010; Twigg, 2015).

2.6.1 The Sustainable Livelihoods Approach

The Sustainable Livelihoods Approach (SLA) has been a key theoretical framework for understanding and assessing the effectiveness of flood response mechanisms in Tsholotsho District, Zimbabwe. In this study, the SLA was deployed to evaluate how the district's communities have utilized their various assets such as natural, human, physical, financial and social during flooding events and how these assets contribute to resilience and sustainable livelihoods. The framework was applied to explore both the short-term and long-term impact of flooding on community livelihoods and to assess the strategies employed by local communities to recover and adapt to future flood risks. The deployment of SLA, in this context, enables the study to ly evaluate the various factors that influence flood preparedness, response and recovery in Tsholotsho.

One of the primary ways in which the SLA was deployed in this study was by categorizing the types of assets within the district and examining how these assets are affected by flooding. The study explored how natural capital, such as land, water and biodiversity, is often damaged during flooding events, which disrupts the agricultural-based livelihoods of many communities in Tsholotsho. The framework was used to assess how human capital skills, knowledge and labor played a role in how communities responded to these damages. Through interviews and surveys, the study identified examples of how local knowledge and community-driven solutions were employed to mitigate the impacts of floods, showing how human capital can be a key determinant of resilience in flood-prone areas (Scoones, 1998; Ellis, 2000).

The study also deployed the SLA to examine the role of social capital in flood response. The strength of social networks, community cohesion and collective action were found to be critical in enabling communities to recover from flood damage. Social capital facilitated the sharing of resources, information and labor, which are crucial during flood recovery. The study's findings showed that communities with strong social ties were better equipped to cope with the economic and emotional impacts of flooding, as they could rely on each other for support. This was especially important for vulnerable groups such as women, the elderly and the disabled, who were often more affected by flooding but benefited from social networks that provided both physical and emotional support (Bebbington, 1999; Putnam, 2000).

The physical capital of Tsholotsho, which includes infrastructure such as roads, bridges, homes and irrigation systems, was also a focus in the application of the SLA. Flooding significantly

damages this physical capital, hindering recovery efforts and making it difficult for communities to access essential services and markets. The SLA framework allowed the study to assess how effectively local governments and NGOs have mobilized resources to rebuild or repair infrastructure after floods. It also provided insight into the gaps in infrastructure planning and development that exacerbate vulnerability to flooding.

Through SLA, the study highlighted the need for improved infrastructure resilience as a key component of long-term flood management strategies in the district (Adato and Meinzen-Dick, 2002, Muzamhindo and Ndlovu, 2023). Financial capital was another critical area of focus in the application of the SLA. In the aftermath of floods, financial resources, including savings, credit and insurance, are crucial for community recovery. The study examined how households in Tsholotsho accessed financial resources to repair homes, replace lost assets and restore agricultural production. One of the findings was that many communities in Tsholotsho lacked access to affordable financial services, leaving them highly vulnerable to the economic impacts of flooding. Through using SLA, the study was able to justify the need for improved financial services, such as microloans and insurance products, to enhance the resilience of communities in flood-prone areas (Ashley and Carney, 1999; Moser, 1998, Molnar-Tanaka and Surminski, 2024).

The justification for the inclusion of the SLA in this study lies in its holistic and multidimensional approach to understanding livelihoods. Unlike traditional disaster management approaches that focus primarily on the immediate response to disasters, SLA considers the long-term development context and the complex interplay of various assets that communities rely on for survival and well-being. Through including the SLA, this study captures the interconnections between different forms of capital and how their depletion due to flooding affects communities' ability to bounce back. This broader perspective enables a more evaluation of flood response mechanisms, not only in terms of how effective they are in the immediate aftermath of a disaster, but also in terms of how they contribute to the sustainability of livelihoods in the long term (Chambers and Conway, 1992; Scoones, 1998).

The SLA allows for a participatory and community-centered approach to understanding resilience. This aligns with the study's aim to explore how grassroots communities in Tsholotsho have managed to adapt to recurring flooding events. Through using SLA, the study ensures that the voices of local community members are central to the analysis. Interviews and focus group discussions with local residents provided firsthand insights into how communities view and

manage flood risks and the effectiveness of the response mechanisms. The participatory nature of SLA ensures that the study is grounded in local knowledge, which is essential for developing contextually appropriate and effective flood management strategies (Moser, 2009; Pretty, 1995).

The SLA offers a flexible framework that can adapt to changing contexts, which is particularly important given the dynamic nature of flood risks in Tsholotsho. Flooding patterns may shift over time due to climate change and socio-economic changes and the SLA framework allows the study to examine how communities and institutions evolve their response strategies to meet these new challenges. This adaptability is crucial for ensuring that flood response mechanisms remain relevant and effective over time. The study used SLA to track changes in community adaptation strategies over the years, providing insights into how these strategies can be strengthened or modified to improve long-term resilience (Speranza *et al.*, 2014, Bwanali and Manda, 2023).

The SLA was also useful in linking the study to broader sustainable development objectives, particularly the Sustainable Development Goals (SDGs). Through assessing the effectiveness of flood response mechanisms through the SLA lens, the study contributes to the achievement of several SDGs, such as SDG 1 (no poverty), SDG 2 (zero hunger), SDG 14 (life below water) and SDG 15 (life on land). The SLA's focus on sustainable livelihoods directly ties into these global goals, as it emphasizes the need for resilience and sustainable practices in managing natural resources and building adaptive capacities in the face of climate-related disasters like flooding. The inclusion of SLA thus ensures that the study's findings are not only relevant to the local context but also contribute to global discussions on resilience and sustainable development (United Nations, 2015).

The SLA allows for a systems thinking approach to understanding flood risks and responses. This systems perspective is vital for identifying the interconnectedness of various factors that contribute to community vulnerability and resilience. For example, the study found that the impacts of flooding are not only a result of the physical hazard but are also influenced by governance, social structures and access to resources. The inclusion of SLA in the study helps unpack these complex relationships and provides a clear framework for understanding how effective flood response mechanisms can be developed, considering all facets of community resilience. This systems approach makes the SLA a powerful tool for informing both policy and practice in flood management (Moser, 1998; Davies, 2009). Through deploying the SLA in this study, it is possible to generate a understanding of how communities in Tsholotsho are responding to flooding, what resources they rely on and where gaps exist in strengthening

resilience. The SLA not only justifies the study's approach but also enhances its relevance in addressing the pressing challenges of flooding and climate change in rural Zimbabwe.

The SLA offers profound implications for rural development by providing a holistic framework to address the vulnerabilities and challenges faced by rural communities, particularly in disaster-prone areas like Tsholotsho. Through emphasizing the interplay between natural, human, social, physical and financial capital, the SLA highlights the multifaceted nature of rural livelihoods and the importance of building resilience across these dimensions. Rural development strategies informed by the SLA can focus on strengthening these assets to enhance community well-being and reduce vulnerability to shocks such as flooding. For instance, promoting sustainable agricultural practices, improving infrastructure and enhancing access to financial services can empower rural communities to recover from disasters while fostering long-term development. The SLA's emphasis on inclusivity ensures that interventions address the needs of marginalized groups, promoting equity and social cohesion in rural areas.

The SLA underscores the importance of participatory and community-centered approaches in rural development. Through integrating local knowledge and grassroots solutions into planning and decision-making processes, the SLA ensures that rural development strategies are contextually relevant and sustainable (Mitheu, 2023, Wolff, et al, 2021). This participatory approach not only strengthens community ownership of development initiatives but also enhances the adaptive capacity of rural communities in the face of dynamic challenges, such as climate change and socio-economic transformations. Furthermore, the SLA's alignment with global development goals, such as the Sustainable Development Goals, provides a strategic pathway for rural development to contribute to broader objectives of poverty reduction, food security and sustainable resource management. Ultimately, the SLA bridges the gap between immediate disaster response and long-term development, ensuring that rural communities are not only able to recover from shocks but also build a sustainable and resilient future.

2.6.2 Linkages between flood resilience and sustainable development

Flood resilience and sustainable development are interconnected concepts that aim to reduce the vulnerability of communities to flood hazards while promoting sustainable development (Dewulf, 2019, Mngumi, 2020). Flood resilience refers to the ability of communities to withstand, recover and adapt to flood events, while sustainable development aims to meet the needs of the present without compromising the ability of future generations to meet their own needs (Donner and

Havidan, 2008; Doorn, Gardoni and Murphy, 2018). Building flood resilience is important for sustainable development as it: reduce the risk of flood-related disasters, protecting lives, livelihoods and infrastructure, minimizing flood damage, businesses and industries can continue to operate, supporting economic growth and development, incorporate environmental considerations, such as preserving natural habitats and ecosystems (Ensor and Harvey, 2015; Erickson, 2015).

Flood resilience measures can prioritize vulnerable populations, ensuring their safety and well-being. Through prioritizing flood resilience, communities can reduce disaster risk, support economic growth, enhance environmental sustainability and promote social equity, innovation and climate change adaptation (Hegger *et al.*, 2016, Ndung'u, 2023).

It is also prudent to stipulate that lack of flood resilience can undermine or even undo progress towards the Sustainable Development Goals (SDGs). Disaster risk reduction and sustainable development are closely linked and interdependent (Donner and Havidan, 2008; Doorn, Gardoni and Murphy, 2018). Floods affect more people around the world than any other hazard and therefore undermine countries' progress towards reaching the SDGs in a lot of ways. Achieving the SDGs will require a radical rethink of how we look at risks, including climate change impacts (Fatimah *et al.* 2020; Bayala *et al.*, 2021). More investments in disaster risk reduction (DRR), climate change adaptation and climate smart, risk informed development are urgently needed.

Without this, development gains are at risk of being lost in future disaster events. Any policies and strategies that national governments develop to achieve the SDGs must also incorporate climate smart, resilience thinking for floods and other hazards (Baudoin *et al.* 2014; Aslam *et al.* 2019). Through incorporating resilient, climate-smart thinking into disaster risk management, climate change adaption and development agendas, countries and donors can ensure that the SDGs are not undercut by the impacts of floods (Visvizi and Lytras, 2018; Zhang and Zhang, 2020). When developing policies to achieve the SDGs national governments must also incorporate climate smart, resilience thinking for floods and other hazards. Otherwise, any progress risks being undermined by disaster (Zhang and Zhang, 2020).

2.7 Limitations of flood risk management and response approaches

Flood disaster risk management systems are designed to mitigate the impact of floods on communities (Adger *et al.*, 2021; Tshuma, 2021). However, these systems face several challenges and limitations that hinder their effectiveness. Data limitations are a significant challenge. Inadequate or inaccurate data on flood risk, vulnerability and exposure can lead to ineffective flood risk management decisions (Baudoin *et al.* 2014; Aslam *et al.*, 2019). Financial constraints are another challenge; as insufficient funding can limit the implementation of flood risk management measures.

Political and institutional challenges also exist, including lack of coordination and cooperation among government agencies, stakeholders and communities (Bulti *et al.*, 2019). Social and cultural barriers, such as limited public awareness and understanding of flood risk, can also hinder flood risk management efforts. Infrastructure limitations, including inadequate or poorly maintained flood protection infrastructure, can increase flood risk. Climate change is also a significant challenge, as it increases the frequency and severity of floods. Rapid urbanization in flood-prone areas further increases vulnerability (Centre for Research on the Epidemiology of Disasters, 2019; Mizutori, 2020).

Limited resources, including inadequate emergency response personnel, equipment and supplies, can impede effective flood response (Daramola *et al.*, 2016). Communication challenges, such as difficulty disseminating timely and accurate information to the public during floods, can also occur. Technological limitations, including limited use of flood modelling and early warning systems due to lack of resources or expertise, can also hinder flood risk management (De Souza, 2014; Dewa *et al.*, 2022). Community resistance to flood risk management measures, such as relocation or evacuation, can also be a challenge. By addressing these challenges and limitations, flood disaster risk management systems can be improved, reducing the impact of floods on communities (Dewa *et al.*, 2021). To overcome these challenges and limitations, it is essential to: improve data collection and analysis, increase funding for flood risk management, enhance coordination and cooperation among stakeholders and conduct public awareness and education campaigns.

2.8 Research gap

Flooding is one of the most common and impactful natural disasters globally, with significant consequences, especially in developing countries. It poses a major threat to development and its persistent nature has caused numerous casualties worldwide. Floods disrupt people's livelihoods and global trends indicate that they are a growing risk for many human settlements. This is particularly concerning in countries like Zimbabwe, where risk management strategies remain underdeveloped. In many developing nations, flood disaster response tends to be reactive, responding only to current disasters. However, a shift from reactive to proactive measures is necessary to enhance the effectiveness of flood response and reduce the loss of life and property. A proactive approach requires greater involvement from governments, NGOs, private sector entities and local communities. Stakeholder participation is crucial in disaster risk reduction (DRR) and with communities now more engaged in DRR efforts, it is essential to analyze their role and influence in local-level disaster governance. Research on the progress of national and local flood management plans is often outpaced by the increasing frequency and severity of flood events in Zimbabwe, highlighting the need for more focused attention. This study aims to explore the impact of flood response mechanisms at both the local and national levels in Zimbabwe, an area where technological responses have often been drawn from developed countries with advanced flood management systems. This research focuses on examining the potential of local technologies, specifically within the African context and aims to create opportunities for development actors in Zimbabwe to improve flood response strategies.

2.9 Chapter Summary

The reviewed literature highlights that flooding is a recurring hazard with profound impacts on livelihoods, particularly in rural districts such as Tsholotsho where socio-economic vulnerability is high. At the global level, evidence shows that flood disasters increasingly affect both developed and developing nations, but the severity of their impacts is more pronounced in low-income communities due to inadequate infrastructure, limited resources and reduced coping capacity. Within Africa, decentralised and community-led responses have demonstrated significant potential for reducing losses, especially when they integrate indigenous knowledge with scientific forecasting. In Zimbabwe, floods linked to river overflow, intense rainfall and cyclonic activity have repeatedly disrupted agriculture, damaged infrastructure and displaced communities. The persistence of these hazards underscores the need for targeted interventions that not only respond to immediate crises but also strengthen long-term resilience.

The chapter also establishes that while the current institutional arrangements in Zimbabwe provide a centralised coordination structure, their reactive nature limits effectiveness in rural districts where early mobilisation is critical. Studies point to the value of frameworks that empower local actors, align community structures with formal disaster governance and draw on sustainable funding sources. These observations inform the argument for a localised flood response framework for Tsholotsho that is grounded in community ownership, low-cost infrastructure utilisation and multi-level collaboration. Such a framework would bridge the gap between policy and practice by embedding preparedness and recovery into local governance routines, enabling faster response times and more equitable resilience outcomes. In that regard, the literature review provides both the theoretical foundation and the empirical rationale for the subsequent framework development presented later in the thesis.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This research aimed to evaluate the effectiveness of flood response mechanisms and propose appropriate interventions for improving flood disaster management in Tsholotsho District. This chapter presents the research methods used to develop relevant interventions for more effective flood response mechanisms in the district. It includes a detailed description of the study area, highlighting the reasons for its selection. Additionally, the chapter covers the research design, the population under study and the sampling procedures. It also outlines the data collection methods, data analysis techniques, ethical considerations and the anticipated outcomes of the research.

3.2 Description of the Study Area

The study was conducted in Tsholotsho District, situated in the north-western part of Zimbabwe within Matabeleland North Province. The district lies between latitudes 19°20' and 20°00' South and longitudes 27°50' and 28°20' East, covering an area of approximately 7,754 square kilometres (ZimStats, 2022). It shares boundaries with Lupane District to the east, Bulilima District to the south and Botswana to the west, with the north-western boundary adjoining Hwange National Park. Administratively, the district comprises 22 wards, each governed by elected councillors under the Tsholotsho Rural District Council.

3.2.1 Topography and Hydrology

Tsholotsho lies within the catchment area of two major river systems – the Gwayi and Umzingwane whose tributaries, including the Manzanyma and Kana rivers, traverse the district. The terrain is largely flat to gently undulating, which, coupled with sandy soils of low permeability, increases the propensity for waterlogging during intense rainfall events (Nyamapfene, 2020). The district's topography facilitates downstream accumulation of floodwaters from upstream catchments in Lupane and Nkayi, making it vulnerable to both localised flooding and transboundary flood events originating outside its administrative boundaries (Chanza and Musarandega, 2020). The lack of significant elevation variation limits natural drainage, causing floodwaters to persist in low-lying areas for extended periods.

3.2.2 Climate and Rainfall Patterns

The district experiences a semi-arid climate characterised by hot, wet summers and cool, dry winters. Average annual rainfall ranges between 450 mm and 650 mm, with the bulk of precipitation falling between November and March (Zimbabwe Meteorological Services Department, 2023). While rainfall is generally low, it is highly variable and extreme events such as prolonged heavy downpours within short periods trigger flash flooding. Climate variability in recent decades has increased the frequency of intense storm events, amplifying the district's exposure to flooding (Mugandani *et al.*, 2021).

3.2.3 Flood History

Flooding in Tsholotsho has been a recurrent hazard, with notable events in 2007, 2014, 2017 and 2021 displacing hundreds of households and damaging critical infrastructure (Civil Protection Unit, 2022). The 2017 floods were particularly severe, inundating over 800 homes and prompting large-scale evacuations to temporary shelters established in schools and churches. Post-disaster assessments have repeatedly identified poor drainage infrastructure, delayed response times and inadequate early warning dissemination as factors exacerbating flood impacts.

3.2.4 Socio-Economic Profile and Vulnerability

According to ZimStats (2022), Tsholotsho has a population of approximately 115,000 people, predominantly Ndebele-speaking, with livelihoods largely dependent on subsistence farming, livestock rearing and informal cross-border trade. Poverty prevalence is high, with over 70% of households living below the poverty line (World Bank, 2021). Housing is predominantly of pole-and-dagga construction with thatched or corrugated iron roofs, making dwellings highly susceptible to flood damage. Limited access to formal financial services and insurance compounds vulnerability, leaving households reliant on informal coping strategies.

3.2.5 Governance and Disaster Response Structures

Disaster risk management in Tsholotsho operates under the Civil Protection Act [Chapter 10:06], coordinated by the District Civil Protection Committee (DCPC). At ward level, Disaster Risk

Reduction Committees (DRRCs) exist but often lack consistent resources, training and operational autonomy. Traditional leaders play a central role in community mobilisation during emergencies, often serving as first responders. However, the district's reliance on top-down, centrally controlled disaster response systems has resulted in delayed interventions, particularly during high-impact flood events.

3.2.6 Implications for the Study

The combination of flat topography, upstream flood inflows, inadequate drainage infrastructure and socio-economic vulnerability creates a complex hazard environment. Understanding these geographic and socio-economic characteristics is essential in evaluating the applicability of the proposed localised flood response framework. Given that a portion of Tsholotsho's flood risk is linked to catchment hydrology beyond district boundaries, effective resilience-building will require coordination not only within the district but also with upstream authorities in neighbouring districts and across the Botswana border.

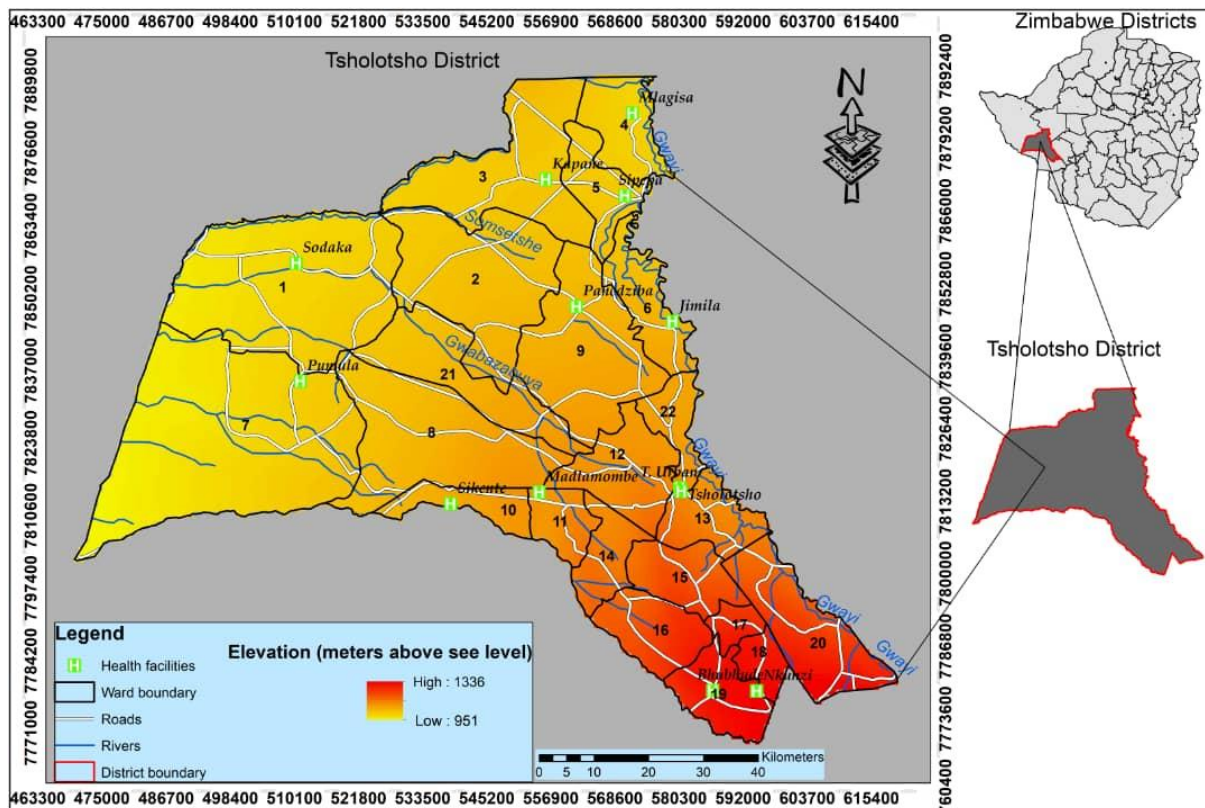


Figure 3.1: Map of Tsholotsho District in Zimbabwe

Source: GoogleMaps

The Gwayi, Zombami and Manzimnyama rivers are the primary sources of water that contribute to flooding, particularly in settlements located in flood plains and low-lying areas (Dube, 2017). The district consists of 22 wards and 6 chiefdoms: Mathapula, Mswigana, Ngqoya, Magama, Siphoso and Gampu. Wards 6, 7 and 8 are the most flood-prone in the district. Significant floods occurred in 2000, 2001, 2013, 2014 and 2017 (Dube, 2017). The people of Tsholotsho primarily rely on livestock farming, including cattle, goats and donkeys, as well as subsistence farming. Common crops include maize, millet and sorghum. Remittances from the diaspora serve as a key source of income for many households in the district (Phiri *et al.*, 2014). The community relies on various water sources, such as boreholes, rivers and dams, for both consumption and livelihoods.

Traditional huts made from mud, poles and thatch are common in the area. The district features many gravel roads, with a tarred road connecting it to Lupane and Bulawayo. The district also has bridges, dams, schools, churches and businesses, all of which are susceptible to flood damage. However, many communities in Tsholotsho District have developed own knowledge and strategies to cope with flood risks and vulnerabilities.

3.3 Research Philosophy and Design

This study was guided by the pragmatic philosophical position, which prioritises practical solutions to real-world problems by selecting methods that best address the research questions (Creswell and Plano Clark, 2018). Pragmatism is particularly well suited to inquiries that seek to generate actionable recommendations for policy and practice, as it focuses on “what works” rather than adhering rigidly to a single philosophical tradition (Feilzer, 2010). In this research, the choice of pragmatism was informed by the need to combine the interpretive exploration of community experiences with the systematic measurement of patterns and associations. The aim was not only to document the lived realities of flood-affected communities in Tsholotsho but also to quantify key trends and test the strength of observed relationships. This flexibility allowed for the integration of qualitative and quantitative evidence, producing findings that could inform both immediate disaster response measures and long-term resilience strategies.

An exploratory sequential mixed-methods design was adopted to operationalise this philosophical orientation. This design unfolded in three distinct but interconnected phases. The first phase applied a qualitative approach grounded in interpretivism to surface the perspectives, meanings and local mechanisms shaping flood response. Data were collected through key informant interviews, focus group discussions, field observations and a review of documentary sources.

This phase helped to identify the constructs and categories most relevant to the local setting, providing the empirical foundation for the subsequent stage. The second phase applied a quantitative survey to a representative sample of households, enabling the testing and extension of the constructs and relationships identified earlier. In line with post-positivist reasoning, this phase sought to measure the prevalence of certain experiences and assess the statistical significance of identified patterns (Bryman, 2016). The final phase involved integrating findings from both strands into a unified analysis, leading to the development of a locally grounded framework for enhancing flood disaster response. This integration process preserved the depth of qualitative narratives while validating them against systematically gathered quantitative evidence, ensuring that the framework was both credible to local stakeholders and defensible within academic standards.

3.3.1 Justification of the Methodological Approach

This study adopted a mixed-methods research design, integrating both qualitative and quantitative approaches to comprehensively examine the effectiveness of flood response mechanisms in Tsholotsho District. The choice of this design was guided by the need to capture both the measurable patterns of institutional performance and community preparedness, as well as the nuanced perceptions, experiences and strategies of affected households (Creswell and Plano Clark, 2018). Quantitative data, gathered through structured questionnaires, provided statistical evidence on the prevalence of specific challenges and the perceived effectiveness of interventions. Qualitative data, collected through key informant interviews and focus group discussions, allowed for deeper exploration of local knowledge systems, governance dynamics and contextual barriers that may not be evident through numerical analysis alone (Bryman, 2016).

An exclusively quantitative design was deemed insufficient for this study because it would have risked overlooking critical socio-cultural and institutional factors influencing disaster response. Conversely, a purely qualitative approach would have limited the ability to generalise findings across the district or identify statistically significant trends. The mixed-methods strategy provided methodological triangulation, strengthening the validity of the findings by enabling cross-verification between qualitative narratives and quantitative indicators (Fetters *et al.*, 2013). In disaster risk reduction research, this combination has been shown to yield richer, more actionable insights by capturing the interplay between lived experiences and measurable outcomes (Rahman, 2020). The approach was therefore most appropriate for addressing the study objectives, testing the research hypotheses and producing recommendations that are both evidence-based and contextually grounded.

3.4 Target population

Target population in research is a group of individuals or research objects that share common characteristics of interest to a researcher (Best and Khan 1993: Tang *et al.*, 2018). The study target population was 300 households in the most flooding prone Wards 6, 7 and 8 of Tsholotsho District and key stakeholders drawn from government and non-government institutions involved in flood mitigation strategies. The key stakeholders selected were from the following institutions: District Development Coordinator's (DDC) Office, Rural District Council (RDC), District Social Welfare, Ministry of Health and AGRITEX (Table 3.1).

Table 3.1: Key informants selected and the reasons for their selection

Department	Respondent	Rationale for selection
District Development Coordinator's (DDC) Office	District Development Coordinator	a) To gather information on response mechanisms that have been implemented in Tsholotsho b) To identify strength and weaknesses of the response mechanisms c) To gather information on specific roles of stakeholders operating in Tsholotsho to manage flood impacts
Rural District Council (RDC)	Ward councilor for wards 6, 7 and 8	a) To gather information on various impacts of floods in Tsholotsho District b) To gather information on response mechanism that have been implemented in Tsholotsho c) To gather information on what can be done to manage future floods.
District Social Welfare	District Social Services Officer	a) To gather information on the impacts of floods on people's livelihoods b) To gather information on various interventions that have been implemented c) To get information on the various stakeholders operating in Tsholotsho District
Ministry of Health	District Health Officer	a) To get information on the impacts of floods on the health sector b) To obtain information on current response mechanisms c) To get information on health sector reforms that can be done to manage flooding impacts
Department of AGRITEX	District AGRITEX head	a) To obtain information on the impacts of floods on agriculture production b) To understand how reforms have managed flood impacts on the agriculture sector.
PLAN International	PLAN Officer	a) To gather information on the impacts of floods on people's livelihoods b) To gather information on various interventions that have been implemented

3.5 Sampling and Sampling procedures

Sampling refers to a process of selecting a representative portion of the population for observation or experimentation (Bryman, 2008; Driscoll, 2011). To select household heads or their proxies for the household survey, the researcher started by purposefully sampling three wards (6, 7 and 8) of Tsholotsho district that were classified by the Civil Protection Unit as the most significantly affected communities. Household statistics obtained from the Tsholotsho District Civil Protection Unit (CPU) records showed that the total number of affected households during the last flooding in 2017 was as follows: 50, 100 and 150 in wards 6, 7 and 8 respectively. A total of 169 households, representing 50% of the total number of affected households, was selected to be a sample for the three wards.

These households were selected based on the record availed from the district office using the 50% ratio. According to Bryman (2008), a sample ranging between 20 to 50% provides a reliable representation of the whole population. To ensure proportional representation, a stratified random sampling technique was used to select the households from the three wards. In stratified sampling, researchers divide subjects into subgroups called strata based on characteristics that they share (e.g., race, gender, educational attainment). Once divided, each subgroup is randomly sampled using another probability sampling method.

In this case, the household sample was distributed as follows: 25, 50 and 75 in wards 6, 7 and 8 respectively. The households that were excluded from the sample were selected using the purposive sampling technique for focus group discussions. It is important to note that Nyariki (2009) holds that when using this sample size, one must factor in the possibility of non-response. The researcher personally selected the sample for the questionnaires to minimize the nonresponse rate. Given the limited financial budget and time constraints, the sample size was manageable. As Nyakiri (2009) highlights, it is essential to consider budgetary and time limitations when determining the sample size. Moreover, the chosen sample size was justified, as it closely aligned with those used in similar studies.

Purposive sampling, also known as expert sampling, was used to select key informants in the district. These informants were chosen to provide insight into the various response mechanisms implemented in Tsholotsho District, as well as to identify the strengths and weaknesses of the current mechanisms. The purposefully selected key informants included the District Development Coordinator (DDC) for Tsholotsho, Ward Councilors from wards 6, 7 and 8, Health Officers from

the Ministry of Health, the District Head from AGRITEX, Social Services Officers from the Department of Social Welfare, Works Officers from the Ministry of Public Works and the District Education Officer (DEO) for Tsholotsho. To ensure representation of disaster management experts, snowball sampling was also employed to identify relevant non-governmental organizations such as ORAP, Plan International and UNICEF. These organizations were selected for their expertise in disaster management and their potential contribution to suggesting effective interventions for flood response mechanisms.

3.6 Sample size

The term sample size is defined by Leavy (2017) as the number of individual cases that one ultimately draws and from which data are generated. For this study, the household survey targeted a population of 300 households affected by the 2017 floods across wards 6, 7 and 8 in Tsholotsho District, as recorded by the District Civil Protection Unit. The study applied Cochran's (1977) sample size formula to determine a statistically valid sample for this finite population, resulting in an adjusted target of 169 households.

The Cochran formula for sample size n_0 is:

$$n_0 = \frac{Z^2 p * (1 - p)}{e^2}$$

$$n_0 = \frac{(1.96)^2 * 0.50 * (1 - 0.5)}{(0.05)^2}$$

$$n_0 = \frac{3.8416 * 0.25}{0.0025}$$

$$n_0 = \frac{0.96040}{0.0025}$$

$$n_0 = 384.16$$

Finite population correction:

$$n_0 = \frac{n_0}{1 + \frac{n_0 - 1}{N}}$$

Where:

- N is the population size (300 in this case)
- n_0 is the initial sample size calculated (384.16)
- Where Confidence level: 95% (which corresponds to a Z-value of 1.96)
- Desired level of precision (margin of error, e): 5%
- Estimated proportion (p): Assuming 50% (0.50) for maximum sample size
-

$$n_0 = \frac{384.16}{1 + \frac{384.16 - 1}{300}}$$

$$n_0 = \frac{384.16}{1 + \frac{383.16}{300}}$$

$$n_0 = \frac{384.16}{1 + 1.2772}$$

$$n_0 = \frac{384.16}{2.2772}$$

$$n_0 = 168.66$$

Sample size = **169 participants**

Table 3.1: Sample size computation

This proportional distribution ensured that each ward was represented in accordance with its share of affected households. The adjusted sample size balances statistical confidence with the practicalities of field implementation, thereby maintaining the representativeness and reliability of the study findings.

3.7 Justification of Sample Size

The final sample size for this study comprised [insert number] participants, drawn from households, Civil Protection Committees (CPCs), local leaders and key institutional actors involved in flood response in Tsholotsho District. The sample was determined using a combination of purposive sampling to ensure inclusion of relevant stakeholders and snowball sampling to identify additional participants with direct knowledge or experience of flood response mechanisms. Snowballing was employed until data saturation was reached the point at which no new themes, insights, or variations were emerging from successive interviews or survey responses (Guest *et al.*, 2020). This approach ensured that the perspectives captured were both diverse and information-rich, while avoiding unnecessary data collection beyond the point of redundancy.

The adequacy of the sample size is consistent with methodological guidance for mixed-methods disaster research, where qualitative components typically require between 20–40 in-depth informants for saturation (Mason, 2010) and quantitative surveys in small rural populations achieve reliability at similar proportional coverage levels (Creswell and Plano Clark, 2018). Moreover, the range of participant categories in this study from household respondents to policy-level actors provided the breadth necessary to test the study's hypotheses and validate the proposed localised flood response framework.

3.8 Data collection methods

According to Kothari (2004), a research method refers to the approach used by a researcher to carry out their research work. In this study, both primary and secondary data collection methods were employed. Primary data refers to original data collected directly from the source by the researcher. The primary data collection techniques used in this study included interviews, field observations, photographs and focus group discussions (Salkand, 2010; Ajayi, 2017). These methods provided firsthand insights into the flood response mechanisms and the local community's experiences in Tsholotsho District.

3.8.1 Survey Questionnaire

A questionnaire was administered to 150 sampled households in wards 6, 7 and 8 of Tsholotsho district. A questionnaire was used as it enabled the collection of comparable data from many households. The questionnaire had both closed and open-ended questions that assisted to collect quantitative and qualitative data. The study objectives were used as sub-headings in the questionnaire and relevant questions were asked under each sub-heading. The questionnaire

collected information from households' socio-demographic, the typologies of damage caused by flooding on natural environmental resources and social infrastructure, the factors that influence the effectiveness of flooding response mechanisms and the functionality of existing institutional arrangements for managing flood-induced disasters. The questionnaire was administered using the drop-and-pick method. In this case, the respondent was given the questionnaire and it was collected after a day. This was meant to give each respondent ample time to respond. Where the respondents needed assistance to complete the questionnaire, the researcher had to go through the questionnaire with the respondent whilst recording the responses on their behalf.

To ensure that every respondent clearly understood the questions, the data collection instruments were first translated into isiNdebele and then back-translated into English to confirm accuracy of meaning, a process recognised as essential for preserving semantic equivalence in multilingual surveys (Brislin, 1970; Harkness *et al.*, 2010). All enumerators were fluent local isiNdebele speakers familiar with the dialects in Tsholotsho, which helped build rapport and minimise misinterpretation (Chakraborty, 2020). A cognitive pre-test involving twelve participants from non-sample households was conducted to refine the wording and adjust response options to improve clarity, following recommendations by Willis (2015) on question testing. For participants with low literacy, the questionnaires were administered orally, supported by pictorial Likert scales showing sad, neutral and happy faces, a method shown to improve comprehension in rural African settings (Booyesen *et al.*, 2018).

Where technical items were unavoidable, relatable examples drawn from daily rural life were used to aid understanding. A detailed enumerator manual was prepared to standardise how clarifications were given and to reduce the risk of leading questions, aligning with best practices in field survey protocols (De Leeuw *et al.*, 2012). Enumerators took part in a full-day role-play exercise before fieldwork, simulating interviews and practising consistent use of probes. All participants were given the option to respond verbally and consent along with confidentiality assurances were explained in plain, straightforward language in accordance with ethical guidance for community-based research (Israel *et al.*, 2013).

3.8.2 Semi-structured interviews

Interviews can be used to find out what someone thinks and how they think about a particular topic (Jerry and Marcin, 2007). An interview is defined as a social encounter in which speakers collaborate to produce reflections and future explanations or versions of past or future behaviors,

experiences, feelings, attitudes, avoidances and thoughts (Seale, Giampietro, Gubrium and Silverman 2004; Bowen, 2009). For this study, semi-structured interviews (Willis *et al.* 2003) were conducted with key informants from government and non-governmental organisations (e.g. District Development Coordinator's Office, AGRITEX Department, District Social Welfare, District Council, Department of Public Works, Department of Health and District Education Department). Guided by the study objectives, a template to be used in guiding the interview sessions was developed.

Relevant questions were asked under each sub-heading drawn from the specific objectives. Interview guide assisted to ensure a flawless and focused conversation. The interviews were done at the interviewee's office after making an appointment in advance. The interviews were audio-recorded whilst note taking was done to capture non-verbal reactions and summarize key themes emerging during the discussions. Overall, the semi-structured interviews obtained information about manifestation of floods in the studied wards, response initiatives that are currently in place and how successful the initiatives are.

3.8.3 Direct field observations

Baker (2006) defines observation as a systematic recording of observable phenomena or behavior in the natural environment. One of the advantages of this method is that it allows the researcher to directly interact with the subject under investigation (Ngunduru, 2007; Driscoll, 2011). The use of observational methods is often guided by the adage "Seeing is believing," which suggests that witnessing an event firsthand enhances understanding and can provide stronger evidence of its existence or truth (Grass, 2005). In this study, direct field observations were conducted in situ during the years 2019 and 2020. The researcher used observation guides to document the typologies of damage caused by flooding to both natural environmental resources and social infrastructure, as well as the response mechanisms in place. Geo-tagged photographs were taken during these observations for further analysis and cross-referencing of the phenomena. These field observations were carried out concurrently with Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs).

3.8.4 Focus group discussions

A focus group discussion (FGD) is defined as a gathering of individuals with similar backgrounds and experiences to discuss a specific topic of interest (Gerritsen, 2011; Burman, 2011). In this study, a total of six FGDs were conducted across three wards, with two FGDs per ward. The discussion questions were developed based on the specific objectives outlined in Chapter 1. Each FGD consisted of 12 participants, with gender and age considerations taken into account. Both males and females were equally represented in each FGD and participants were at least 18 years of age.

To create a more comfortable environment for the female participants, the FGDs were conducted separately for males and females. This approach ensured that women could freely express their views on flood response initiatives, as mixing genders could potentially lead to reluctance in sharing their opinions due to the patriarchal nature of the society. This separation allowed the researcher to gather high-quality, unbiased information, as participants felt more at ease discussing the topic. The FGD method provided an opportunity to obtain insights that would have been difficult to gather through other methods. Listening to the experiences and thoughts of others encouraged participants to share their own stories (Lindlof and Taylor, 2002; Kimberellis and Dimitriadis, 2005). FGDs fostered combined learning and discovery through the interactions between researchers and participants, as well as among the participants themselves. This approach also helped to stir participants' collective memories, as they reminded each other of their lived experiences, leveraging group dynamics to generate in-depth discussions (Chiweshe, 2011).

To identify the response mechanisms for flooding in Tsholotsho District, a thorough review of relevant documents was conducted. This involved examining a variety of sources, including reports on flood response mechanisms. These sources ranged from books, journals and newspapers to films, television, art, music and videotapes of human interactions. Additionally, transcripts of conversations, situation reports, NGO reports, government reports and academic literature were analyzed. Particular attention was given to articles, pictures and videos that focused on the Tsholotsho floods, their effects on the community and the government's response to these events. These materials were sourced from newspapers, reports and online platforms. Through these resources, the researcher was able to document key events that occurred before the study began, providing valuable context for understanding the ongoing flood response efforts. The articles, videos and images were downloaded, analyzed and coded, with notes taken on

topics of interest for later in-depth analysis. Documentary sources were often easier to locate compared to other methods, requiring less time to access. This approach helped ensure a understanding of the response mechanisms and avoided the limitations of relying on a single narrative.

3.9 Data analysis procedures

Data analysis is the systematic process of transforming raw data into meaningful and useful information. Through identifying meanings, patterns, trends and interpretations from the raw data, researchers can gain a deeper understanding of the collected information. Depending on the nature and purpose of the study, the analyzed data can be used to support, refute, supplement, or even generate new theories (O'Neal and Schutt, 2013; Bogdan and Biklen, 1998).

Once the data was collected, the next step was to derive insights and meaning from it. For quantitative data collected through questionnaires, the first stage of analysis was data preparation, which aimed to convert raw data into something meaningful. This stage included data validation to ensure that data collection was performed according to standards and without bias. Following validation, the data was edited to identify errors and missing information before being coded and input into a Microsoft Excel spreadsheet. The statistical software IBM SPSS 25 was used to process and analyze the quantitative data through both descriptive and inferential statistical techniques.

For qualitative data, thematic analysis was applied to process the transcribed interviews, while a hermeneutic approach was used to analyze secondary data. Quantitative data were then exported to SPSS 25.0 for further analysis at a 95% confidence level. The first level of analysis involved descriptive statistics, which were used to determine the frequency of damage typologies caused by flooding to both natural resources and social infrastructure in Tsholotsho District. To facilitate the interpretation of data, various tools such as tables and graphs were employed to present the frequencies of responses effectively.

In addition to descriptive statistics, inferential statistics were employed for further statistical analysis to determine the nature of the association between demographic characteristics and the functionality of existing institutional arrangements for managing flood-induced disasters in Tsholotsho District. To assess the normality of the data, the Kolmogorov-Smirnov test was conducted, which helped determine the appropriate statistical test for subsequent analysis. This

ensured that the statistical methods used were suitable for the distribution of the data, thus improving the reliability and validity of the results.

In this research, the Chi-square test was used to statistically test the association between household characteristics (gender, marital status, household size, education, number of years a family has stayed) and typologies of damage caused by flooding on natural environmental resources and social infrastructure. Cross tabulation of data on typologies of damage caused by flooding on natural environmental resources and social infrastructure was done. Kruskal–Wallis tests were used to statistically show the significance of differences in household perceptions of future projection of flood impacts in light of the existing threats.

The qualitative data collected through open-ended questions in the questionnaire and semi-structured interviews underwent a thorough data cleaning process to ensure completeness and accuracy. This involved reviewing the data for errors and missing responses, creating a list of all variables, labels and codes and matching these with the data files. The next step was to identify key variables for analysis, ensuring that all responses were complete and there were no missing values. Missing data, which is common in surveys, was addressed by ensuring that only complete responses were included in the analysis. The qualitative data were then categorized into codes with meaningful titles. Open coding was applied, where, for example, the respondents' ages were assigned numerical codes: 1 for below 20 years, 2 for 21-25 years, 3 for 26-30 years, 4 for 31-35 years, 5 for 36-40 years and 6 for 55 and above.

This coding process allowed for easier analysis and comparison of responses. The data were then subjected to content analysis, wherein emerging themes, patterns and relationships were identified. Content analysis involved the development of categories or codes from the textual data, allowing the researcher to group similar responses together. These categories were then summarized and presented in tabular format to capture the various perspectives of the respondents. Error bars were utilized in the presentation of data to visually indicate whether significant differences existed between the various variables, further enriching the analysis and interpretation of the findings. Quantitative data from the questionnaire were coded in SPSS and analysed using descriptive and inferential statistics. The following hypotheses - indicate method used for each:

Table 3.2: Study Objectives, Hypotheses and Analytical Methods

Objective	Null Hypothesis (H_0)	Alternative Hypothesis (H_1)	Method of Testing
<i>1. Examine damage typologies caused by flooding in Tsholotsho District.</i>	H_{01} : Flooding does not vary by typology across natural resources and social infrastructure.	H_{11} : Flooding varies by typology across natural resources and social infrastructure.	Chi-square test of independence to compare frequencies of reported damage types between categories; Cramer's V used to measure effect size.
<i>2. Determine factors influencing the effectiveness of flood response mechanisms in Tsholotsho District.</i>	H_{02} : No factors significantly influence the perceived effectiveness of flood response mechanisms.	H_{12} : Certain factors significantly influence the perceived effectiveness of flood response mechanisms.	Kruskal–Wallis H test applied to Likert-scale ratings to assess differences across respondent groups; eta-squared used to estimate effect size.
<i>3. Assess the functionality of existing institutional arrangements for managing flood-induced disasters in Tsholotsho District.</i>	H_{03} : Institutional arrangements are not functionally associated with improved flood management outcomes.	H_{13} : Institutional arrangements are functionally associated with improved flood management outcomes.	Chi-square test of independence used to explore association between functionality ratings and reported outcomes; Cramer's V reported for strength of association.
<i>4. Develop a localised flood response framework to enhance the resilience of livelihoods in Tsholotsho District.</i>	No statistical null hypothesis – objective is design-oriented and addressed qualitatively.	H_{14} : A localised flood response framework can enhance the resilience of livelihoods in Tsholotsho District.	Thematic analysis of qualitative data from key informant interviews and focus group discussions to inform framework development.

Source: Researcher Conceptualisation

The use of SPSS in this study was essential for its robust capabilities in handling complex data analysis, ensuring precision and facilitating the extraction of meaningful insights from the collected data. As a widely recognized software in quantitative research, SPSS offers tools for conducting both descriptive and inferential statistical analyses with high accuracy. Its user-friendly interface simplifies the data management process, from data cleaning and coding to visualization and hypothesis testing. This is particularly important for this study, which involved analysing a substantial amount of data related to flooding impacts, institutional functionality and household characteristics in Tsholotsho District. Through employing SPSS, the study was able to conduct

tests like the Chi-square and Kruskal–Wallis with statistical rigor, ensuring reliable results that could be confidently interpreted and linked to the research hypotheses.

SPSS was also integral in meeting the methodological requirements of the study, especially in exploring relationships between variables and determining statistical significance. For instance, the Kolmogorov–Smirnov test conducted through SPSS enabled the selection of appropriate statistical methods for data analysis, ensuring the integrity of the inferential statistics applied. Furthermore, SPSS's ability to generate tables, graphs and error bars allowed for the clear presentation of results, aiding in the identification of patterns and trends within the data. The software's efficiency in handling cross-tabulations and multivariate analyses was crucial in testing hypotheses, such as assessing the association between household characteristics and flood damage typologies and evaluating the effectiveness of institutional response mechanisms. Thus, SPSS not only streamlined the data analysis process but also enhanced the credibility and depth of the research findings. The summary of analysis is presented in Table 3.3.

Table 3.3: Summary of Analysis

Objective	Type of Data	Data Source	Data Analysis
<i>To examine the typologies of damage caused by flooding on natural environmental resources and social infrastructure.</i>	Qualitative descriptions of damage typologies to natural resources and social infrastructure; quantitative counts of reported cases.	Questionnaires, key informant interviews, focus group discussions, local records and official reports on flooding impacts.	Qualitative data coded and categorised thematically; quantitative data summarised using descriptive statistics. Chi-square test applied to examine variation in typologies, with Cramer's V for effect size.
<i>To determine the factors that influence the effectiveness of flooding response mechanisms.</i>	Perceptions and ratings of factors influencing response effectiveness; descriptions of operational mechanisms.	Questionnaires, key informant interviews, focus group discussions.	Thematic analysis of qualitative responses; quantitative Likert-scale data analysed with descriptive statistics and Kruskal–Wallis H test to compare responses across groups; eta-squared calculated for effect size.
<i>To assess the functionality of existing institutional arrangements for managing flood-induced disasters.</i>	Qualitative accounts of institutional roles and coordination; quantitative ratings of functionality.	Questionnaires, key informant interviews, focus group discussions.	Thematic analysis of qualitative data; Chi-square test used to assess associations between functionality ratings and perceived outcomes, with Cramer's V reported for strength of association.
<i>To suggest a framework for enhancing the efficiency of flooding disaster response mechanisms.</i>	Qualitative synthesis of best practices and gaps from earlier objectives; prioritised attributes of a localised framework.	Questionnaires, key informant interviews, focus group discussions; review of disaster management literature.	Integrative analysis combining thematic patterns and statistical results from Objectives 1–3 to design the proposed framework, supported by literature-based validation.

3.10 Ethical considerations

Research ethics reflects a range of methodological practices within specific social and cultural contexts and is concerned with the moral choices that influence the choices and behaviors of target populations and the differences between inherently right and wrong actions. Defined as complex constructs related to principles (Greener, 2008; Powell and Fitzgerald, 2012). Ethical issues are part of the research process and exist at all stages of research (Israel, 2015). The researcher must, therefore, be aware and act appropriately at the various stages (Willows, 2017).

Before commencing data collection, ethical clearance was obtained from the University of Venda to ensure the protection of participants' anonymity, confidentiality and informed consent throughout the study. Ethical guidelines were rigorously followed to uphold the rights and privacy of all participants. Participants were fully informed about the aims and objectives of the study, the reasons for their selection, any potential risks and the contact details of the research supervisor for additional information. The permission to conduct the research was granted by the Ministry of Local Government and Public Works.

In adherence to cultural protocols, permission was also sought from traditional leaders before engaging with villagers. This step is essential in Zimbabwean communities as it respects the authority of traditional leaders, who might otherwise feel disrespected if consent is not first obtained. The purpose of the study was clearly explained to all participants to ensure they understood the importance of the research both in their personal capacity and as members of the broader community. Prior to the commencement of interviews or the distribution of questionnaires, all participants were asked to give either verbal or written consent. Explicit permission was also sought from participants to record audio and video and take photographs for the study.

To ensure participants' comfort, confidentiality was guaranteed, encouraging them to share their views openly without fear of exposure. Participation was voluntary and participants were informed that they had the right to withdraw at any point without facing any negative consequences. If at any time participants felt uncomfortable or intimidated, they were encouraged to withdraw from the study. All research activities were conducted in a manner that prioritized the safety and comfort of participants. Villagers were engaged in their natural settings, where they typically meet for community discussions. Special care was taken to ensure that children and youth were engaged in safe environments and protected from adverse weather conditions during data collection.

The study fully respected universal rights, including freedom of expression, in line with Article 13 of the United Nations Convention on the Rights of the Child (UNCRC), which guarantees children's right to freely express their views. The Zimbabwean Constitution's Bill of Rights, which guarantees fundamental rights such as freedom of expression and freedom of association, was also adhered to throughout the study.

3.11 Validity and reliability

Reliability and validity are fundamental to the quality and credibility of research (Brink, 1993). In this study, meticulous attention was paid to these aspects to ensure robust and trustworthy findings. Reliability refers to the consistency of research outcomes, indicating that the study's findings can be replicated under similar conditions (Leung, 2015). In other words, the research process and results must be repeatable. To maintain reliability, the researcher adhered to a clear and transparent approach, documenting all decisions, processes and materials used during data collection, such as the dates of interviews and their locations. This documentation ensured that the research could be reproduced with the same procedures, offering a duplicable trail.

To enhance the robustness of the study's measurements, both qualitative and quantitative validation procedures were applied. Content validity was ensured through the expert review of all research instruments by two university-based disaster risk reduction (DRR) scholars and two district-level practitioners with extensive experience in flood management in Tsholotsho. Feedback from these reviewers was recorded in a structured change log and necessary amendments were incorporated before the commencement of data collection (Heale and Twycross, 2015). A pilot test involving fifteen households from a non-sampled village was conducted to refine question wording, sequencing and skip logic. This pre-testing process also allowed for assessment of respondent comprehension and completion time. Revisions were implemented based on pilot feedback and all pilot data were excluded from the main analysis (Van Teijlingen and Hundley, 2001).

Construct validity for multi-item scales, such as perceived early warning system functionality and institutional coordination, was evaluated using the Kaiser–Meyer–Olkin (KMO) measure and Bartlett's test of sphericity. The KMO statistic for the dataset was 0.784, exceeding the recommended 0.60 threshold for sampling adequacy (Field, 2018). Bartlett's test yielded a statistically significant result ($\chi^2 = 645.21$, $df = 120$, $p < 0.001$), confirming the suitability of the data for factor analysis. Internal consistency reliability was assessed through Cronbach's alpha, with results ranging between 0.71 and 0.88 for the multi-item indices. These values indicate acceptable to high reliability, consistent with the benchmark suggested by Taber (2018). For the qualitative strand, inter-coder reliability was established by double-coding 20% of interview and focus group transcripts. The resulting Cohen's kappa coefficients ranged from 0.72 to 0.81, reflecting substantial agreement between coders (Landis and Koch, 1977).

Triangulation was achieved through the integration of findings from key informant interviews, focus group discussions, household surveys and direct observations. Further validation occurred through member checking sessions with the District Civil Protection Committee, where preliminary interpretations were presented for feedback and confirmation (Birt *et al.*, 2016). Potential common-method bias was mitigated during instrument design through measures such as the assurance of anonymity, counterbalancing of items and the use of varied question formats. A Harman's single-factor test was subsequently conducted, with results indicating that the first factor accounted for 32.4% of the variance well below the 50% threshold commonly associated with bias risk (Podsakoff *et al.*, 2003).

3.12 Chapter Summary

This chapter outlined the methodological choices that guided the study on the effectiveness of flood response mechanisms for building resilient livelihoods in Tsholotsho District. The research adopted an exploratory design, underpinned by a pragmatic orientation, to allow the use of both qualitative and quantitative techniques in generating robust and contextually relevant findings. Three wards 6, 7 and 8 were purposively selected based on their classification by the Civil Protection Unit as the most affected by flooding. Data were collected through household surveys, key informant interviews and focus group discussions, providing perspectives from community members, traditional leaders, government officials and humanitarian actors. Stratified random sampling was used for household selection to ensure proportional representation, while purposive and snowball sampling were applied to identify key informants and relevant organisations. The sample size of 169 households was determined using Cochran's formula with finite population correction, balancing statistical reliability with logistical feasibility.

The analysis plan integrated descriptive and inferential statistics for quantitative data, including chi-square tests, Kruskal–Wallis tests and effect size measures such as Cramer's V and eta-squared, to examine relationships between variables and test hypotheses. Qualitative data from interviews and discussions were analysed thematically to capture nuanced community experiences and perceptions. Ethical considerations were strictly observed, with informed consent obtained from all participants and confidentiality assured throughout the process. The methodology was designed to ensure that the findings are not only credible and replicable but also relevant to the realities of Tsholotsho's disaster management environment. In that regard, the chapter provides a transparent account of the research design, data collection procedures

and analytical approaches, forming a solid foundation for interpreting the results presented in Chapter Four.

CHAPTER FOUR : RESULTS OF THE STUDY

4.1 Introduction

This chapter presents the findings of the study, highlighting the demographic characteristics of respondents and their implications for the broader analysis. It systematically explores the diverse impacts of flooding on natural environmental resources, social infrastructure and community livelihoods in Tsholotsho District. Through detailing demographic profiles, the chapter provides a foundational understanding of the study's population, enabling nuanced interpretations of how socio-economic and cultural factors shape perceptions and experiences of flooding. Furthermore, the results emphasize the intersection between vulnerability and resilience, with specific attention to gender, education levels and household dynamics, offering insights into the socio-demographic contexts influencing flood response and mitigation efforts. The chapter also investigates the typologies of flood damage, focusing on the destruction of infrastructure, the loss of natural resources and socio-economic disruptions. Drawing from both quantitative and qualitative data, it maps the most affected areas and examines the efficacy of existing flood management mechanisms. In doing so, the chapter provides a critical analysis of systemic barriers to effective disaster response, such as limited resources, resistance to relocation and inadequate early warning systems. These findings underscore the urgent need for tailored interventions and policy reforms to enhance community resilience and reduce the adverse impact of flooding, laying the groundwork for evidence-based recommendations in subsequent chapters.

4.2 Demographic profile of respondents

In this section, results on the demographics of the respondents selected for the study is presented, including their gender, marital status, age and duration of stay in Tsholotsho District. The findings obtained show that of all the respondents, females constituted 54% of the total respondents, while males constituted 45% (see Table 4.1). The demographic profile of respondents serves as a foundational element for contextualizing and interpreting the study's findings, providing a lens through which to examine the complexities of social and behavioral patterns in Tsholotsho District. The gender distribution, with females comprising 54% and males 45%, highlights a slightly higher representation of women, which may reflect broader social dynamics, such as gender roles or accessibility during the sampling process. Understanding this distribution is critical, as it allows for an exploration of gendered perspectives, ensuring that the study captures a balanced representation of experiences. This aspect is particularly relevant in contexts where gender might

influence access to resources, decision-making, or lived experiences within the district. Such representation is also crucial for formulating inclusive policy recommendations that address the unique needs and contributions of both genders.

the inclusion of variables such as marital status, age and duration of residence provides a multi-dimensional understanding of the respondent pool. These factors allow for a deeper examination of how demographic characteristics intersect to shape individual and collective experiences within the district. For instance, marital status may influence household dynamics and community engagement, while age offers insight into generational perspectives on local challenges and opportunities. Duration of residence, on the other hand, provides an indicator of respondents' familiarity with the area and their potential depth of experience with local issues. Collectively, these demographic variables enrich the analysis by enabling a nuanced interpretation of the findings, fostering a understanding of the population under study and laying the groundwork for recommendations that are sensitive to the diverse realities of the community.

The majority of the respondents (71%) were married, while 16% were divorced, 10% were widowed and lastly, 3% were recorded as single (Table 4.1). The relationship between marital status and migration is context-dependent, influenced by a complex interplay of social, economic and cultural factors. In the case of Tsholotsho District, the high proportion of married respondents (71%) suggests the prevalence of stable household structures, which might influence mobility patterns. Married individuals often face constraints or incentives that shape their migration decisions differently from those who are single, divorced, or widowed.

For example, married individuals may be less likely to migrate independently due to family obligations or shared economic responsibilities, while their migration decisions may be collectively negotiated within the household. Conversely, marital status can also act as a driver of migration in certain contexts, particularly where family reunification or the need to secure better opportunities for dependents is a motivating factor. Understanding this dynamic requires a deeper exploration of the local socio-economic conditions in Tsholotsho, as well as cultural norms governing marriage and family life. As such, while the results indicate a majority of married respondents, the influence of marital status on migration probabilities remains an empirical question that warrants further investigation in this specific context.

Table 4.1: Demographic Data of Questionnaire Respondents

Variable	Category	Frequency	Percentage
Gender	Males	63	45
	Females	77	55
Age, years	Below 20	2	2
	21-25	10	7
	26-30	21	15
	31-35	15	11
	36-40	27	19
	41-45	18	13
	46-50	17	12
	51-55	14	9
	55+	16	10
Marital status	Single	4	3
	Married	99	71
	Divorced	21	16
	Widowed	14	10
Education	Non-formal	6	4
	Primary	24	13
	ZJC	32	23
	Completed secondary	38	27
	Tertiary	46	33

Source: Survey data (2025).

In terms of education, approximately 33% of the respondents had attained tertiary education as their highest qualification, while 27% had completed secondary education. Education plays a crucial role in shaping an individual's perception, attitude and behavior toward various phenomena. In this study, the educational background of households was a key factor in influencing their awareness of flood risks and their attitudes toward government and stakeholder interventions for flood management. Higher levels of education were expected to correlate with greater preparedness and a more informed perspective on flood mitigation measures. Education plays a pivotal role in shaping how individuals perceive, interpret and respond to risks such as flooding.

Those with tertiary education (33% of respondents) are likely to have greater access to information and resources, enabling them to better understand the causes, impacts and potential mitigation strategies for flood risks. Higher education levels often correlate with increased critical

thinking and analytical skills, which can enhance individuals' ability to anticipate risks and evaluate the effectiveness of government and stakeholder interventions.

For example, educated households may be more inclined to seek scientific explanations, trust early warning systems and adopt preventive measures such as relocating from high-risk areas or improving their housing structures. Conversely, individuals with lower levels of education may rely on traditional knowledge or community norms, which, while valuable, might limit their ability to fully engage with or critique formal policies and interventions. Therefore, the education status of respondents not only influenced their anticipation of flood risks but also shaped their attitudes towards and participation in reform processes, highlighting its significance in risk governance and community resilience strategies.

4.3 Duration of stay of respondents in the district

Understanding the duration of respondents' stay in an area is crucial for contextualizing their knowledge, experiences and perceptions of local phenomena. Long-term residents often possess deeper insights into historical patterns and events, such as flooding, which are invaluable for evaluating the effectiveness of past and present interventions. This information enhances the reliability and credibility of the study's findings by grounding them in lived experiences and long-term observations. Concerning the duration of stay in the district, the results show that about 31% of the respondents have been staying in the district for over 16 years (Figure 4.1).

They have settled in the area a long way back when the country obtained its independence status. Hence, they moved freely to these ideas despite several calamities they would experience. To support this, the Ward councilor for wards 6, 7 and 8 confirmed that dating back, the area had less number of people but has since increased which explains why some had stayed for a decade and less in the area. Additionally, long-term residents of Tsholotsho possessed in-depth knowledge of the district's flooding history and provided valuable baseline information on the effectiveness of past interventions. Their lived experiences offered critical insights into how flood management strategies had evolved over time and their overall impact on the community.

The period of stay in the area was crucial since it had a bearing on the quality of responses obtained with regards to the phenomenon under investigation which thus ensured the credibility of the findings derived. Results also show that about 22% had stayed in the area for about 6-10 years hence they were also regarded to be knowledgeable considering the time stayed (Figure

4.1). Added to the above, about 17% had also stayed in the area for 2-5 years and were regarded as new with little experience with issues about floods and their devastating impacts. On the other hand, 11% indicated that they had stayed in the area for less than one year and these were regarded as new with less experience related to the flooding phenomenon. However, error bars revealed that there were no significant differences with regards to the period stayed in the area except for those who had stayed over 16 years in the area. Research findings from the Focus Group Discussion FGDs that were conducted also demonstrated that there are variations in terms of the number of years that individuals had stayed in the area. They explained that this attribute has a significant bearing in terms of the wealth of knowledge possessed by each respondent as some would not have experienced the impact of flooding and well versed on the various types of flood impacts.

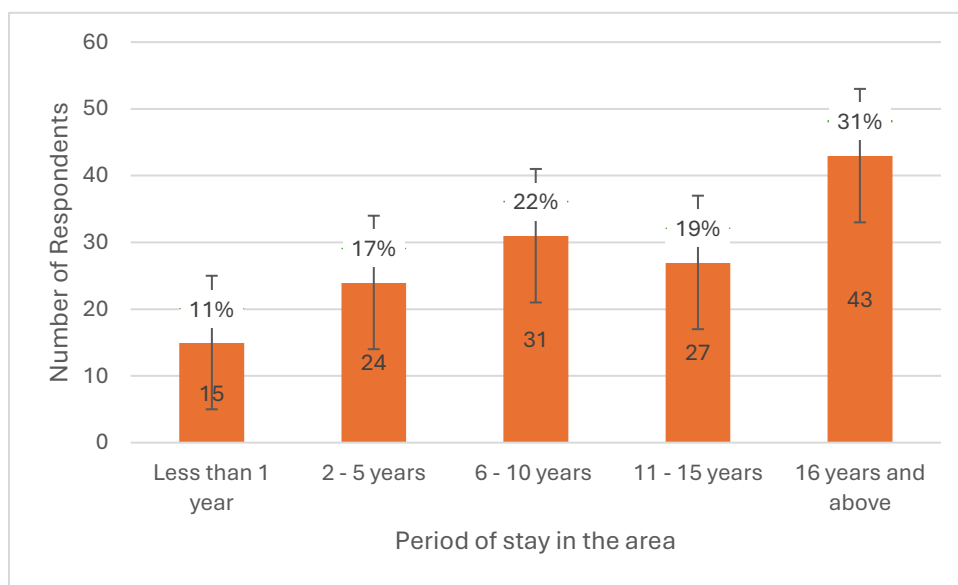


Figure 4.1: Period of Stay in the area

Source: Survey data (2025).

4.4 The types of damage caused by flooding on natural environmental resources and social infrastructure in Tsholotsho district

The effects of flooding on natural environmental resources and social infrastructure within grassroots communities of Tsholotsho District were also examined. Descriptive analysis results demonstrated that flooding negatively impact several natural environmental resources. In order

to ascertain this, mapping of the most hard-hit areas was done with the results shown in Figure 4.2. Results from the mapping and interpretation phases show that Ward 6, 7 and 8 of Tsholotsho District were hard-hit by the impact of flooding which manifested in several ways. To support this, findings from the FGDs conducted also observed that flooding was a natural phenomenon that always hard hit the area as it has been noted and observed to have several impacts. This explains why the District Development Coordinator called for the need to develop mechanisms to manage floods and reduce the impacts as it affected people's lives hence compromising efforts aimed at achieving Sustainable Development Goals.

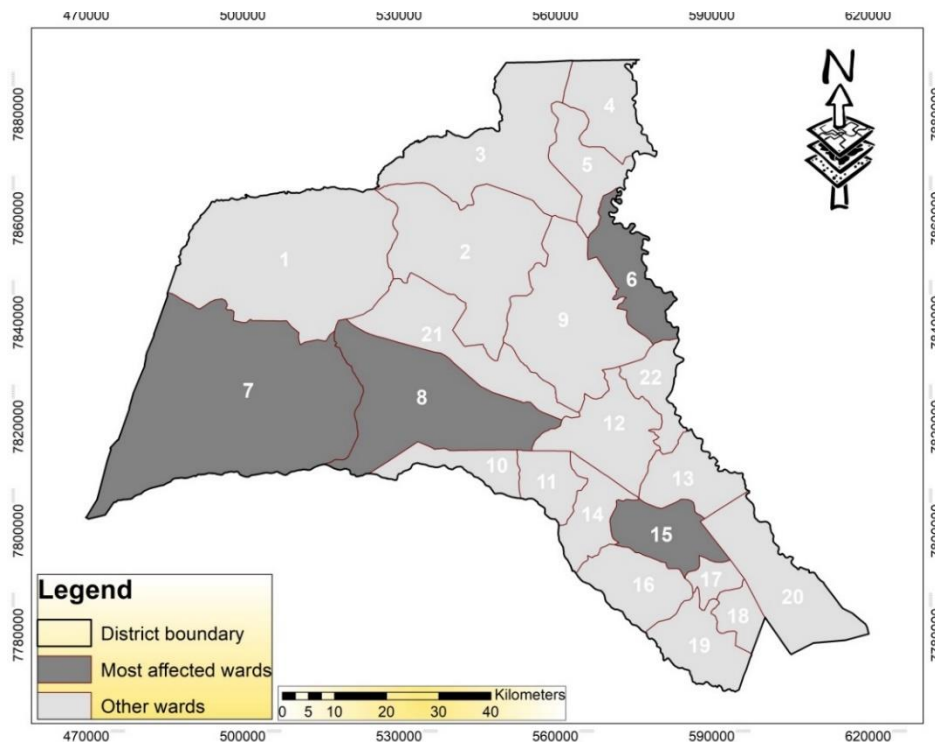


Figure 4.2: Map of significantly affected wards

4.4.1 Environmental Impacts of Flooding in Tsholotsho

Flooding in Tsholotsho District, particularly in Wards 6, 7 and 8, has caused extensive environmental damage, as demonstrated by the mapping results. One of the most significant impact is the widespread loss of vegetation, with large tracts of grazing lands and agricultural fields submerged during the flooding season. This destruction reduces agricultural productivity and deprives livestock of grazing areas, threatening the livelihoods of households dependent on subsistence farming. Additionally, floodwaters have led to severe soil erosion, washing away

fertile topsoil and rendering the land barren in some areas. The degradation of the natural landscape contributes to declining food security and increases the vulnerability of local communities to future climatic events. Another notable impact is the contamination of water sources, including rivers, boreholes and wells.

During flooding events, debris and silt are deposited into water bodies, making them unfit for human consumption and disrupting aquatic ecosystems. Respondents in Ward 6 highlighted that after flooding, access to clean water became a challenge, with most households forced to rely on untreated and potentially unsafe water sources. This has significant health implications, as contaminated water has been linked to an increase in waterborne diseases such as cholera and dysentery. Likewise, wetlands, which are critical ecosystems for biodiversity, were reported to have been degraded due to excessive waterlogging, resulting in loss of habitat for various plant and animal species. These findings provide empirical evidence that challenges the null hypothesis, demonstrating that flooding causes significant damage to natural environmental resources in Tsholotsho District.

Findings from the Focus Group Discussions (FGDs) corroborated these observations, providing qualitative insights into the environmental impacts of flooding. Participants noted that floods in Wards 6, 7 and 8 are not a new phenomenon but have intensified over recent decades due to climate variability and changes in land use patterns. In particular, participants emphasized the loss of indigenous tree species, which play a vital role in regulating the microclimate and supporting wildlife. The destruction of these natural assets has ripple effects on the community, reducing access to firewood and other forest-based resources critical for household survival. Participants also highlighted that flooding disrupts the balance of ecosystems by displacing wildlife, which often migrates into human settlements, leading to increased human-wildlife conflicts. This issue was particularly severe in Ward 8, where residents reported incidences of crocodile attacks following heavy rains.

The FGDs further revealed that flooding exacerbates the challenges of waste management, as debris and human waste from settlements are often swept into rivers and open spaces, further polluting the environment and creating public health hazards. This underscores the urgent need for sustainable flood management strategies that prioritize both environmental conservation and community resilience. Through detailing these environmental impacts and their implications for livelihoods and ecosystems, the findings highlight the urgency of implementing flood mitigation mechanisms in Tsholotsho District. Addressing these issues is critical to achieving Sustainable

Development Goals, particularly those related to environmental sustainability, health and poverty reduction.

4.4.2 Analysis of the Typologies of Flooding Damages

Flooding in Tsholotsho District has caused a range of devastating impacts on both the environment and the socio-economic fabric of the community. The survey results reveal the most significant damages experienced by the respondents, with the loss of lives emerging as the most catastrophic impact, affecting approximately 70% of respondents. This was followed by the destruction of infrastructure (50%) and the loss of livestock (40%). Additionally, health issues such as waterborne diseases were reported by 30% of respondents and the degradation of soil nutrients due to prolonged flooding also affected 45% of the population. These typologies of damage demonstrate the severity of the flooding impacts on local communities, illustrating how the phenomenon affects both human and environmental systems. The following graph provides a detailed breakdown of these impacts, highlighting the percentage of respondents affected by each damage type, along with error bars showing the variability in responses.

Flooding impact within Tsholotsho District have been observed to manifest in diverse ways, with the distinction between "drowning" and "loss of life" emerging as critical for understanding the data. Drowning refers explicitly to fatalities caused by individuals being submerged in floodwaters during sudden or unexpected flooding events. These instances typically occur due to swift water currents or individuals being caught unprepared by rising water levels. In contrast, "loss of life" encompasses a broader scope, including fatalities indirectly linked to flooding, such as those resulting from injuries during evacuation efforts, prolonged exposure to adverse weather conditions, or the unavailability of critical medical care during and after the floods. Differentiating these categories is essential to understanding the multifaceted nature of flood-related risks and fatalities, which can guide the development of more targeted and disaster response strategies.

The infrastructure damages caused by flooding in Tsholotsho District were diverse and extensive, affecting critical systems essential for community functioning. Roads and bridges were among the most severely damaged, with many being washed away or rendered impassable, thereby cutting off access to essential services and isolating affected communities. The destruction of schools disrupted education, forcing children to miss extended periods of learning, while damaged clinics hindered the delivery of healthcare services to vulnerable populations.

4.4.3 Typologies of impacts of flooding on livelihoods, natural resources and social infrastructure

Irrigation systems crucial for agricultural productivity were destroyed, adversely affecting food security and the livelihoods of many households reliant on farming. These impacts on infrastructure highlight the urgent need for resilient systems capable of withstanding extreme weather events and ensuring continuity in service delivery during crises. Figure 4.3 shows the typologies of damages posed by flooding in the district.

Waterborne diseases also emerged as a significant impact of flooding, representing a public health challenge in the aftermath of such disasters. Diseases such as cholera and typhoid became prevalent due to the contamination of water sources by floodwaters, which often carry pollutants, sewage and pathogens into drinking water supplies. The outbreaks of these diseases are an indirect yet severe consequence of flooding, demonstrating how the failure of water management and sanitation systems exacerbates vulnerabilities in affected communities. These health challenges are particularly detrimental as they strain already limited healthcare infrastructure and resources, compounding the impacts of the disaster on local populations. The survey findings and focus group discussions further reinforced the widespread and varied impacts of flooding in the district.

Respondents highlighted how the damage to infrastructure, coupled with the outbreak of waterborne diseases, created long-term challenges for recovery and development. The destruction of essential services not only disrupted daily life but also compromised efforts to achieve key Sustainable Development Goals, such as those related to education, health and food security. These findings emphasize the need for integrated flood management approaches that address both immediate impacts and long-term vulnerabilities through investment in resilient infrastructure, effective water and sanitation systems and community-based disaster preparedness programs.

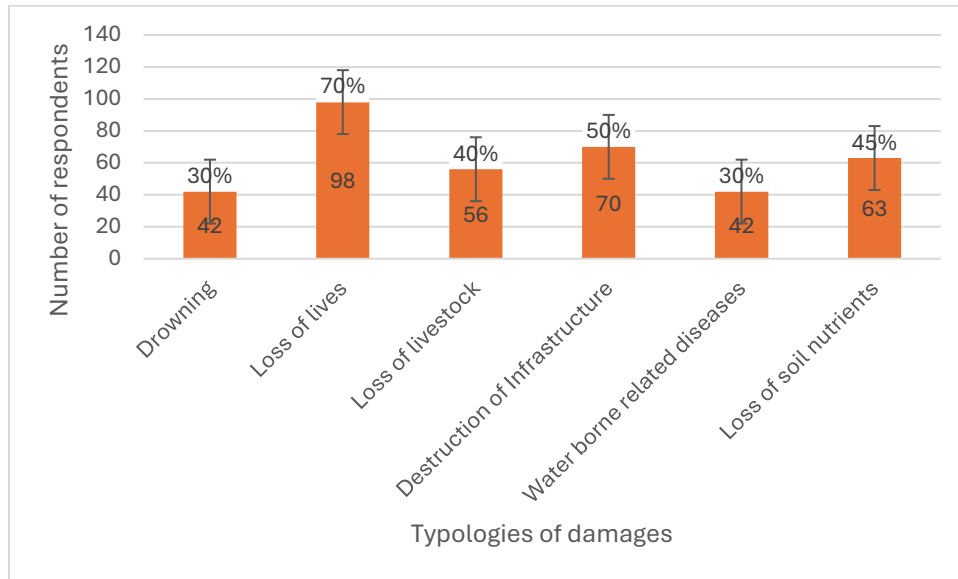


Figure 4.3: Typologies of damages posed by flooding in the district.

Source: Survey data (2025).

4.4.3.1 Loss of lives

The results show that the majority of the respondents (70%) indicated that loss of lives was a major pressing problem posed by flooding (Figure 4.3). The results show that the majority of the respondents (70%) indicated that loss of lives was a major pressing problem posed by flooding (Figure 4.3). This suggests that flooding has had a direct and devastating impact on human life, surpassing other forms of damage such as the loss of livestock or destruction of property. The high percentage of respondents citing loss of lives as the most significant impact could be attributed to several factors. First, the sudden and unpredictable nature of flooding in the district often catches communities unprepared, resulting in casualties during the flooding events. Respondents highlighted those areas near rivers or low-lying zones, where populations have settled due to access to water and fertile lands, are particularly vulnerable, making escape or timely evacuation challenging.

Besides, the lack of early warning systems and limited disaster preparedness further exacerbates the risk of loss of lives during flooding events. Participants in the focus group discussions explained that poor communication and inadequate infrastructure to disseminate flood alerts left many unaware of impending danger, resulting in delays in evacuation. These factors, coupled with limited access to rescue services or safe evacuation points, contribute to the high mortality

rates associated with floods in the district. These findings provide strong evidence that refutes the null hypothesis, confirming that flooding in Tsholotsho District has severe and multifaceted impacts on social infrastructure, particularly through significant loss of human life.

In comparison, while livestock loss was also a significant impact, cited by 40% of respondents, it did not surpass the human toll in terms of severity. This difference can be attributed to the ability of some community members to prioritize saving their livestock during flooding, as animals are essential for livelihoods and food security. However, the focus on human life as the primary concern underscores the emotional and social weight placed on family and community members lost during these disasters. Additionally, the loss of livestock and other damages often follow as secondary effects once lives are already at risk or lost, further cementing the critical importance of prioritizing life-saving interventions during floods.

Addressing the high rates of loss of lives due to flooding requires urgent interventions, including the establishment of community-based early warning systems, improved evacuation plans and investment in flood-resistant infrastructure. These measures can significantly reduce the vulnerability of populations, particularly in high-risk areas, ensuring that lives are protected even during severe flooding events. Furthermore, integrating flood education and preparedness into community programs can empower residents with the knowledge and tools to mitigate the devastating impacts of future floods.

During an interview with the District Social Services Officer, it was explained that flooding has resulted in the collapse of lineages, as in some cases, most members of a family perish or are displaced, making it difficult for surviving members to trace or reconnect with relatives. This incident is particularly common in severe flooding incidents where entire homesteads are swept away and family members are scattered to distant locations, often without communication channels. Additionally, the loss of key family documents, such as birth certificates and identification records, exacerbates the challenge of reconstructing family networks, further highlighting the need for strategies to cushion local people from the impacts of flooding. It was also established that the most devastating flood occurred in 2019 with extensive impacts on the natural and socio-economic environment.

The devastating flood of 2019 was widely acknowledged as the most destructive event in Tsholotsho District, with significant loss of life and widespread damage to both infrastructure and the environment. Evidence from local government records indicated that the 2019 floods led to

the loss of more than 50 lives across the district, the highest number in any recorded flood event in the past decade. Additionally, over 500 households were displaced, with families losing their homes and livelihoods. A large number of schools, clinics and roads were also severely damaged, affecting the ability of the community to recover quickly. Comparatively, the 2019 floods exceeded previous years in terms of fatalities and infrastructural destruction, as earlier floods in 2014 and 2016 had fewer recorded casualties and less widespread damage.

Furthermore, data from the District Social Services Officer and local authorities confirmed that the 2019 floods caused unprecedented disruptions to local socio-economic activities. Many schools were forced to close for extended periods and a substantial number of small businesses were either destroyed or unable to operate due to damaged roads and loss of property. In contrast, while flooding in earlier years had caused localized damages, the scale of destruction in 2019 was far greater, affecting more people and leaving the community struggling to cope. These comparisons highlight the unique severity of the 2019 flooding event and underscore the need for enhanced flood management strategies to mitigate future risks and impacts. The comparison of flood impacts over the years further reinforces the rejection of the null hypothesis, illustrating the increasing severity of flood-related damages and the inadequacy of current response mechanisms in safeguarding lives and livelihoods.

The 2019 flooding in Tsholotsho District was particularly severe, with a total of 246 lives lost, which far surpassed the number of fatalities in previous years. For instance, the floods of 2014 and 2016 resulted in far fewer casualties, with 120 and 150 fatalities respectively, as reported by local authorities. The significant increase in loss of life in 2019 can be attributed to a combination of factors, including the unusually high rainfall during the flood season, which overwhelmed existing flood mitigation measures. Additionally, many communities were caught off guard by the magnitude of the disaster, with limited preparedness and fewer early warning systems in place to evacuate at-risk populations. As such, the 2019 floods were much deadlier, underscoring the growing vulnerability of the area to extreme weather events. In terms of displacement, the 2019 floods also had a much greater impact compared to previous years. A total of 319 individuals were left homeless, with Sipepa Hospital being converted into a temporary shelter for those affected.

In contrast, the 2014 and 2016 floods displaced significantly fewer people, with around 150 and 200 people, respectively, being temporarily housed in various shelters across the district. The villages of Matipula, Manyange, Mbanyai and Mahlava in Ward 6 were identified as the most

severely affected, with widespread damage to homes, crops and infrastructure. The 2019 flood damage, both in terms of lives lost and displacement, was unparalleled in recent history, highlighting the urgent need for improved flood resilience strategies in Tsholotsho District. The patterns observed in the increasing frequency and severity of flood-induced mortality and displacement further disprove the null hypothesis, highlighting the urgent need for effective flood management interventions in the district.

4.4.3.1 Destruction of physical and social infrastructure

Physical and social infrastructure refer to the essential services and structures that support the daily functioning of a community, economy and society. Physical infrastructure includes tangible assets such as roads, bridges, schools, hospitals and homes, which facilitate mobility, access to services and provide a safe living environment. Social infrastructure, on the other hand, pertains to the institutions and services that contribute to the social well-being of the community, including education, healthcare and community centers. These infrastructures are vital for maintaining a high quality of life, fostering social cohesion and supporting economic activities. When flooding occurs, as seen in Tsholotsho District, both physical and social infrastructure are severely affected, disrupting normal activities and services and exacerbating the vulnerability of the population, especially in rural areas where such resources are already limited. The damage to these infrastructures further highlights the need for effective disaster preparedness and rehabilitation efforts.

The result show that half of the respondents (50%) indicated that destruction of basic and social infrastructure was another problem posed by flooding (Figure 4.3). According to these respondents, the district experienced severe flooding in 2017 due to Cyclone Dineo, which caused extensive damage to homes, livelihoods, bridges, clinics, hospitals, schools and roads. To support this, the District Development Coordinator echoed that loss of infrastructure was a major issue that hit the area and this was more significant in Wards 6, 7, 8 and 15 at times forcing school children not to attend their lessons which also piled pressure on the families and community at large thus rendering the people more vulnerable. In one of the FGDs that was conducted in the areas it was revealed that flooding disturbed the school children as sometimes they could not cross flooded bridges which would also been wiped away.

The results also demonstrated that the flooding significantly affected the quality of education in the affected wards. For instance, the Ward councilor for wards 6 indicated that two primary

schools, Mahlaba and Sipepa, in Ward 6 were damaged, causing children to relocate to Tshino Secondary School. This position was also confirmed by the District Schools Inspector (DSI) who cited that floods cause problems to the education sector. However, this measure negatively impacted the quality of education, as the available resources were insufficient to meet the needs of the growing student population. The destruction of schools remains a major challenge, necessitating rehabilitation efforts within the community. During the survey, the researcher observed students attending lessons under old and torn tents (Plate 4.1).

The results from the questionnaire survey indicate that flooding caused extensive damage to both physical and social infrastructure in Tsholotsho District. Specifically, a significant portion of respondents (50%) highlighted the destruction of infrastructure as one of the major impacts of flooding. The flooding in 2017, attributed to Cyclone Dineo, led to the destruction of over 200 homes, several bridges, roads and essential service facilities, including clinics and schools. For instance, the District Schools Inspector (DSI) confirmed that two primary schools, Mahlaba and Sipepa, were severely damaged in Ward 6, forcing students to relocate to Tshino Secondary School. This relocation disrupted the continuity of education as the available resources at Tshino Secondary were insufficient to accommodate the displaced students, further exacerbating the strain on local infrastructure. These findings support the rejection of the null hypothesis, as they provide substantial evidence that flooding has a significant and detrimental impact on both physical and social infrastructure in Tsholotsho District.

Additionally, in the areas most affected by the flooding, including Wards 6, 7 and 8, roads and bridges were either washed away or rendered impassable, which impeded the movement of both people and goods. This was particularly challenging for school children who, at times, could not cross the flooded bridges to attend school, as revealed in one of the Focus Group Discussions (FGDs). The District Development Coordinator further emphasized that the damage to infrastructure in these areas not only disrupted daily activities but also intensified the vulnerability of the community. The damage to homes and social services led to increased displacement, which placed additional pressure on the local population and significantly hindered the community's ability to recover quickly from the disaster. This underscores the need for rehabilitation and disaster resilience strategies to address these infrastructural challenges. Plate 4.1 shows children learning under an old tent at Sipepa Secondary School.

The destruction of physical and social infrastructure due to flooding in Tsholotsho District has significant implications for rural development. Firstly, the disruption of education systems caused

by the damage to schools such as Mahlaba and Sipepa underscores the long-term developmental setbacks faced by rural communities. Education is a cornerstone of rural development, as it equips individuals with the skills and knowledge necessary for sustainable livelihoods and economic participation (Wolff, et al, 2021, Tshuma, 2023). When children are forced to learn under substandard conditions, such as old and torn tents, or relocate to overcrowded schools with inadequate resources, their learning outcomes are compromised. This creates a generational impact, as limited access to quality education reduces opportunities for upward mobility and constrains the human capital development critical for fostering innovation and growth in rural areas. Furthermore, the loss of infrastructure impedes efforts to address rural poverty and inequality, as it exacerbates disparities between affected and unaffected areas.

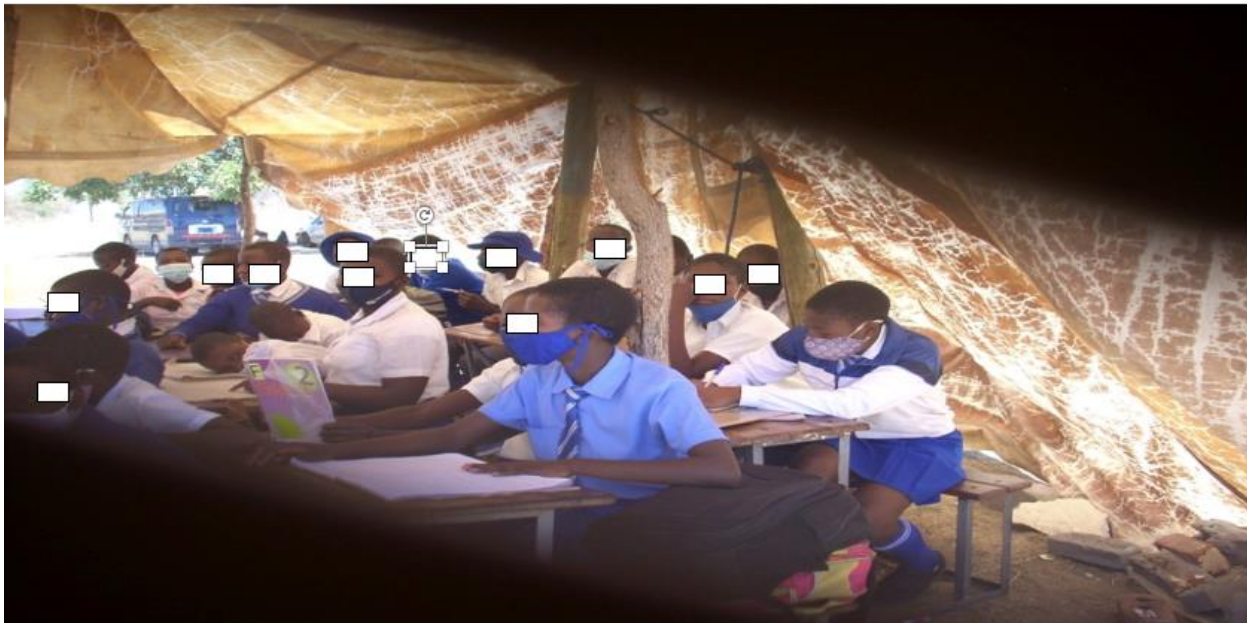


Plate 4.1: Children learning under an old tent at Sipepa Secondary School

Source: Primary data (2025).

Secondly, the destruction of roads, bridges, clinics and other essential infrastructure hampers economic activities and access to basic services, further deepening the vulnerabilities of rural populations. Impassable roads and damaged bridges disrupt market access for farmers, who depend on selling their produce for income (Mizutori, 2020, Mngumi, 2020). This not only affects household incomes but also destabilizes local food systems, potentially leading to food insecurity. The inaccessibility of clinics and hospitals during floods jeopardizes the health and well-being of the community, particularly for vulnerable groups such as the elderly, pregnant women and

children. These disruptions constrain rural development efforts, as resources that could have been invested in long-term development projects are instead diverted to emergency response and infrastructure rehabilitation. Addressing these challenges requires integrating disaster risk reduction into rural development planning to build resilient infrastructure, improve community preparedness and safeguard the socio-economic progress of rural areas.

The analysis revealed that respondents' knowledge of flooding events and response mechanisms increases significantly with the duration of residence in Tsholotsho District. Those residing for less than a year recorded the lowest mean knowledge score (3.23), while individuals with over 16 years of residence had the highest score (6.98). This pattern suggests that longer-term residents are better informed, likely due to their cumulative experiences with flooding and familiarity with local interventions. The ANOVA test confirmed statistically significant differences between the groups ($p < 0.05$), reinforcing the link between residence duration and knowledge levels. These findings emphasize the critical role of local, long-term knowledge in understanding flooding dynamics and responses. Long-standing residents, with their historical insights and practical experiences, serve as valuable assets for shaping effective flood management strategies. Their contributions can be integral to designing community-based interventions that draw on lived experiences to enhance resilience.

4.5 Factors Influencing Vulnerability to Flood-Induced Damage on Social Infrastructure in Tsholotsho District

The study sought to understand the factors influencing vulnerability to flood-induced damage on social infrastructure in tsholotsho district, qualitative data was analysed to substantiate the findings derived from the questionnaire survey, field observations conducted in the affected areas revealed extensive damage to critical infrastructure, particularly bridges and roads. These observations provided direct evidence of the impacts of flooding on the physical environment. In Wards 6, 7 and 8, several bridges collapsed due to the intensity of floodwaters. Roads were severely eroded or rendered impassable. These infrastructural damages disrupted transportation networks, impeding access to essential services such as healthcare and education. The inclusion of these observations enhances the validity of the study by offering tangible evidence that complements the survey findings and underscores the pressing need for targeted interventions to rehabilitate and fortify infrastructure in flood-prone areas.

The District Development Coordinator revealed that six bridges were damaged during the 2019 floods, including one that linked Tsholotsho and Bulawayo (Plate 4.2). The observed damage to this bridge significantly hampered the movement of people and goods. Such infrastructural destruction is a recurrent consequence of flooding in the District, with economic centres such as Tsholotsho rendered inaccessible during such events.

A statistically significant association was observed between local awareness and perceptions of the effects of flooding on social infrastructure in the ward ($P > 0.01$). Households in Tsholotsho District expressed widespread dissatisfaction with the flooding's impact on the road network and transportation systems. These disruptions negatively affected livelihood activities, including cross-border trade and remittance-dependent households. The movement of goods from neighbouring countries was particularly challenging, which exacerbated economic hardships for families reliant on this trade. These findings support the rejection of the null hypothesis, as they demonstrate that socio-demographic factors significantly influence household vulnerability to flood-induced damage on social infrastructure, reinforcing the need for targeted policy interventions.



Plate 4.2: Road damage in Tsholotsho

Source: Primary data (2025).

Fieldwork and secondary data analysis revealed that flooding severely damaged approximately 57 km of road network in Tsholotsho District, particularly in Wards 6, 7 and 8. The estimated cost of repairing this infrastructure was \$1.3 million, thus underscoring the magnitude of the devastation. Furthermore, Mahlaba and Sipepa schools sustained extensive damage, with repair costs estimated at \$200,000. Healthcare infrastructure also faced significant setbacks, with one clinic in Ward 8 rendered inoperative due to flooding, requiring \$150,000 for restoration. Housing infrastructure suffered considerable losses, with over 180 homes completely destroyed and an estimated repair cost of \$300,000.

Livestock losses further compounded the economic impact, with over 250 cattle and goats lost to drowning. This represented a critical blow to the livelihoods of households. These findings highlight the widespread and multifaceted economic and social consequences of flooding in Tsholotsho District, highlighting the urgency of mitigation and recovery strategies to bolster infrastructure resilience and support affected communities.

To understand the relationship between household head socio-demographic characteristics and the vulnerability to flood-induced damage on social infrastructure, a Chi-square test was employed. This analysis was performed to assess whether specific socio-demographic factors such as gender, age and household size of the household head are significantly associated with the impact of flooding on critical social infrastructure in the district. The objective was to determine whether certain groups, based on these characteristics, experience greater damage to infrastructure compared to others. The test specifically focused on the association between the household head's gender ($p = 0.028$) and household size ($p = 0.006$) and the flooding's effects on social infrastructure, including roads, schools, clinics and homes. Through conducting this analysis, the study aimed to explore the patterns of vulnerability and provide insights into the need for targeted interventions to minimize the impact of flooding in the district.

The specific social infrastructure examined in this analysis includes essential services and physical structures such as roads, schools, healthcare facilities (clinics and hospitals) and homes, which are the most affected by flood events in Tsholotsho District. The Chi-square test results reveal a significant relationship between household head characteristics and the vulnerability of these infrastructures. For instance, households led by females were more likely to report extensive damage to roads and schools, possibly due to pre-existing socio-economic

vulnerabilities. In contrast, households with larger sizes (more family members) showed a higher vulnerability to flooding, which often led to a greater need for housing, making their homes more susceptible to flood damage. This insight is crucial as it suggests that flood-related damage disproportionately affects those who are already vulnerable, particularly larger households and female-headed households.

The reason for choosing the Chi-square test over simpler correlation analysis was due to the categorical nature of the variables involved. Household head gender, household size and flood impact on infrastructure are categorical variables, making Chi-square analysis the most appropriate choice for determining whether a statistically significant relationship exists between them. Simple correlation analysis, on the other hand, would not have been suitable for categorical data because it assumes continuous data with linear relationships. Through using the Chi-square test, the study was able to identify and quantify the strength of associations between socio-demographic characteristics and the varying effects of flooding on infrastructure, which was the primary goal of the analysis.

The results from the Chi-square test show that both the gender of the household head and household size significantly influence the perception and extent of damage caused by flooding, particularly with respect to infrastructure. Female-headed households were more likely to report damage to roads and schools, reflecting the specific challenges that women and children face in accessing basic services during and after flood events. In contrast, larger households tend to experience greater disruptions due to overcrowding, which may hinder their ability to adapt to and recover from the effects of flooding. These findings underscore the importance of considering socio-demographic factors when developing flood resilience strategies, as different groups within the population may require different interventions.

Through highlighting the socio-demographic characteristics associated with increased vulnerability to flood damage, the analysis emphasizes the need for targeted policies that address the unique needs of these households. Given that flooding exacerbates existing inequalities, interventions must take into account the gender and household size factors that contribute to the disproportionate effects of flooding. For example, policies focused on improving road infrastructure, providing temporary housing solutions and ensuring the continuity of education through flood-resistant schools could be more effectively tailored by recognizing these demographic variables. The findings also call for further research into how these socio-

demographic characteristics interact with other environmental and economic factors to shape vulnerability to flooding, particularly in rural areas like Tsholotsho.

The analysis of household demographics and vulnerability revealed significant associations between key variables and household susceptibility to flooding. The p-values indicate that the gender of the household head ($p = 0.028$), marital status ($p = 0.045$), household size ($p = 0.006$) and the number of years a family has resided in the area ($p = 0.007$) are statistically significant factors. These findings suggest that demographic characteristics play a critical role in influencing a household's vulnerability to flooding, with longer-term residents potentially more equipped to manage flood risks due to their familiarity with local conditions and adaptive strategies.

The relationships between the socio-demographic characteristics of household heads and their vulnerability to the effects of flooding on social infrastructure were examined. Statistically significant associations between specific socio-demographic attributes and the impact of flooding on infrastructure were observed. Specifically, the household head's gender ($p < 0.05$), marital status ($p < 0.05$), household size ($p = 0.01$) and the duration of residence in the area ($p < 0.01$) exhibited significant relationships with vulnerability to flood-induced infrastructure damage. These findings suggest that socio-demographic factors play a critical role in shaping household vulnerability. For instance, the gender and marital status of the household head may reflect disparities in coping mechanisms or access to resources, while household size and duration of residence might influence reliance on local infrastructure and preparedness for flood events. These results underscore the necessity of integrating socio-demographic considerations into the design of flood mitigation strategies and interventions, ensuring that diverse household needs are addressed within the community.

All surveyed households reported awareness of the current effects of flooding in their respective wards. However, perceptions regarding the impact and effects of flooding were heterogeneous. The Kruskal–Wallis test, employed to analyze differences in household perceptions of the state of low-lying areas, yielded a statistically significant result ($p = 0.001$). This non-parametric test was chosen due to the ordinal nature of the data where responses could be ranked but did not conform to a normal distribution.

The test aimed to assess whether household perceptions varied across different socio-demographic groups, considering factors such as location, household size, or duration of residence. The significant result indicates notable differences in perceptions of flood impacts on

low-lying areas, suggesting that experiences and vulnerabilities differ among groups within the study population. These variations highlight the influence of socio-demographic and locational factors on household perspectives, emphasizing the need for tailored interventions that account for diverse experiences and vulnerabilities in addressing the impacts of flooding.

4.5.1 Loss of soil nutrients

Questionnaire survey results show that about 45% of the respondents indicated that loss of nutrients is another type of impact posed by flooding in their area (Figure 4.3). The respondents indicated that they are more agricultural-based, implying that they rely more on agriculture. However, their livelihood was being compromised by the impact of flooding. It was, therefore, reported to be a major pressing problem posed by flooding in the FGDs that were conducted in the respective wards. Most of the respondents in FGDs conducted in Ward 8 reiterated that in most cases when floods hit the areas, especially after torrential rains most of their fields are either buried or even washed away which adds misery to the already resource-constrained communities. This was also observed to be worsening the poverty threshold of the local community whose livelihood solely depended on agriculture for their sustenance. To support this, the AGRITEX District Head alluded that there are several impacts of floods on agriculture production. The yields expected in the area dropped by a considerable proportion which also put the people at risk of becoming food insecure.

The impact of flooding on agriculture in Tsholotsho District extends beyond nutrient loss and includes significant damage to critical agricultural infrastructure, which exacerbates the challenges faced by the predominantly agrarian community. Observations during fieldwork revealed that several dip tanks used for livestock treatment in Wards 6 and 8 were damaged, leaving farmers without essential facilities to protect their cattle from diseases. Additionally, flooding destroyed small irrigation systems and silted up dams, reducing water storage capacity and affecting irrigation farming activities. The AGRITEX District Head emphasized that such damage further diminishes agricultural productivity, contributing to a significant drop in crop yields and livestock health. This, in turn, heightens the risk of food insecurity for communities already reliant on subsistence farming for their livelihoods. The destruction of these agricultural assets underscores the need for disaster preparedness and resilience-building measures in the district.

4.5.2 Waterborne related diseases

Questionnaire survey results show that about 30% of the respondents indicated that waterborne related diseases is another type of impact posed by flooding in their area (Figure 4.3). They indicated that lack of clean water combined with waste in flood waters raises the risk of waterborne diseases, which can include typhoid, giardia, cryptosporidium, cholera and many other diseases depending upon the location of the flood. To support this, the District Health Officer (DHO) explained that during flooding times there are reported high cases of waterborne diseases, which can include typhoid, giardia and cholera which have the potential to result in loss of lives in the district. The DHO went on to highlight that since floods can potentially increase the transmission of water- and vector-borne diseases, such as typhoid fever, cholera, malaria and yellow fever, among others, it is important to know your risk and protect your water sources. In other words, the most common risks associated with flooding are the contamination of drinking water facilities and standing water, which can be a breeding site for mosquitoes, bring chemical hazards and cause injuries. In light of this communities should be aware of how to protect their health during a flood. Findings from the FGDs indicated that damage to roads and transport infrastructure may make it difficult to mobilize aid to those affected or to provide emergency health treatment.

Flooding in Tsholotsho District has been linked to a notable increase in the prevalence of waterborne diseases such as typhoid, cholera and giardia, as reported by the District Health Officer (DHO). Health facility records from 2017 to 2020 indicate that cases of cholera spiked by 40% during severe flood seasons, with typhoid cases increasing by 35%. This rise in disease prevalence can be attributed to the contamination of water sources due to damaged infrastructure, including boreholes, wells and water storage tanks. Field observations revealed that several boreholes in Wards 6 and 8 were submerged or rendered non-functional due to siltation, leaving communities reliant on unsafe water sources. Discussions during FGDs emphasized that standing floodwaters, coupled with inadequate sanitation facilities, further exacerbated the spread of diseases. The damage to roads and bridges hindered timely delivery of clean water supplies and health services, compounding the health crisis during flood events. These findings highlight the urgent need for resilient water infrastructure and improved emergency response mechanisms to mitigate health risks in flood-prone areas.

All the examined variables, namely the household head's gender, age, marital status, level of education and period of stay were statistically significant predictors of vulnerability to flood impact.

The findings emphasize the nuanced ways in which demographic factors shape households' exposure to and capacity to cope with flood-related challenges.

The gender of the household head ($p < 0.001$) was a critical factor, reflecting potential disparities in access to resources, decision-making authority and disaster preparedness strategies between male- and female-headed households. Similarly, the age of the household head ($p < 0.001$) was significantly associated with flood impacts, suggesting that younger or older heads may face distinct challenges related to physical capacity, awareness, or experience in managing disasters. Marital status ($p < 0.001$) also played a role. Married individuals potentially benefitted from shared responsibilities and stronger support systems compared to single or widowed individuals, who may be more vulnerable during disaster events.

Education level ($p < 0.001$) and period of stay in the area ($p < 0.001$) further highlighted the importance of socio-economic and experiential factors. Higher educational attainment likely equipped individuals with greater awareness and adaptive capacity, thereby enabling them to prepare more effectively for floods. Meanwhile, households with longer tenure in the area may be more familiar with local flood risks and coping strategies, even though they might also face cumulative vulnerabilities due to prolonged exposure. These results support the rejection of the null hypothesis, confirming that socio-demographic factors significantly influence household vulnerability to flood-related impacts, including waterborne diseases, thus highlighting the need for targeted and adaptive flood mitigation strategies. These findings underscore the importance of designing targeted, demographic-sensitive interventions to mitigate the impacts of flooding, for example gender-sensitive programs, education-driven awareness campaigns and tailored support for vulnerable groups based on their unique socio-demographic profiles.

4.6 Factors influencing the effectiveness of flooding response mechanisms

The study, through a combination of several methods, also identified several factors that influence the effective implementation of resilience strategies against the impacts of floods. These strategies can either result in positive outcomes whilst at the same time can be major drawbacks as shall be presented largely. Findings from the FGDs revealed that resistance by local households in Tsholotsho District is multifaceted. One major aspect of resistance pertains to the reluctance to relocate from flood-prone areas to safer, government-designated relocation sites. This hesitation often stems from a deep attachment to ancestral lands, where individuals feel a strong cultural and emotional connection to their place of origin. Some respondents emphasized

that leaving these lands is perceived as dishonoring their ancestors and disrupting traditional burial sites, which they regard as sacred. They also expressed mistrust towards relocation plans, fearing that the new locations may not offer the same agricultural or economic opportunities as their current settlements.



Plate 4.3: Structures built in Tsholotsho

Source: Survey data (2025).

Resistance is also linked to the reluctance to adopt modern building techniques and materials that are better suited to withstand flooding. Many households continue to construct homes using traditional methods, such as mud and pole structures, which have limited durability against harsh weather conditions. This resistance is partly due to a lack of resources, as modern materials are perceived to be expensive and beyond the financial reach of many households. Additionally, some community members hold on to traditional knowledge and practices, believing they have been effective for generations, despite clear evidence of their limitations in adapting to changing climatic patterns.

This cultural resistance underscores the need for educational campaigns that bridge the gap between traditional practices and modern, evidence-based solutions. To further understand the nature of resistance, Table 4.2 highlights survey findings on specific areas of resistance among

households. The results demonstrate that resistance to relocation and adoption of modern building techniques are the two most cited barriers to effective flood mitigation. The table also shows the percentage of respondents who cited economic constraints, mistrust of authorities and cultural factors as influencing their resistance.

Table 4.2: Specific areas of resistance among households

Area of Resistance	Percentage of Respondents (%)
Reluctance to relocate to safer areas	45%
Preference for traditional building	35%
Economic constraints	12%
Mistrust of relocation plans	5%
Cultural beliefs	3%

Source: Survey data (2025).

Resistance is deeply rooted in socio-economic and cultural contexts. Effective flood response mechanisms should address these underlying factors by incorporating local traditions into relocation and construction strategies, while also providing incentives and education to improve community resilience.

Furthermore, questionnaire survey results show that the majority (70%) of the respondents indicated that resistance by local people in the area influences the effectiveness of response mechanisms in their area (Figure 4.4). These respondents explained that in most cases, as traditionally believed, people are abiding by what is rooted in their traditional knowledge which they have derived from their elders and or ancestors. These respondents fail to appreciate the change of time and events that have taken place and still want to be guided by the past yet the climate is changing which has the potential to disrupt things. During an interview, the Ward Councilor for Ward 6 reiterated that often at times response mechanisms put in place fail as there is resistance to change, which puts the effectiveness of measures instigated into question. The question that remains unanswered is are the mechanisms in place a social evil with regards to the dilemma and unfortunate circumstances?

Households in Tsholotsho District exhibited resistance to structural change, often retaining traditional dwellings without reinforcement to withstand harsh weather conditions. These structures, characterized by low tensile strength, were highly susceptible to flooding during

periods of excessive rainfall. Such vulnerabilities were particularly evident in Ward 6, one of the most flood-affected areas in Tsholotsho District, as observed by the researcher (Plate 4.3).

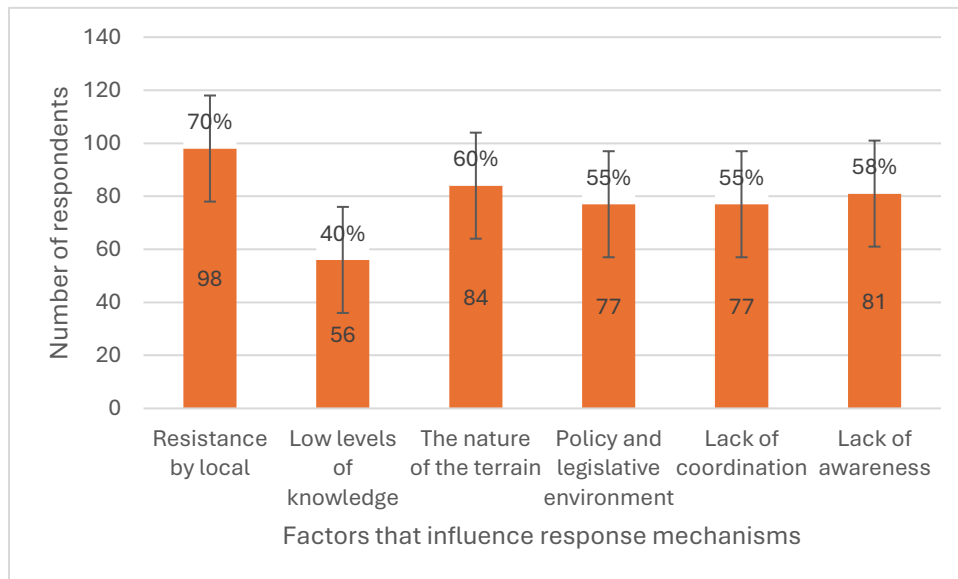


Figure 4.4: Factors that influence response mechanisms effectiveness

Source: Survey data (2025).

4.6.1 The nature of the terrain

Questionnaire survey results show that about 60% of the respondents indicated that the nature of the terrain is another factor that deserves mention when it comes to the issue of perceived effectiveness of the mechanism in place to control floods effects (Figure 4.4). They indicated that the area which they reside is generally low lying and hence prone to flooding which continues to pose threats each year around. The District Development Coordinator during an interview reiterated that the nature of the terrain in Tsholotsho District is also another attribute that affects effectiveness of measures put in place to prevent the effects of flooding. He went on to emphasize that the area that is hard hit most is that, which is characterized by flat, low-lying terrains that are associated with high risk of flooding. Generally, Tsholotsho is such a low-lying area which is more susceptible to flooding which puts the effectiveness of any type of control measure put in place into question (Plate 4.4).

While it is true that the nature of the terrain is a natural factor that cannot be easily altered, its inclusion in this study is important for understanding the broader context of flood management challenges in Tsholotsho District. The low-lying and flat nature of the area is a key determinant of flood susceptibility and recognizing this reality helps frame the discussion around the need for

tailored interventions. For example, this knowledge can guide the strategic placement of flood control infrastructure, such as dykes or drainage systems and inform community relocation efforts to higher ground. Additionally, highlighting terrain-related vulnerabilities underscores the importance of proactive measures, such as early warning systems and community preparedness, to mitigate the impacts of flooding. Through including this factor, the study provides a view of the barriers to flood management and helps to justify the need for continued investment in adaptive and preventive strategies.



Plate 4.4: Low lying and flood prone areas of ward 6

Source: Survey data (2025).

4.6.2 Lack of awareness

The results show that about 58% of the respondents indicated that lack of awareness is another factor that affects the effectiveness of measures put in place to reduce the impact of flooding in the area (Plate 4.4). Awareness campaigns in the area are primarily conducted through community meetings facilitated by local leaders, NGOs and government officials. These campaigns often include information dissemination via posters, radio announcements and

workshops to educate residents about flood risks and preparedness measures. Despite these efforts, gaps in outreach and limited participation have affected the overall impact of these initiatives.

They indicated that awareness is a key capacity for the success of any project and as such people have to be aware of what should be done and put in place and have it in their hearts so that it is easy to establish on the ground. Added to the above, it was identified that low levels of knowledge were another challenge which is hindering successful building of community resilience against the impacts of floods. The District Development Coordinator emphasized that the level of understanding and mastering of new things determines the critical understanding of phenomenon that targets to build community resilience which substantially enhance communities' capacities to withstand future floods.

However, this was not the same case as some of the people in the community were not aware which could be attributed to the number of years stayed in the area. This thus had a significant bearing in the amount of wealth of knowledge possessed by an individual which has an impact in terms of the effectiveness of a measure or control strategy. The results of the hypothesis test confirm a statistically significant relationship ($p < 0.05$) between awareness levels and the effectiveness of flood mitigation measures, reinforcing the need for improved and more inclusive awareness campaigns to enhance community resilience.

4.6.3 Lack of coordination

Questionnaire survey results show that about 55% of the respondents indicated that lack of coordination in as far efforts aimed at improving the status quo presents challenges. They indicated often at times there is lack of coordination for instance between Government departments and Non-Governmental Organizations which may result in duplication of efforts hence lessening the effectiveness. They also explained that resources are scarce yet they are pivotal in as far as success of a particular measure is concerned which is hindering efforts aimed at addressing flood issues in the area.

To support this, the Ward Councilors cited that lack of resources especially funding restrictions is another limiting factor, preventing investment in crucial resources and infrastructure required for effective flood management. The Councilors for Wards 6, 7 and 8 also emphasized the significance of improving enforcement procedures in order to promote compliance and lower the

likelihood of flood occurrences. To add on, results from the FGDs indicated that accessing flood management resources, is challenging, particularly for small-scale farmers. Competing priorities for time and resources make it difficult to prioritize flood management activities.

4.7 Functionality of existing institutional arrangements for managing flood-induced disasters

The third objective of the study sought understand the functionality of existing institutional arrangements aimed at establishing the management of flood induced disasters. However, during one of the FGDs it was also confirmed that UNICEF gave children books at schools. This point was expressed by one respondent in the FGDs who reiterated that;

.....” We are very grateful to the UNICEF organization for their outstanding work which is observed in our local community. These people are God sent and are always with us during difficult times as they provide us with the necessary social support required once disaster strikes us as unforeseen circumstances”.....

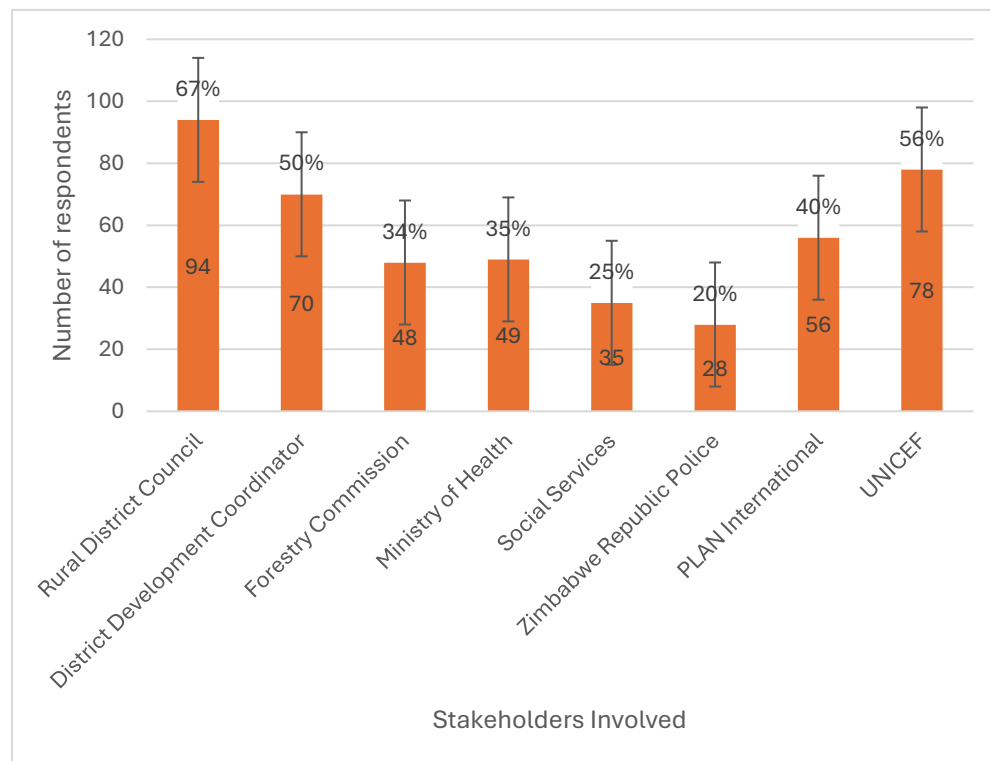


Figure 4.5: Stakeholders involved in building flood disaster resilience

Source: Survey data (2025).

The District AGRITEX head also highlighted that, there are DRR committees at community level and they are empowered by Non-Governmental Organizations through training. Though some respondents indicated that DRR committees were effective, there are some who highlighted that they are not effective. The proportion of respondents who highlighted it as an ineffective mechanism articulated that; though committees are there, they lack adequate resources to use for rescuing people during a disaster. The Ward Councilor confirmed that, if the partners who are assisting these DRR committees leave, it implies that the committees will not function.

Questionnaire survey results show that there are various stakeholders who are involved in flood impact management in the low-lying district of Tsholotsho (Figure 4.5). Results show that about 67% indicated that the RDC is one of the major stakeholders involved in flood risk management in the area. They explained that in most cases the RDC is involved in such issues as they require urgent attention often at times. This was not surprising as the Ward Councilors during interviews indicated that the RDC leads public education and awareness campaigns. These awareness campaigns are crucial since they are a key capacity measure for the success of these particular projects. Thus, they are an important stakeholder in the area. The RDC is also responsible for the dispatch of fire ambulances for search, rescue and evacuation of flood victims. These are, therefore, the most apparent group as they are readily available to assist in times of the need.

Results also show that other government departments such as the District Development Fund (DDF) were also prominent stakeholders when it comes to flood disaster issues. To support this the DDC indicated that the DDF has been a major backbone for the local community as they chipped in after floods and assisted to rehabilitate the road network which had been disrupted by the floods that had occurred. This therefore significantly improved the transport and communication strategies for the community at large hence these were observed to be effective and functional in as far as disaster response mechanisms and strategies were concerned. It could also be key to note that effectiveness also depended on the availability of resources to enhance the smooth processes involved in rehabilitation. T

o add on, ZINWA also played a pivotal role in the affected wards. It was observed during FGDs conducted that flooding resulted in contamination of the already scarce resources which put the communities at risk. The end result was polluted and unsafe water for drinking yet local people could not afford to tap clean water. In light of this, the ZINWA managed to site and drill boreholes in collaboration with DDF which at the end thus improved provision of safe and clean water for drinking and other domestic uses in the area.

Questionnaire survey results show that there are various stakeholders who are involved in flood impact management in the low-lying district of Tsholotsho (Figure 4.5). Results show that about 50% indicated that the District Development Coordinator's Office is one of the major stakeholders involved in flood risk management in the area. They explained that in most cases the DDC is involved in such issues as they require urgent attention often at times. This was not surprising as the DDC indicated during an interview that the District Development Coordinator's Office leads the DDCPU, co-ordinates activities of the CPU on the ground and chairs its planning committee in the District.

These are some of the most important tasks and roles that this important wing constitutes hence it is crucial. Results also show that about 56% highlighted that UNICEF is also another important stakeholder in as far as flooding issues are concerned in the low-lying area. They demonstrated that UNICEF is a critical stakeholder when the community is hit by devastating floods. For instance, after the floods attributed to Dineo, the organization brought evacuation tents to the affected households which acted as a cushion hence assisting the people who were homeless at that particular time.

Questionnaire survey results show that about 40% indicated that PLAN international is an important organization in as far as flood management is concerned in the area. They explained that in most cases PLAN is involved in such issues as they require urgent attention often at times with the required needs to assist the local communities. This was not surprising as the Plan Officer during interviews indicated that the organization spearheads developmental projects in affected areas. The Officer indicated that the organization has since built a school block at Sipepa Secondary School. This position was also confirmed by respondents in one of the FGDs conducted in Ward 6,7 and 8 since these were most hard hit by the floods. Questionnaire survey results also show that there are various stakeholders who are involved in flood impact management in the low-lying district of Tsholotsho.

Results show that about 35% indicated that the Ministry of Health is one of the major stakeholders involved in flood risk management in the area. They explained that the Ministry is responsible for the provision of basic health care to flood victims. The sector becomes an important element considering the fact that the people in local communities are often exposed to water-borne-related diseases such as cholera and hence need a cushion to protect themselves and prevent unforeseen deaths.

Questionnaire survey results show that various stakeholders are involved in flood impact management in the low-lying district of Tsholotsho. Results show that about 25% indicated that the Social Services department also deserves mention. It was revealed that the sector is responsible for the registration of NGOs and humanitarian Agencies that assist in flood disasters both during and after the disaster. Respondents also highlighted that the department also carries out vulnerability assessments of affected people to account for the situation and present a detailed outlook not based on a false premised understanding. The stakeholders also coordinate relief aid and long-term recovery programs. It is these programs that enable communities to bounce back when they are hard hit by unforeseen circumstances. However, the process was also observed to have its own weaknesses such as corruption and errors of inclusion and exclusion which therefore limited its functionality as an institutional arrangement that calls for scrutiny.

Results from FGDs carried out across the most affected wards also revealed that the Zimbabwe National Army and ZRP were also other important stakeholders involved in search and rescue operations during flood disasters, with the Air Force of Zimbabwe providing helicopter assistance to stranded flood victims. The Zimbabwe Republic Police Bulawayo Fair Bridge Sub Aqua Unit was also deployed in the District during flood disasters. However, some respondents mentioned that, the Sub Aqua Unit, ZRP and Air force of Zimbabwe take time to respond to distress calls thereby leading to more casualties. One of the major reasons cited for the delay is due to lack of resources.

In Tsholotsho District, several stakeholders are involved in flood disaster management, each playing distinct roles within the broader disaster response framework. The District Development Coordinator (DDC) leads the Disaster Coordination and Preparedness Unit (DCPU), which is responsible for managing flood disaster responses across the district. The DCPU coordinates efforts between various government departments, NGOs and community groups, ensuring a structured approach to managing flood risks and impacts. The DDC's office oversees the planning, response and recovery phases, mobilizing resources and facilitating collaboration among all involved parties. However, despite this formal structure, there are noted challenges regarding the coordination and implementation of effective flood management measures. Resource constraints and delays in communication have made it difficult for stakeholders to work in a unified and timely manner, particularly in the crucial initial stages of disaster response.

Key stakeholders, such as UNICEF, the RDC, AGRITEX, ZINWA and PLAN International, provide critical services and support during and after floods, but their roles are often fragmented. For

instance, UNICEF focuses on providing emergency shelter and essential supplies, while ZINWA works to restore clean water sources, especially after contamination due to flooding. PLAN International has supported reconstruction efforts, such as building a school block at Sipepa Secondary School, while the RDC leads public education campaigns on disaster preparedness. Although these interventions are essential, the lack of a cohesive, long-term strategy for disaster risk reduction and recovery highlights a gap in effective coordination.

The DCPU is meant to bridge these gaps, but limited resources and inconsistent involvement from some stakeholders have hindered the overall success of flood resilience efforts. The Zimbabwe Republic Police (ZRP) and Zimbabwe National Army (ZNA), despite being integral to search and rescue operations, often face delays in response due to logistical challenges. These gaps suggest that while stakeholders play valuable roles, a more coordinated and resource-supported approach is necessary to improve the effectiveness of flood disaster management in Tsholotsho.

Questionnaire survey results show that respondents had varied views in as far as the functionality of existing arrangements is concerned in the area (Figure 4.6). They explained that in most cases several organizations are involved in such issues as they require urgent attention often at times often with the required needs to assist the local communities.

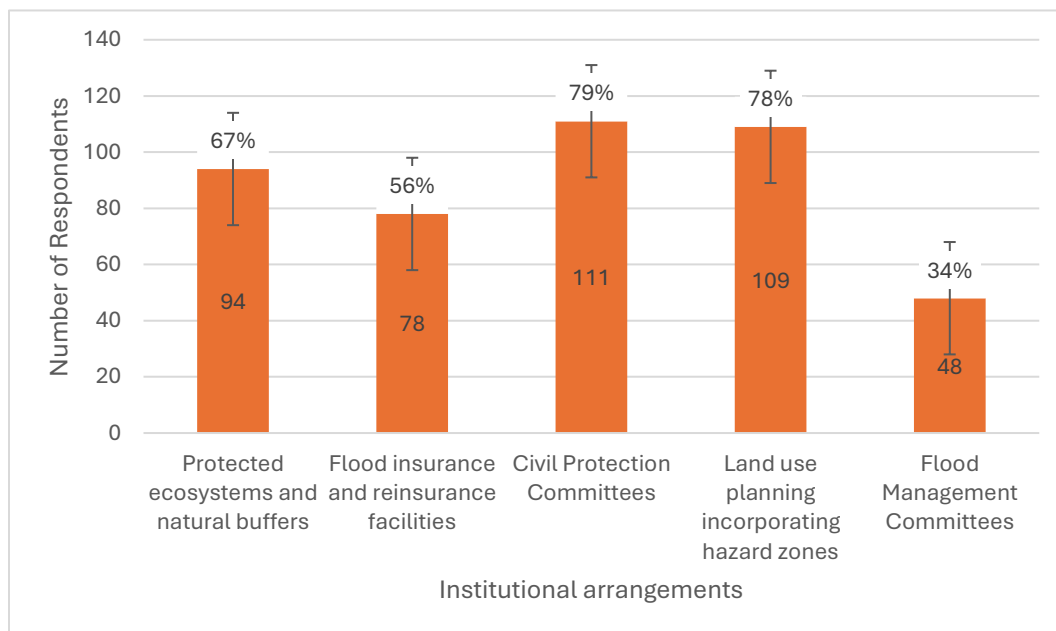


Figure 4.6: Institutional arrangements in the Tsholotsho District

Source: Survey data (2025).

4.7.1 Civil Protection Committees

Questionnaire survey results show that about 79% indicated that Civil Protection Committees are an important arrangement in as far as flood management is concerned in the area (Figure 4.6). The respondents highlighted that disaster risk reduction committees are an effective tool for responding to floods. This strategy was further supported by the District Development Coordinator (DDC) who also mentioned the availability of Ward DRR committees. However, the DDC emphasized that the ward level committees need to be capacitated through regular training. Overall, the results indicate that there is no significant difference ($P=0.15$) in the perceptions of males and females regarding flood disaster risk management in Tsholotsho.

The studied area has effective systems and procedures in place to assess flood impacts, monitor and disseminate data on floods, provide accurate early warning systems and integrate indigenous and scientific knowledge for community resilience. Trained and equipped Village Civil Protection Committees (VCPC) are also seen as an effective mechanism to respond to flooding. However, challenges arise where there is lack of training and limited appreciation of the roles played by this sector which puts functionality into question.

Civil Protection Committees (CPCs) play a central role in managing flood risks and responding to disasters in Tsholotsho District. While 79% of respondents acknowledged the importance of these committees, their effectiveness largely depends on the availability of resources and the capacity to respond swiftly and adequately to flood events. The committees, which operate at both the ward and village levels, are intended to be the first responders to flood disasters, providing immediate assistance such as evacuation, shelter and emergency relief.

However, the success of these committees is hampered by several challenges, including limited financial and material resources, insufficient training and a lack of essential tools and equipment to effectively manage flood situations. Without adequate funding and resources, the committees struggle to perform their duties and meet the community's needs during floods, reducing their overall impact. The results of the hypothesis test ($P = 0.15$) indicate no statistically significant difference in perceptions of CPC effectiveness based on gender, suggesting that both male and female respondents equally recognize their role in disaster management.

Furthermore, the capacity of the Civil Protection Committees to respond to flooding disasters is directly linked to the level of training and knowledge they possess. The District Development Coordinator (DDC) emphasized the need for continuous training to build the competencies of these committees at the ward level. Despite their acknowledged importance, many members of the committees lack the necessary skills and expertise to effectively coordinate disaster responses. The training provided is often irregular and insufficient, which affects the overall preparedness of the committees when floods strike. There is also sometimes a lack of understanding within the community about the roles and responsibilities of CPCs, leading to challenges in their operation during actual disasters. This lack of capacity, both in terms of training and resources, undermines the committees' ability to implement the flood disaster management measures effectively.

Added to the need for training, there is a critical requirement for better coordination and resource allocation. While the Village Civil Protection Committees are seen as an effective tool in flood management, their ability to respond quickly and efficiently is constrained by limited access to necessary resources such as flood relief supplies, rescue equipment and communication tools. Many of the CPCs are also dependent on external organizations and government agencies for support, but these stakeholders are often stretched thin during major disaster events. Strengthening the capacity of the CPCs through better resource allocation, enhanced training programs and regular support from relevant stakeholders will enable these committees to improve their response to flooding disasters and increase community resilience.

4.7.2 Early warning system

Results also show that early warning systems are an effective mechanism to respond to flooding. The respondents highlighted that early warning systems help the respondents to make informed decisions like implementation of disaster evacuation plans, setting of rescue teams and also relocation of people from disaster prone areas. The District Meteorological Services Department works with local radio stations such as Skyz Metro FM based in Bulawayo and other organisations like Econet to relay early warning messages to communities at risk of flooding. The civil protection committees which incorporate community traditional leaders also cascade warning messages from *Umlisa* (headman) to *Sobhuku* (village head) down to the households which are organized in linear settlements. A messenger from the village head is sent out to convey the warning messages door to door at household level.

However, there are some respondents who highlighted that early warning systems are not an effective response mechanism to flooding. The District Development Coordinator highlighted that due to climate change variability and changes being experienced it is now very difficult to predict weather occurrence. They usually rely on indigenous knowledge system to foretell flooding and other weather scenarios. Prior extensive climate change knowledge which was used as a tool to predict that floods would occur after every 4 years is no longer applicable due to unpredictable weather conditions. Indigenous knowledge greatly influences the level of understanding disaster risk in Tsholotsho District.

This is the knowledge the community believes to be true and effective because it has been tried and tested and found to work over generations. This therefore shows that human capital such as knowledge as embedded in the SLF is therefore crucial. The hypothesis test results ($P < 0.05$) indicate a statistically significant relationship between respondents' level of education and their perception of early warning system effectiveness, suggesting that individuals with higher education levels are more likely to trust and respond to formal early warning mechanisms. Figure 4.7 shows the elements of an effective EWS.

An effective Early Warning System (EWS) for flood management consists of several critical elements that work together to ensure communities are adequately prepared for impending disaster events. The first element is the detection and monitoring of environmental conditions, including weather patterns, river levels and other flood-related indicators. Reliable weather forecasting and data collection are essential in predicting the likelihood of flooding. In Tsholotsho District, the District Meteorological Services Department plays a crucial role in monitoring climatic patterns and collaborating with local radio stations and mobile network providers, such as Skyz Metro FM and Econet, to communicate potential flood risks. This data is fundamental in providing early alerts to communities at risk of flooding, enabling them to take necessary precautions.

The second element is the dissemination of early warning messages to the affected population. Effective communication is vital for ensuring that warning messages reach the targeted communities in a timely and understandable manner. In Tsholotsho, the civil protection committees, in collaboration with local traditional leaders such as Umlisa (headman) and Sobhuku (village head), are responsible for cascading these messages from higher authorities down to the households. The use of traditional structures in spreading warnings ensures that the message reaches even the most remote or vulnerable members of the community. Additionally, modern

technologies like mobile phones and radio stations are crucial tools for disseminating warnings, as they can cover large areas and reach various segments of the population quickly.

Thirdly, an effective EWS includes a clear and actionable response mechanism. For early warnings to be effective, there must be pre-established procedures that communities can follow once they receive the alert. In Tsholotsho, respondents highlighted that early warning systems allow them to take proactive measures, such as implementing evacuation plans, setting up rescue teams and relocating people from high-risk areas. These response mechanisms are critical in minimizing casualties and property damage. A well-coordinated response relies on the readiness of local authorities, civil protection committees and community leaders to act swiftly and efficiently. It also requires adequate resources, such as transport, emergency supplies and trained personnel, to ensure that the response is effective.

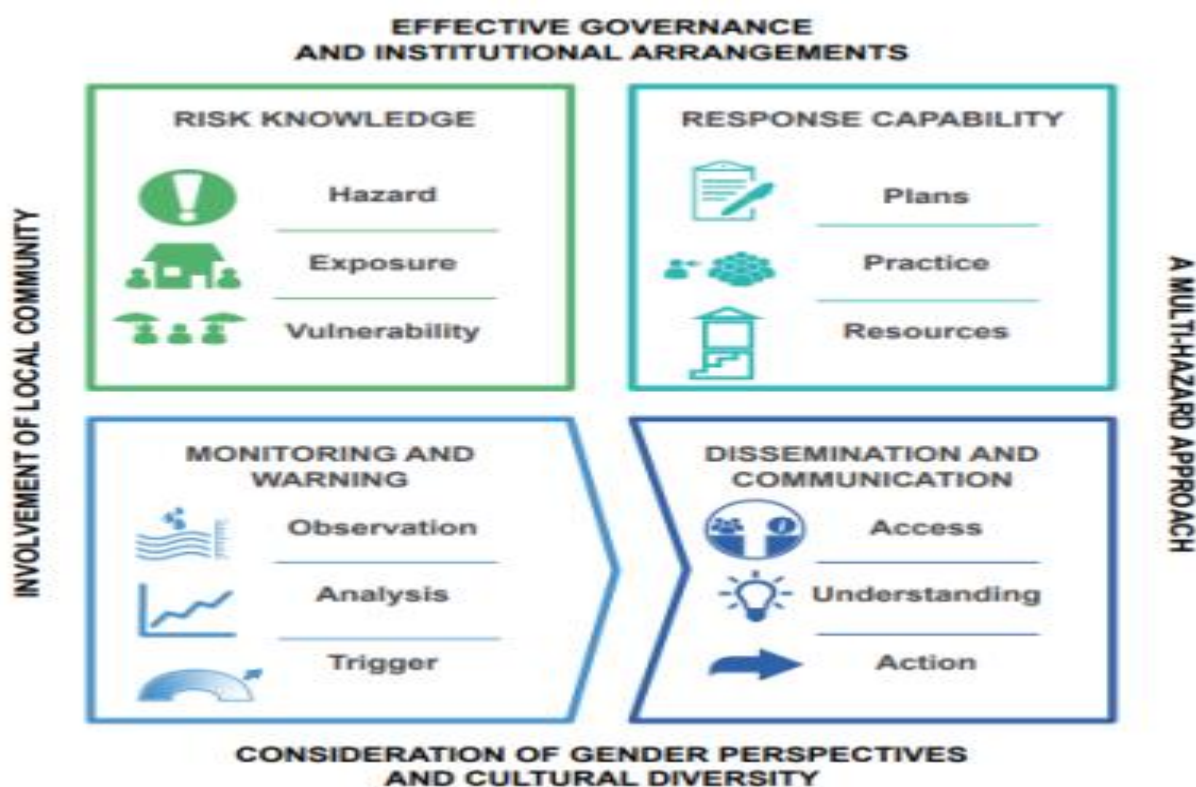


Figure 4.7: Elements of an effective EWS

Lastly, the integration of local knowledge and community involvement is a fundamental component of an effective EWS. In Tsholotsho, indigenous knowledge systems, which have been passed down through generations, play a key role in predicting and responding to floods. While

modern meteorological techniques are increasingly used, the community's reliance on traditional knowledge, such as the belief that floods occur after certain environmental signs, adds an important layer of resilience. Combining scientific data with local knowledge enhances the system's reliability and ensures that communities are better prepared to respond to natural hazards.

Furthermore, the active involvement of community members in the design and implementation of EWS makes it more relevant and effective, as they are more likely to trust and act on the warnings they receive. Fundamentally, an effective EWS combines scientific monitoring, timely communication, coordinated response actions and the integration of local knowledge to ensure that communities are adequately informed and prepared to handle flood disasters. Each of these elements is crucial for the overall success of the system and strengthening them can significantly improve the community's resilience to flooding in Tsholotsho District.

4.7.3 Land Use Planning Zonation

Questionnaire survey results show that about 78% indicated that Land use planning zonation is an important arrangement as far as flood management is concerned in the area (Figure 4.6). The respondents highlighted that disaster risk reduction committees are an effective tool for responding to floods. The study investigated the perceptions of households towards incorporating hazard zones in land use planning, climate change policy and strategy, flood management, economic and production sectoral policies and legislation for local communities with a mandate for flood management, as well as institutional and legal frameworks for flood management with decentralized responsibilities and capacities at all levels.

A Kruskal-Wallis test was used to determine whether there were significant differences in perceptions between males and females for each of these factors. Results show that, for land use planning incorporating hazard zones, there is no significant difference ($P = 0.005$) between males and females, indicating that both genders had similar perceptions. Similarly, for climate change policy and strategy and economic and production sectoral policies, there were no significant difference ($P = 0.05$) between males and females.

A Kruskal-Wallis test was conducted to determine whether there were significant differences in the perceived effectiveness of different interventions, including implementation of District flood management plans, land use planning incorporating hazard zones and protected ecosystems and

natural buffers to mitigate flood disasters. However, the results of the analysis indicated no significant difference ($P = 0.05$) in the perceived effectiveness of these interventions. Key stakeholders explained the need for developing and implementing proper land use planning models that incorporate hazard occurrence zones and this will enhance management of floods.

4.7.4 Protection barriers and natural ecosystems

Questionnaire survey results show that about 67% indicated that protection barriers and natural ecosystem are an important arrangement in as far as flood management is concerned in the area. They explained that, protected ecosystems and natural buffers are crucial for mitigating flood disasters and adapting to climate change. During interviews, the AGRITEX Officer indicated that flood barriers often assist local communities to cushion themselves from the risk associated with flooding. A Mann Whitney U-test was conducted to determine whether there is a significant difference in perceptions of protected ecosystems and natural buffers between males and females. The results indicate that there is no significant difference ($p = 0.813$). Therefore, we fail to reject the null hypothesis and conclude that both males and females share the same sentiments and view that flood buffers may reduce the risk of flooding.

4.7.5 Flood insurance schemes

Questionnaire survey results show that about 56% indicated that flood insurance schemes are an important arrangement in as far as flood management is concerned in the area (Figure 4.6). They explained that flood insurance and reinsurance facilities are critical for assisting affected communities during disaster times. The findings reveal that the majority of the respondents highlighted that they are not covered by any insurance that would aid during a disaster. Rather the respondents articulated that, during the disaster they would only rely on donor aid, government and its stakeholder assistance. Chi-square test results show that the existing institutional arrangements for managing flood-induced disasters are not fully functional ($p = 0.15$). This, therefore, means that the Institutional arrangements in place do not affect flood disaster management.

Results from FGDs also demonstrate that, one of the methods used to disseminate flood disaster risk information is awareness campaigns. Some of the selected respondents agreed that awareness campaigns are an effective tool for substantially enhancing communities understanding of the risk of flooding and basic disaster management strategies. This observation was further supported by the DDC who highlighted that there are campaigns being undertaken in

communities through the DRR committee and some are being done through radios. However, some identified awareness campaigns are not an effective strategy. They mentioned that ward-level DRR committees need to be capacitated with disaster management training for effective response to flood disasters.

Institutional entities like NGOs mobilize the resources needed for emergency relief. Red Cross, through the District Civil Protection Committee, intervened and assisted affected households with tents. A total of 34 8-seater standard tents were pitched at Sipepa clinic in Tsholotsho. During the last excessive flooding, there was high food insecurity due to displacement and loss of food stocks. People were given food stuff such as rice, maize, vegetable oil, mealie-meal, matemba, sugar beans and sugar. The Universities that have contributed significantly to flood disaster management research are Lupane State University, National University of Science and Technology and Midlands State University. Universities and Research Institutions train and mentor future disaster management professionals. The Universities are also facilitating weather forecasts and predictions which are critical elements for designing risk management mechanisms. The universities are researching and evaluating response mechanisms that can be initiated to manage floods and related impacts. Regression analysis results ($p < 0.05$) show a significant positive correlation between institutional involvement and community resilience, highlighting the role of research institutions in enhancing flood preparedness and response.

4.8 Chapter Summary

The chapter presented an in-depth analysis of the results, focusing on demographic characteristics, the multifaceted impacts of flooding and the effectiveness of response mechanisms in Tsholotsho District. It highlights how socio-demographic factors, such as gender, education level and duration of residence, shape perceptions and experiences of flooding. The findings show that women, who constituted 54% of the respondents, are particularly vulnerable due to socio-economic roles and limited mobility. Education emerges as a critical factor influencing flood preparedness and responses, with tertiary-educated respondents demonstrating greater awareness and proactive attitudes. The chapter also maps areas most affected by flooding, revealing significant environmental damage, including loss of vegetation, soil erosion and water contamination, alongside socio-economic disruptions like infrastructure destruction and displacement. These damages are most pronounced in Wards 6, 7 and 8, emphasizing the need for targeted interventions.

The study also examines systemic challenges hindering effective flood management, such as community resistance to relocation, inadequate early warning systems and fragmented institutional responses. Statistical analyses, including ANOVA and Chi-square tests, validate that long-term residents possess richer knowledge about flooding, aiding the credibility of their insights. However, resistance to modern building techniques and cultural attachments to ancestral lands emerge as barriers to resilience. Furthermore, the analysis underscores gaps in institutional arrangements, noting limited resources and coordination among stakeholders like the District Development Coordinator, NGOs and Civil Protection Committees. Despite these challenges, the study identifies opportunities for improvement, including strengthening early warning systems, enhancing community education and fostering collaboration between stakeholders to create more resilient flood response mechanisms. The results are expected to be presented in line with the research design i.e starting with qualitative component

CHAPTER FIVE: DISCUSSION OF STUDY FINDINGS

5.1 Introduction

This chapter presents and discusses the results obtained in the study. A detailed and in-depth discussion provides a clearer understanding of the findings, highlighting their significance and how they compare or contrast with previous related studies. The results are structured and presented according to the specific research objectives.

5.2 Socio-demographic characteristics of respondents

The demographic information of the respondents in the study reveals that the majority were females as compared to their male counterparts. Therefore, findings from this research showed that females are more prone to the devastating impacts of floods as compared to males. This could be attributed to the fact that males are mobile and migrate to urban areas as opposed to remote areas in search of greener pastures so as to look after their families. Contrary to this women are often regarded as child bearers hence remain at their homes and when floods hit they are naturally affected as there have no effective defense mechanisms. The research findings are consistent with other studies in Zimbabwe that have found women to be more vulnerable to the impacts of natural disasters (Chari *et al.*, 2021; Chuma and Makoni, 2021).

The majority of respondents had attained tertiary education as their highest qualification, while others had completed secondary level. This suggests that most individuals in the area possess at least a basic level of education. Education was observed to play a crucial role in shaping individuals' perceptions, attitudes and behaviors toward various phenomena. As a fundamental pillar of society, it serves as a key capacity measure that influences multiple aspects of life. In this study, the education level of households was found to significantly impact their anticipation of flood risks and their attitudes toward government and stakeholder-led flood management reforms. These findings align with studies in sub-Saharan Africa, which have established a positive relationship between education and disaster preparedness and mitigation (Amaratunga *et al.*, 2015; Ndambuki and Liyala, 2020; Mitheu, 2023).

Questionnaire survey results indicate that a significant proportion of respondents had lived in the district for over 16 years. Those who had resided in the area for an extended period explained that they had initially settled there around the time of the country's independence, moving freely despite the recurrent calamities they experienced. Long-term residents were found to have

greater knowledge of the district's flooding history and provided valuable baseline information on the effectiveness of past interventions. Previous studies in Zimbabwe have also highlighted the importance of local knowledge and experience as crucial resources in disaster risk reduction (Masunungure *et al.*, 2021; Ndlovu *et al.*, 2021).

5.3 The typologies of damage caused by flooding on natural environmental resources and social infrastructure in Tsholotsho district

Flooding in Tsholotsho District resulted in significant damage to both natural environmental resources and social infrastructure. Key impacts included the destruction of agricultural land, loss of soil fertility, contamination of water sources and damage to schools, roads and other social infrastructure. Areas most affected were identified as Ward 6, 7 and 8, with severe impacts on the local economy and livelihoods. The destruction of schools, particularly in Ward 2, disrupted education, forcing children to relocate to alternative institutions like Tshino Secondary School. Additionally, the flooding posed health risks by contaminating water supplies and contributing to waterborne diseases.

The extensive damage to agricultural land and soil fertility highlights the vulnerability of Tsholotsho's agrarian-based economy to floods. Flood-induced erosion and soil degradation lead to reduced crop yields and food insecurity, directly affecting the livelihoods of local communities. The contamination of water sources increases the risk of waterborne diseases, which compounds the health challenges in the district. The destruction of schools and roads further exacerbates the social and economic impacts, leading to educational disruptions and reduced mobility, which limits access to essential services. The underlying cause of these impacts can be traced to the region's exposure to frequent floods, which are likely exacerbated by climate change and land-use practices. The low-lying topography of the affected areas makes them highly susceptible to flooding, which is further aggravated by deforestation and poor land management practices.

Similar findings have been observed in other flood-prone regions, such as in sub-Saharan Africa. Mavhura and Manatsa (2016) found comparable impacts in Zimbabwe, with flooding causing significant damage to social infrastructure, including schools and clinics. Studies from Tanzania (Munyuli and Kibiringi, 2018) and Nigeria (Adekola *et al.*, 2013) also highlight the devastating effects of floods on agricultural productivity, soil fertility and natural resources. The findings from Tsholotsho align with these regional studies, confirming the widespread and devastating impacts of flooding on both the natural environment and socio-economic infrastructure. In the same

context, the links between flooding and the Sustainable Development Goals (SDGs) are evident. Flooding impedes progress on SDG 1 (No Poverty) and SDG 2 (Zero Hunger) by disrupting agricultural production and on SDG 6 (Clean Water and Sanitation) by compromising water quality. This observation highlights the need for integrated disaster risk management strategies that consider environmental, health and infrastructural impacts.

The study identified several factors that influence the effectiveness of flooding response mechanisms in Tsholotsho, including resource availability, community awareness, institutional capacity and communication challenges. The lack of funding and adequate resources for disaster management, along with limited capacity of local institutions and poor communication, particularly in disseminating early warning messages, significantly hampered the effectiveness of flood response efforts.

The insufficient resources and institutional capacity limit the ability of local authorities and disaster response committees to mount an effective response. The lack of coordinated efforts between government departments, NGOs and local communities weakens disaster preparedness and response. Inadequate training and a lack of resources for Civil Protection Committees hinder their ability to respond effectively. The poor communication networks exacerbate the situation, as early warning messages fail to reach all affected communities in a timely manner. These challenges suggest that the current response mechanisms are not equipped to handle the scale and frequency of floods in Tsholotsho. The increasing frequency of floods, likely linked to climate change, further stresses the need for enhanced response mechanisms.

Similar challenges have been observed in other flood-prone regions, including Kenya, Tanzania and Zambia. In these countries, local disaster response mechanisms often suffer from resource constraints, poor coordination and inadequate communication systems. A study by Makurira *et al.* (2019) emphasized that poor infrastructure and limited capacity at the local level hinder effective flood management in Southern Africa. These findings are consistent with Tsholotsho's experience, highlighting the need for increased funding, better coordination and capacity building at the community level to improve response effectiveness.

The study assessed the functionality of the existing institutional arrangements for managing flooding in Tsholotsho, such as the Civil Protection Unit (CPU) and local government agencies. Findings revealed that while these institutions are generally functional, there are significant challenges in terms of coordination, capacity and resources. Local disaster management

committees often lack the necessary resources and training to effectively respond to flooding and there is a lack of clear role definitions and communication between institutions.

The lack of coordination between national, regional and local institutions undermines the effectiveness of flood management in Tsholotsho. The unclear roles and responsibilities of various stakeholders, coupled with resource and capacity gaps, result in fragmented disaster management efforts. This issue is exacerbated by insufficient communication channels and a lack of integration of traditional knowledge and community leadership into formal disaster response structures. This indicates that the institutional arrangements in place are not sufficiently equipped to manage the complexities of flood disasters and the effectiveness of these arrangements can be significantly improved through better coordination and resource allocation.

Research in other regions, such as Kenya and Malawi, reveals similar issues with disaster management structures. In these countries, fragmented institutional arrangements and lack of coordination between government and non-governmental stakeholders hinder effective disaster management (UNHCR, 2024). The findings in Tsholotsho resonate with these regional experiences, suggesting that improving institutional coordination and clearly defining roles and responsibilities at all levels of government is critical for effective flood disaster management.

The study proposes a framework for enhancing the efficiency of flood disaster response mechanisms in Tsholotsho. Key components of this framework include strengthening the capacity of Civil Protection Committees, improving early warning systems, increasing community participation and ensuring better resource mobilization. The framework also emphasizes the importance of integrating traditional knowledge and local leadership into formal disaster management processes.

The proposed framework aims to address the weaknesses identified in the current response mechanisms by focusing on capacity building, community involvement and better communication. Strengthening the skills and resources available to local actors, particularly Civil Protection Committees, enhances their ability to respond to flooding effectively. The integration of indigenous knowledge systems is particularly important for ensuring that local communities are better prepared and able to cope with flood events. The framework also advocates for improved early warning systems to ensure timely and effective dissemination of information to all community members. This strategy allows people to take preventive measures before flooding occurs, potentially reducing the loss of life and property.

The framework proposed in Tsholotsho aligns with best practices from international disaster risk management frameworks, such as the Sendai Framework for Disaster Risk Reduction. This global framework stresses the importance of community-based approaches, capacity building and improving early warning systems. Studies from other flood-prone regions, including the Philippines and India, have shown that integrating local knowledge, strengthening community participation and enhancing early warning systems are key to improving disaster resilience. These findings confirm the relevance and potential effectiveness of the proposed framework for Tsholotsho.

5.4 Factors that influence the effectiveness of flooding response mechanisms in the Tsholotsho district

One key factor affecting the effectiveness of flooding response mechanisms in Tsholotsho District is resistance by local communities. A significant number of respondents noted that local people often adhere to traditional knowledge passed down by elders, which, although valuable, does not always align with modern climate change realities. This resistance to change is a barrier to the successful implementation of flood response measures. As Manyena *et al.* (2006) observed, local communities can become an obstacle to development if they are not engaged effectively in the change process. The importance of addressing this resistance is vital, as it reflects a broader challenge of balancing tradition and the evolving nature of climate events. The effectiveness of flood response mechanisms is thus contingent on the inclusion of local knowledge, as well as education on the necessity of adapting to new climate patterns.

The natural terrain of Tsholotsho District presents another significant factor influencing the success of flood response measures. The region's low-lying geography makes it especially vulnerable to flooding. Areas with flat, low-lying terrains are generally more susceptible to natural disasters, as observed by Masih *et al.* (2018), who emphasized the high risk of flooding in such regions. The nature of the land exacerbates the challenges faced by response mechanisms, often rendering them less effective. The persistence of flooding in these areas calls for innovative strategies, including the consideration of relocation programs to more sustainable areas. Such interventions would require substantial investment and political will to improve the resilience of communities in flood-prone zones.

5.5 The functionality of existing institutional arrangements for managing flood-induced disasters

Tsholotsho District has a range of stakeholders involved in managing flood-induced hazards, with several key institutions playing critical roles. The District Development Coordinator's Office (DDC), UNICEF, PLAN International and Rural District Councils (RDCs) are among the primary actors in flood risk management. The DDC is particularly instrumental, as it coordinates activities through the District Civil Protection Unit (DCPU), chairs the planning committee and oversees urgent flood response efforts. This central role makes the DDC an essential player in disaster management in the district. Similarly, UNICEF has been vital in providing emergency relief; for instance, after the flooding attributed to Cyclone Dineo, UNICEF supplied evacuation tents to displaced households. This collective effort demonstrates a coordinated response to disaster management, a key element for success in mitigating the impacts of floods (Kapangaziwiri *et al.* 2017).

The study found that effective systems and procedures are in place for flood risk management in Tsholotsho. These include mechanisms for assessing flood impacts, monitoring flood events, disseminating data and providing early warning systems. The integration of indigenous knowledge with scientific methods for disaster resilience is a particularly significant aspect of these systems. The Village Civil Protection Committees (VCPCs) have been identified as effective tools for responding to floods, as they are well-trained and equipped to handle flood-related emergencies. Research from Mutopo *et al.* (2020) and Nyong *et al.* (2007) supports the view that community participation and collaboration are vital for effective disaster risk management. However, the study also found that gender does not significantly influence disaster risk management in the district, signaling the importance of ensuring equal participation from both men and women in flood response and prevention efforts.

Institutional capacity and collaboration are also critical to the success of flood management in Tsholotsho. The study revealed that the functional capacities of various actors, including central government departments, NGOs, Faith-Based Organizations (FBOs), the private sector and universities, are on par with one another in terms of contributing to disaster management efforts. The Department of Civil Protection, NGOs and FBOs were all found to play important roles, particularly in resource mobilization for emergency relief. For example, the Red Cross, in partnership with the District Civil Protection Committee, provided assistance to affected households. Despite these positive contributions, respondents expressed dissatisfaction with the quality of rehabilitation efforts, citing substandard materials and inadequate housing for large

families. This highlights the need for improving rehabilitation processes to ensure long-term support for affected communities.

Institutional collaboration and effective arrangements are essential in building resilience to flood-induced disasters. Studies conducted by Ogunjobi *et al.* (2018), Simatele *et al.* (2020) and Musiyiwa *et al.* (2019) emphasize the importance of inter-agency cooperation in managing floods in sub-Saharan Africa, including Zimbabwe. This study affirms that the involvement of multiple stakeholders at the local and national levels is key to addressing the challenges posed by floods. The Sendai Framework for Disaster Risk Reduction (SFDRR), which advocates for the development of early warning systems, highlights the importance of stakeholder involvement in reducing disaster risks. The framework's emphasis on terms such as "participation" and "collaboration" underscores the need for inclusive approaches to disaster management. Previous studies in Zimbabwe and sub-Saharan Africa have shown that community-based approaches, which engage local communities in flood risk management, can be highly effective in reducing the impact of floods on social infrastructure.

Civil Protection Committees at the ward level, although effective, require further capacitation through regular training to enhance their ability to respond to flooding. The study highlighted that these committees, including VCPCs, are integral in flood management, but ongoing training is essential for ensuring they remain equipped to handle the increasing frequency and intensity of floods due to climate change. The integration of indigenous knowledge with modern flood management strategies is crucial in the context of unpredictable weather patterns. Indigenous knowledge systems, which have historically been used to predict floods, are no longer as reliable due to climate change. This variability in weather conditions poses a challenge for the community's traditional understanding of flood risks, necessitating a shift toward more robust, scientifically-informed disaster management systems.

The study also revealed the critical role of universities and research institutions in flood disaster management. Institutions such as Lupane State University, National University of Science and Technology and Midlands State University contribute to research on flood risk management and train future disaster management professionals. These universities facilitate weather forecasting and predictions, which are vital for designing effective flood risk management strategies. They also evaluate the effectiveness of existing response mechanisms and contribute to the development of flood management plans. The involvement of academic institutions is a positive step towards building a research-driven, evidence-based approach to disaster management in

Tsholotsho and other flood-prone areas in Zimbabwe. Furthermore, the use of hazard maps and regularly updated data, as identified in previous studies by Masih *et al.* (2018) and Kapangaziwiri *et al.* (2017), can greatly enhance decision-making and the implementation of effective response strategies.

Finally, a Kruskal-Wallis test conducted during the study revealed that there were no significant differences ($P=0.15$) in the perceptions of males and females regarding the effectiveness of various flood disaster management interventions. This suggests that both genders perceive the flood risk management mechanisms as equally important, emphasizing the need for gender-inclusive approaches. The study also identified significant differences in the effectiveness of different interventions, such as land-use planning incorporating hazard zones, protected ecosystems and the development of district-level flood management plans. The results point to the importance of , coordinated flood management plans that address both immediate response needs and long-term strategies for disaster risk reduction. Overall, the study underscores the importance of functional institutional arrangements, stakeholder collaboration and community engagement in building resilience to flood-induced disasters in Tsholotsho District.

5.6 Framework for enhancing the efficiency of flooding disaster response mechanisms

The current study provides key insights into the role of institutional arrangements in flood management and emphasizes the need for more effective flood response measures. These findings are strongly supported by existing literature from Zimbabwe, SADC countries and sub-Saharan Africa. Several studies highlight the importance of incorporating hazard zones in land use planning and developing policies and strategies for climate change and flood management (Mabikke *et al.*, 2020; Mafimbo *et al.*, 2018). Additionally, the need for robust institutional and legal frameworks for flood management, with decentralized responsibilities and capacities at all levels, is recommended (Mutopo *et al.*, 2017; Nhamo *et al.*, 2019; USAID, 2024).

The results of this study underscore the necessity for effective institutional and legal frameworks in flood management, which should include decentralized responsibilities and capacities at all levels. Furthermore, policies and strategies for climate change and flood management should be inclusive of all genders. Incorporating hazard zones in land use planning and developing gender-sensitive policies can better prepare communities to mitigate the impacts of floods and other disasters. This aligns with findings from Mavhura *et al.* (2017), who emphasized that community participation is vital for the success of flood management strategies. The current study also

supports this notion, highlighting the importance of community mobilization and participation in building resilience against floods in Tsholotsho District.

Tevera and Mandondo (2017) note that poor infrastructure and inadequate maintenance contribute to the severity of flooding in Zimbabwe, a point echoed in the current study. They suggest that the central government should provide the necessary infrastructure and maintenance to enhance flood management efforts. Similarly, Chitiga *et al.* (2019) emphasize the role of education and awareness campaigns in strengthening community resilience against floods. The current study also found that low levels of knowledge hinder the development of community resilience. Additionally, the recommendation by Mubaya *et al.* (2018) for policy and regulatory frameworks to support the implementation of climate change adaptation strategies is consistent with the findings of this study, which advocates for the establishment of institutional and legal frameworks for flood management with decentralized capacities. This study highlights the need for investments in adaptive and resilience-building measures to protect vulnerable groups in Tsholotsho District. Masikati *et al.* (2020) similarly stress the importance of proactive measures to build resilience in flood-prone communities. The study also emphasizes the need for effective resource mobilization and financing mechanisms for flood response, as highlighted by Mhizha *et al.* (2021).

To enhance flood management practices at the district level, it is crucial to develop management plans that address the unique needs and challenges of communities. Investments in infrastructure improvements, such as better access roads, are essential for improving flood prevention and response efforts. A collaborative and holistic approach is also necessary to strengthen flood management techniques. Policy frameworks and laws should be reinforced to support flood prevention and management initiatives, while investing in community-based programs, such as training and awareness campaigns, can encourage local participation in flood prevention and response efforts.

5.6.1 Discussion Localised Flood Response Framework

The proposed localised flood response framework for Tsholotsho district is built on the premise that effective disaster management in rural, resource-constrained areas must prioritise community participation, cost-efficiency and decentralised coordination (Wisner *et al.*, 2022; UNDRR, 2019). Local ownership is central, recognising that communities are invariably the first responders when flooding occurs (Twigg, 2015). In this regard, traditional leaders, ward

councillors, village heads and local disaster committees are positioned not as passive recipients of aid but as active partners in planning, decision-making and execution. This aligns with the view of Mercer *et al.* (2010) that disaster resilience is strengthened when local knowledge and leadership are integrated into formal response systems.

Given the financial limitations typical of rural Zimbabwe, the framework encourages the use of existing low-cost infrastructure such as schools, churches and village assembly points as temporary shelters, supply depots and communication hubs. Reliance on accessible technologies, particularly basic mobile phones and widely used platforms like WhatsApp, is promoted for early warning and coordination purposes (Zhou *et al.*, 2020). Decentralised disaster response is a further cornerstone, with active Ward Disaster Risk Reduction Committees linked to the District Civil Protection Committee to ensure faster mobilisation and reduced dependency on centralised responses. Evidence from Mozambique's post-Cyclone Idai recovery indicates that such decentralised arrangements, particularly when supported by traditional leaders and religious institutions, facilitate timelier and more adaptive responses (da Costa and Pimenta, 2021).

The framework also prioritises inclusive communication strategies to ensure that flood warnings, preparedness messages and recovery plans reach all demographic groups, including children, persons with disabilities and the elderly. Messages are translated into local languages and disseminated in formats accessible to those with limited literacy, an approach consistent with recommendations by the International Federation of Red Cross and Red Crescent Societies (IFRC, 2021). Timeliness is equally important, with a shift from reactive relief towards anticipatory measures based on seasonal forecasts, simulation exercises and pre-positioned emergency kits. Hazard monitoring along the Gwayi and Umzingwane catchments forms part of this preparedness focus, in line with findings by Chanza and Musarandega (2020) on the importance of upstream surveillance in reducing downstream disaster impacts.

Inter-institutional collaboration is embedded in the framework, with clear role definitions for government departments, humanitarian NGOs, churches and traditional authorities to minimise duplication of effort and ensure coherent action. Sustainability is pursued through continuous local capacity building, particularly in first aid, emergency coordination and shelter management, reflecting the argument by Manyena (2016) that disaster risk reduction in Africa must be embedded within everyday governance structures.

Institutionally, the framework operates from the ground up, linking households, village assemblies and ward committees through four primary stages: early warning, evacuation, relief and recovery. These stages are connected by feedback loops that facilitate ongoing information exchange and adaptive decision-making (Alexander, 2021). What distinguishes this approach from the prevailing centralised system in Tsholotsho is its emphasis on anticipatory, locally led coordination rather than delayed top-down interventions. This reduces bureaucratic lag and embeds disaster readiness in local governance routines.

Operationalisation leverages existing governance platforms such as village assemblies for preparedness meetings, evacuation drills and mobilisation efforts. Ward Disaster Committees serve as the operational arm for implementing district strategies at local level but require consistent training in emergency response, information relay and coordination (Makoni *et al.*, 2022). Funding is sourced through Zimbabwe's devolution policy, district disaster funds and supplementary contributions from local businesses and diaspora networks, a financing blend that enhances readiness while reducing reliance on external donors (Madamombe, 2021). Through pooling financial, material and technical resources already embedded in the community, the framework becomes both practical and sustainable, ensuring that preparedness and response are institutionalised within the social and governance fabric of Tsholotsho.

5.6.1.1 Actors

The framework integrates a diverse range of actors whose coordination is critical to an effective flood disaster response in Tsholotsho. At the grassroots level, households, village assemblies and traditional leaders form the backbone of preparedness, drawing on indigenous knowledge systems and strong social cohesion to initiate rapid action when flood threats emerge (Mercer *et al.*, 2010). Ward Disaster Committees serve as an operational bridge between community structures and the District Civil Protection Committee, ensuring that local insights directly inform district-level strategies. Community-based organisations such as churches and local businesses contribute by mobilising resources and providing logistical support, often compensating for the gaps left by formal state structures (Manyena, 2016). At the district tier, the Civil Protection Committee coordinates administrative, technical and inter-institutional interventions, while provincial and national agencies provide policy direction and strategic resources. This multi-actor design supports a bottom-up model of disaster management that better reflects the realities and capacities of rural governance.

5.6.1.2 Processes

The operational structure of the framework is organised into four interlinked stages early warning, evacuation, relief and recovery each supported by continuous feedback loops to facilitate adaptive management (Alexander, 2021). Early warning systems combine hydrological monitoring along the Gwayi and Umzingwane catchments with accessible communication tools such as WhatsApp groups, community radio and word-of-mouth alerts. Evacuation procedures identify safe routes and designate schools, churches and community halls as temporary shelters. The relief phase delivers emergency supplies, healthcare and temporary accommodation, while the recovery stage focuses on restoring livelihoods, repairing infrastructure and rehabilitating affected ecosystems. The feedback loop after each phase enables communities and institutions to evaluate performance, identify bottlenecks and integrate lessons into preparedness planning for subsequent flood events.

5.6.1.3 Resource Channels and Decision Points

The sustainability and responsiveness of the framework rely on blended resource channels that draw from both formal and informal systems. Zimbabwe's devolution funds and district disaster budgets provide institutional financing for planned interventions, while local businesses and diaspora networks contribute rapid, flexible funding during emergencies (Madamombe, 2021). Material resources including boats, first aid kits and communication equipment are procured and strategically stored for immediate deployment. Decision points are embedded within each stage of the process, empowering ward-level committees to initiate evacuation, prioritise vulnerable groups and allocate resources based on locally verified information. This decentralised approach minimises bureaucratic delays and ensures that response decisions are grounded in the immediate realities of the affected communities.

5.6.1.4 Relevance to Tsholotsho

Tsholotsho's downstream location relative to the Gwayi and Umzingwane catchments exposes it to recurrent floods, often with minimal lead time due to upstream rainfall patterns (Chanza and Musarandega, 2020). The existing centralised disaster response mechanisms in Zimbabwe frequently mobilise after damage has occurred, limiting the scope for anticipatory action (Manyena, 2016). The proposed framework addresses this shortcoming by positioning hazard monitoring,

decision-making authority and preparedness activities at ward and village levels, allowing for earlier mobilisation and targeted interventions. This aligns with the United Nations Office for Disaster Risk Reduction (UNDRR, 2019) and Mercer *et al.* (2010), who emphasise that resilience in rural contexts is most effectively built when operational control is decentralised and embedded in local governance systems. Leveraging existing structures such as village assemblies and ward committees also ensures cultural legitimacy and operational efficiency, reducing dependence on delayed central interventions.

5.6.1.5 Contribution to Resilience

The framework enhances resilience by shifting emphasis from reactive, centrally administered aid distribution to proactive, community-led coordination. Recognising households and local institutions as first responders, it equips them with the training, resources and authority to act rapidly. Similar decentralised strategies in Mozambique's Cyclone Idai recovery demonstrated that community-led coordination supported by traditional and religious leadership facilitated faster evacuations and more effective relief distribution (da Costa and Pimenta, 2021). Furthermore, the inclusive communication model ensures that children, persons with disabilities and the elderly receive accessible and timely information, reducing vulnerability during high-risk periods (IFRC, 2021). Through integrating capacity-building, local financing mechanisms and collaborative governance into daily community practice, the framework builds adaptive capacity over the long term and reduces dependency on slow-moving external interventions.

5.6.1.6 Policy and Operational Recommendations

The findings of this study and the proposed localised flood response framework point to specific actions that can enhance disaster preparedness and resilience in Tsholotsho and similar rural districts. These recommendations target local authorities, national policymakers and development partners, ensuring alignment between institutional mandates and community capacities.

1. Institutionalise Ward-Level Disaster Risk Reduction Committees

Local government should formally recognise and resource ward disaster committees as the operational units for preparedness and early response. This recognition should be accompanied by clear role descriptions, reporting structures and accountability mechanisms to ensure they are functional beyond crisis periods (Manyena, 2016).

2. Establish Dedicated Local Disaster Preparedness Budgets

Under Zimbabwe's devolution framework, district councils should allocate a fixed proportion of their annual budgets to disaster preparedness and response. This dedicated funding should cover early warning equipment, pre-positioned relief supplies and periodic simulation exercises (Madamombe, 2021).

3. Strengthen Inclusive Early Warning Systems

Early warning messages should be accessible to all community members, including children, persons with disabilities and the elderly. This requires translation into local languages, use of multiple communication channels and dissemination through trusted figures such as traditional leaders and religious authorities (IFRC, 2021).

4. Integrate Informal Support Networks into Formal Preparedness Planning

Local businesses, diaspora groups and faith-based organisations already contribute significantly to flood response. Formalising their role through preparedness agreements can improve coordination, reduce duplication and ensure that their resources are deployed strategically (Mercer *et al.*, 2010).

5. Embed Capacity Building into Annual Development Plans

Training in first aid, flood evacuation procedures and shelter management should be part of annual local development planning. Simulation exercises conducted before the rainy season will reinforce skills and improve inter-institutional collaboration (Alexander, 2021).

6. Develop a National Policy on Community-Led Disaster Governance

The success of decentralised models in flood-prone areas such as Tsholotsho highlights the need for a national policy that empowers local units to take the lead in disaster preparedness and response, with central government providing technical and logistical backup rather than controlling operations (Chanza and Musarandega, 2020).

7. Prioritise Catchment-Level Flood Monitoring

Given Tsholotsho's vulnerability to upstream flooding from the Gwayi and Umzingwane catchments, hydrological monitoring stations should be established or upgraded in key upstream

points. Data from these stations must feed directly into local early warning systems to maximise lead time for evacuation and preparedness.

5.7 Conclusion

In conclusion, the discussion chapter has critically analyzed the factors influencing the effectiveness of flood response mechanisms and the functionality of institutional arrangements in Tsholotsho District. Key factors such as resistance to change rooted in traditional knowledge, the challenging terrain and a lack of coordination between various stakeholders have been identified as major barriers to effective flood disaster management. Despite the presence of critical stakeholders, such as the District Development Coordinator's Office, UNICEF and various NGOs, challenges remain in terms of resource allocation, inadequate rehabilitation efforts and inconsistent collaboration among actors. This analysis highlights the need for improved coordination, better resource mobilization and capacity building at local levels to enhance the resilience of communities affected by flooding.

The chapter also explored the importance of integrating indigenous knowledge with modern scientific methods in flood risk management. While trained Civil Protection Committees and early warning systems are effective mechanisms in place, the study indicates that improvements are needed in community engagement, gender inclusivity and the consistency of flood prediction models due to climate change variability. The findings underscore the significance of a multi-agency approach, with active participation from government, NGOs, research institutions and local communities, to achieve effective disaster management. Overall, the discussion emphasizes that while institutional arrangements in Tsholotsho are functional, significant strides must be made to address gaps in rehabilitation, resource mobilization and stakeholder collaboration for more effective flood disaster risk management.

CHAPTER SIX: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter provides a summary of the study, highlighting the key findings, conclusions drawn and recommendations for improving flood disaster management in Tsholotsho District. The study aimed to evaluate the effectiveness of existing flood response mechanisms and their role in fostering resilient livelihoods within the district. Key objectives included examining the damage caused by flooding on natural resources and social infrastructure, identifying factors influencing the effectiveness of response mechanisms, assessing the functionality of institutional arrangements and proposing a framework for enhancing flood resilience. The findings from the study provide crucial insights into the challenges and opportunities for strengthening flood management strategies in Tsholotsho, particularly in the context of climate change and the vulnerability of local communities. Based on the findings, the chapter also presents several actionable recommendations for key stakeholders, including government agencies, local authorities, NGOs, traditional leaders and research institutions. These recommendations aim to enhance institutional coordination, improve community preparedness, strengthen early warning systems and promote sustainable land management practices. Additionally, the chapter identifies areas for further research, including the long-term impacts of climate change on flood risks and the socio-economic consequences for vulnerable populations. Through addressing these recommendations, stakeholders can take concrete steps toward building a more resilient and adaptive approach to managing flood-induced disasters in Tsholotsho and other similar regions.

6.2 Summary

The study sought to evaluate the effectiveness of flood response mechanisms for enhancing resilient livelihoods in Tsholotsho District, Zimbabwe. Four key objectives guided the research: to examine the types of damage caused by flooding on natural environmental resources and social infrastructure, determine factors influencing the effectiveness of response mechanisms, assess the functionality of existing institutional arrangements and develop a framework for enhancing efficiency in flooding disaster response. The study employed a mixed-methods approach, including household surveys, focus group discussions (FGDs), interviews and field observations, to gather data.

The findings highlighted that flooding causes extensive damage to natural environmental resources and social infrastructure, especially in Wards 6, 7 and 8. The impacts included loss of lives, destruction of homes, damage to roads, bridges, schools, clinics and contamination of water sources. Livelihoods were disrupted, with agricultural productivity declining due to soil erosion and damaged irrigation systems. Waterborne diseases such as cholera and typhoid were prevalent in the aftermath, underscoring the vulnerability of local communities. These findings align with studies from other flood-prone regions in Zimbabwe and sub-Saharan Africa, emphasizing the critical need for targeted interventions to address these impacts.

A significant factor influencing the effectiveness of response mechanisms was resistance by local people, often rooted in cultural attachment to ancestral lands and mistrust of relocation plans. The nature of Tsholotsho's terrain, characterized by flat, low-lying areas, also exacerbates flooding risks, making it difficult for conventional control measures to succeed. Additionally, lack of coordination among stakeholders and inadequate resources were cited as challenges that hindered effective disaster management. These observations suggest a need for greater collaboration and investment in flood resilience infrastructure and community education.

The study also assessed the functionality of existing institutional arrangements, identifying the District Development Coordinator's Office, Civil Protection Committees (CPCs) and NGOs like UNICEF and PLAN International as key players. While these institutions contributed significantly to flood disaster management, resource limitations and fragmented efforts hampered their overall effectiveness. Evidence from the study underscores the importance of strengthening institutional capacity, enhancing coordination and ensuring sustainable partnerships among stakeholders.

To enhance the efficiency of response mechanisms, the study proposed a framework emphasizing community education, early warning systems, improved infrastructure and sustainable land management practices. This framework advocates for a holistic, participatory approach that integrates local knowledge and modern technologies to build resilient communities. The findings contribute valuable insights into the socio-environmental dynamics of flooding in Tsholotsho, offering a foundation for policy recommendations and practical interventions to mitigate flood risks.

The study further emphasized the critical role of early warning systems in flood disaster management. These systems, while present in Tsholotsho, faced challenges in effective communication and coverage. Traditional methods of disseminating warnings, such as using

messengers from village heads, were limited in reach and speed. Additionally, the reliance on indigenous knowledge for predicting weather events, though valuable, has become less reliable due to climate variability. This underscores the need for integrating advanced meteorological tools and technologies with local practices to enhance the accuracy and timeliness of early warning systems. The study also highlighted the importance of empowering communities to act on early warnings through education and preparedness training.

Institutional arrangements, while functional, revealed gaps in resource mobilization and the quality of rehabilitation efforts. Stakeholders like the Red Cross and NGOs were pivotal in providing emergency relief, including food, temporary shelters and water purification supplies. However, the dissatisfaction expressed by respondents regarding substandard housing and inadequate support for large families highlights the need for long-term rehabilitation strategies. Effective institutional collaboration, resource allocation and monitoring mechanisms are essential for addressing these gaps and ensuring sustained support for affected communities. The findings also pointed to the importance of gender inclusivity in flood disaster management. Although the study found no significant differences in perceptions of disaster management effectiveness between men and women, it stressed the need to actively involve both genders in planning and implementing response mechanisms.

Women, often disproportionately affected by disasters, bring unique perspectives and capabilities that can enhance disaster preparedness and recovery efforts. Strengthening gender-sensitive approaches can help build more inclusive and equitable flood resilience strategies. The study noted the growing influence of universities and research institutions in disaster management in Zimbabwe. These institutions contribute through research, training and the development of innovative tools for disaster prediction and management. Their involvement in Tsholotsho underscores the potential for academic partnerships to support evidence-based policymaking and capacity building in flood-prone areas. Enhanced collaboration between academic institutions and disaster management agencies can lead to more effective, research-driven solutions.

Finally, the study highlighted the critical need for integrating sustainable land-use practices into flood risk management. Deforestation, poor drainage systems and unsustainable agricultural practices were identified as factors exacerbating flood impacts in Tsholotsho. Encouraging reforestation, soil conservation and the development of green infrastructure can mitigate these risks. Additionally, policies promoting sustainable land management should be complemented by community education programs to ensure long-term adoption and effectiveness. This holistic

approach can address the root causes of flooding while enhancing community resilience and livelihoods.

6.3 Conclusions

The study set out to evaluate the effectiveness of flooding response mechanisms in Tsholotsho District, focusing on their role in fostering resilient livelihoods. It highlighted the extent to which flooding impacts natural environmental resources and social infrastructure, identified factors influencing response mechanisms, assessed institutional functionality and proposed a framework for enhancing response efficiency. The findings underline the severity of flooding as a natural hazard in Tsholotsho, with extensive socio-economic and environmental consequences that disrupt livelihoods and hinder development. Flooding in Tsholotsho is a recurring disaster that primarily affects low-lying areas, causing widespread destruction of agricultural land, infrastructure and homes. The loss of soil fertility, combined with the destruction of roads, schools and clinics, demonstrates the interconnectedness of flood impacts. These damages threaten the livelihoods of a community heavily reliant on agriculture, underscoring the vulnerability of rural economies to climate-induced hazards. The prevalence of waterborne diseases during floods further compounds the challenges, highlighting the urgent need for improved water and sanitation infrastructure.

The study identified resistance to change among local communities as a key barrier to the effectiveness of flood response mechanisms. Traditional beliefs and attachment to ancestral lands often hinder relocation efforts and the adoption of modern flood-resistant practices. This resistance, while rooted in cultural values, limits the potential of response mechanisms to protect lives and livelihoods. Addressing this challenge requires culturally sensitive approaches that balance traditional practices with the demands of a changing climate. Coordination among stakeholders emerged as a significant factor influencing the effectiveness of flood response mechanisms. While institutions like the District Development Coordinator's Office, NGOs and Civil Protection Committees play critical roles, their efforts are often fragmented due to poor communication and resource constraints. Effective disaster management requires a cohesive strategy that unifies stakeholders under clear roles and responsibilities. Strengthened coordination can optimize resource use and enhance the overall impact of flood response measures.

Institutional arrangements in Tsholotsho, though functional, require improvements in capacity and resource allocation. Civil Protection Committees, which serve as the first line of defense in flood response, are constrained by inadequate training and limited resources. The involvement of NGOs and academic institutions, while invaluable, must be complemented by sustained government support to ensure the long-term resilience of affected communities. This calls for investment in training, infrastructure and financial resources to bolster institutional effectiveness.

Early warning systems are a vital component of flood disaster management but face challenges in coverage and reliability. The reliance on indigenous knowledge, while important, is becoming less effective due to the unpredictability of climate change. Integrating advanced meteorological tools with local practices can enhance the accuracy and timeliness of warnings. Furthermore, empowering communities to act on early warnings through education and preparedness training is crucial for reducing flood-related losses.

Gender inclusivity in flood response mechanisms is also critical. While the study found no significant gender differences in perceptions of disaster management effectiveness, it emphasized the importance of involving both men and women in planning and implementing response strategies. Women often bear a disproportionate share of disaster impacts and bring valuable perspectives to disaster preparedness and recovery efforts. Gender-sensitive approaches can strengthen community resilience and ensure equitable outcomes.

In conclusion, the study underscores the urgent need for and integrated approaches to managing flood risks in Tsholotsho District. Through addressing socio-economic and environmental vulnerabilities, fostering collaboration among stakeholders and implementing the proposed framework, policymakers can enhance the resilience of communities to flooding. These efforts are essential not only for safeguarding livelihoods but also for advancing sustainable development goals in the face of increasing climate variability.

6.4 Contribution of the study

This thesis advances the field of disaster risk reduction in rural African contexts by developing and empirically validating a localised flood response framework that is grounded in both institutional analysis and community-led governance. While previous studies on flood risk management in Zimbabwe (Manyena, 2016; Chanza and Musarandega, 2020) have emphasised the importance of decentralisation, they have not operationalised a functional model that

integrates formal disaster structures with indigenous governance systems and informal support networks. This research addresses that gap by producing a framework that is both context-specific to Tsholotsho's socio-hydrological realities and adaptable to other rural districts with similar governance and resource constraints.

A key contribution lies in demonstrating, through mixed-methods evidence, that resilience can be significantly strengthened when operational authority, decision points and resource mobilisation are embedded at ward and village levels rather than centralised at district or provincial offices. The framework's design, which incorporates multi-actor coordination, anticipatory preparedness and blended financing channels, represents an original synthesis of disaster risk governance theory (UNDRR, 2019) with empirical insights from a flood-prone rural district. This provides a replicable model for integrating decentralised governance into national disaster policy without undermining existing statutory structures.

Methodologically, the study contributes by combining quantitative measures of response effectiveness with qualitative accounts of lived experience, producing a multi-dimensional analysis of institutional performance under resource-constrained conditions. This approach offers a blueprint for evaluating disaster management systems in similar environments where statistical data alone may obscure critical governance dynamics.

At the policy level, the findings challenge the prevailing assumption that disaster readiness in rural Zimbabwe must rely primarily on central government intervention. Instead, they provide evidence that strategic empowerment of local units, supported by predictable financing and inter-institutional collaboration, can deliver more timely, inclusive and cost-effective flood responses. This shifts the discourse from reactive aid distribution to proactive resilience-building, marking a conceptual and practical advancement in Zimbabwe's disaster governance landscape.

6.4 Recommendations

Based on the findings of the obtained in this study, the following recommendations were thus proffered to different stakeholders and specified:

6.4.1 Ministry of Local Government and Public Works

- a) The Ministry can strengthen Rural District Councils' (RDCs) capacity for flood management through predictable funding allocations and technical support. This could prioritise flood-resilient infrastructure and pre-disaster planning, aligning with Sendai Framework priorities on local capacity;

- b) The Ministry may consider refining and enforcing land-use regulations to prevent settlement in high-risk flood zones. Evidence from this study and post-event reports in Tsholotsho (CPU, 2022) show that unregulated settlement patterns significantly increase household exposure; and
- c) Facilitating scenario-based drills and regular training for Civil Protection Committees at ward and village levels can improve preparedness and evacuation efficiency, reflecting best practice documented in community-based disaster risk reduction literature

6.4.2 Tsholotsho Rural District Council (RDC)

- a) The RDC may enforce settlement patterns that minimise exposure by formalising hazard mapping and relocation incentives. The research findings indicate that clustered settlement in low-lying areas contributed to recurrent displacement;
- b) Partnering with government and donors to develop and maintain elevated roads, bridges and community shelters can enhance accessibility and safety during floods. Case studies in Zambia's floodplains show such infrastructure significantly reduces isolation during peak events; and
- c) The RDC can strengthen public awareness campaigns through schools, churches and village assemblies. This aligns with this study's findings that early-warning uptake improves when messages come from trusted local structures.

6.4.3 Traditional Leadership Structures

- a) Traditional leaders can mobilise communities for evacuation drills, preparedness meetings and hazard mapping exercises. Their authority remains a proven driver of participation, as confirmed by local key informants;
- b) Equipping traditional leaders with radios or mobile devices can improve the speed and reach of early-warning messages. This is consistent with findings that delays in warning dissemination often stemmed from communication bottlenecks; and
- c) Traditional leaders may promote conservation measures, such as reforestation and controlled grazing, to reduce environmental degradation that worsens flood impacts (FAO, 2022).

6.4.4 District Development Coordinator's Office (DDC)

- a) The DDC can lead in aligning the activities of government agencies, NGOs and traditional structures to avoid duplication. Coordination gaps identified in this study often resulted in inefficient resource use;
- b) Regular technical training for CPCs, traditional leaders and RDC staff in early-warning systems, first aid and evacuation planning can raise preparedness levels. This is in line with UNDRR (2019) recommendations for localised capacity development; and
- c) The DDC may explore partnerships with donors and private sector actors to fund priority flood mitigation infrastructure and preparedness programs.

6.4.5 Civil Protection Committees (Ward and Village Levels)

- a) CPCs can formalise communication pathways between meteorological services, traditional leaders and households, ensuring timely alerts;
- b) Establishing small reserves of food, water and medical kits at community shelters can enable immediate relief during access disruptions; and
- c) CPCs may coordinate the co-creation of ward-level flood plans that map evacuation routes, assign responsibilities and schedule annual drills

6.4.6 NGOs and International Partners

- a) NGOs can support community-driven early-warning systems, evacuation plans and small-scale protective infrastructure, building local ownership;
- b) CPCs and RDCs with training in disaster risk assessment, GIS mapping and climate-smart land use can bridge capacity gaps identified in this study; and
- c) Programmes may ensure the inclusion of women, youth and marginalised groups in decision-making and access to post-flood recovery support

6.4.7 Universities and Research Institutions

- a) Universities can focus on flood-specific risk mapping, climate change projections and evaluation of community-based interventions to inform policy;
- b) Collaborating with local authorities to adapt GIS, remote sensing and mobile alert systems to rural settings can enhance early-warning effectiveness; and

- c) Academic institutions can partner with communities to deliver short courses and participatory workshops on disaster preparedness, ensuring that research outputs are accessible to end-users.

6.5 Proposed Framework for enhancing the efficiency of flooding disaster response mechanisms

6.5.1 Overview of the Framework

The proposed framework aims to enhance the efficiency of flood disaster response mechanisms in Tsholotsho District, addressing the persistent challenges posed by flooding in resource-constrained, remote areas. It is designed to tackle systemic issues, including inadequate preparedness, fragmented stakeholder collaboration and insufficient community resilience. Through focusing on localized solutions, the framework integrates community engagement, scientific approaches and institutional collaboration to mitigate flood impacts effectively. Its holistic approach ensures that both immediate and long-term needs are addressed, thereby reducing vulnerability and enhancing recovery capacities for affected populations.

Central to the framework is the recognition that effective flood disaster management requires a multi-dimensional strategy. This multi-dimensional strategy includes empowering communities through education and awareness initiatives, fostering collaboration among stakeholders and investing in robust early warning systems and sustainable infrastructure. The framework also emphasizes capacity-building efforts and the use of innovative flood detection technologies to provide timely and actionable data for disaster preparedness. Through aligning these components with global best practices and local realities, the framework creates a scalable and adaptable model for flood management.

The framework's design is grounded in empirical findings from the study, which highlighted critical gaps in current flood management practices. It prioritizes community-centered approaches, such as involving residents in disaster planning and decision-making, while leveraging institutional support to address broader systemic barriers. Furthermore, the framework incorporates environmental sustainability and resilience-building as key principles, recognizing the importance of protecting ecosystems and implementing land-use planning to reduce flood risks. Ultimately, this framework creates a unified and coordinated approach to flood disaster management, fostering resilience and reducing the socio-economic impacts of flooding in Tsholotsho District.

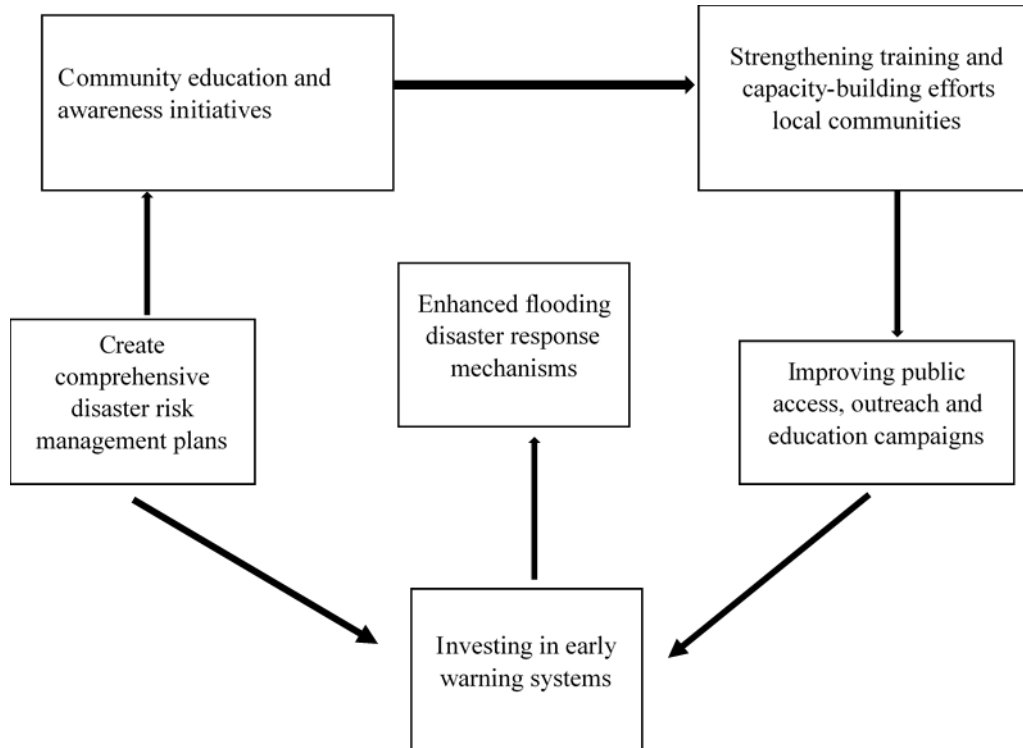


Figure 6.1: Proposed framework for integrated flood management and resilient livelihoods

6.5.2 Key Components of the Framework

The framework is built on several interconnected components designed to improve flood disaster response efficiency. The first component focuses on community education and awareness initiatives. These initiatives aim to empower local populations with knowledge about flood risks, preparedness strategies and response measures. Through providing training sessions, workshops and awareness campaigns, the framework ensures that communities are equipped to anticipate and respond effectively to flooding events. This component also emphasizes integrating indigenous knowledge with modern practices, bridging gaps in understanding and fostering trust in disaster management interventions.

The second component is enhanced stakeholder collaboration and resource coordination. Recognizing the fragmented nature of current flood response efforts, this component seeks to streamline operations and foster partnerships among government agencies, non-governmental organizations, local authorities and community groups. It promotes resource pooling, synchronized action plans and shared responsibilities to create a cohesive and efficient disaster

response system. Key strategies include establishing clear roles for each stakeholder, creating disaster preparedness committees and facilitating regular communication and joint training programs. The third critical component is investment in early warning systems and sustainable infrastructure. This includes deploying advanced technologies for flood detection and forecasting, ensuring that communities receive timely and accurate warnings. Infrastructure upgrades, such as flood-resistant buildings, improved drainage systems and strategically placed protective barriers, form the backbone of this component. Sustainable land-use planning, including hazard zoning and the preservation of natural buffers like wetlands, is integral to mitigating flood risks. Together, these components address both the immediate and long-term needs of flood-prone areas, creating a resilient and adaptive framework for disaster management.

6.5.3 Modalities for Deploying the Framework

Deploying the proposed framework requires a phased and strategic approach that prioritizes coordination, capacity building and resource mobilization. The first step involves conducting a stakeholder analysis to identify key players in flood disaster management, including government agencies, non-governmental organizations (NGOs), local leaders and community groups. This analysis ensures clarity of roles, responsibilities and resources, reducing duplication of efforts and fostering a collaborative environment. Establishing multi-stakeholder committees at the district level facilitates effective communication and decision-making during both the planning and implementation phases. Community engagement is a vital modality for the framework's success.

Deploying the framework involves conducting grassroots-level consultations to understand local needs, priorities and challenges. These consultations will ensure that interventions are context-specific and culturally sensitive. To enhance community ownership, participatory approaches such as community workshops, feedback sessions and co-designing action plans are employed. Additionally, the integration of indigenous knowledge systems into modern flood management practices strengthens the framework's acceptance and relevance at the local level.

Another key modality is the integration of capacity-building initiatives to strengthen institutional and community preparedness. This includes organizing training sessions for community leaders, local authorities and disaster response teams on flood risk assessment, early warning systems and evacuation procedures. Universities and research institutions can play a pivotal role in offering technical support and developing training curricula. Furthermore, equipping communities with tools, materials and technologies to implement flood mitigation measures is crucial for

building resilience. Resource mobilization is central to operationalizing the framework. This involves securing funding from multiple sources, including government budgets, donor agencies and private sector partnerships. The framework recommends creating a dedicated disaster response fund at the district level to ensure the availability of resources during emergencies. Transparent allocation and utilization of these resources is monitored through community-based accountability mechanisms. Additionally, partnerships with NGOs and international organizations can provide access to specialized expertise, equipment and additional funding.

Robust monitoring and evaluation mechanisms ensures the framework's effectiveness and sustainability. This includes establishing performance indicators to track progress and conducting periodic reviews to identify gaps and opportunities for improvement. Real-time data collection during flood events will be analyzed to refine disaster response strategies and inform long-term planning. Continuous engagement with stakeholders through regular feedback sessions helps adapt the framework to emerging challenges, ensuring its ongoing relevance and success in mitigating flood impacts in Tsholotsho District.

6.5.4 Anticipated Outcomes and Benefits of the Framework

The implementation of the proposed framework is expected to yield significant improvements in flood disaster management in Tsholotsho District. A primary anticipated outcome is enhanced community resilience, achieved through increased awareness, education and preparedness. Through equipping residents with the knowledge and tools necessary to anticipate and respond to floods, the framework reduces the vulnerability of local populations to the devastating impacts of flooding. This empowerment also fosters greater community ownership of disaster risk reduction efforts, ensuring sustainable and proactive engagement in flood management practices.

Another key benefit of the framework is the creation of a more efficient and coordinated disaster response system. Strengthened collaboration among stakeholders, such as government agencies, NGOs and local authorities, streamlines resource allocation and operational effectiveness during flood events. This minimizes response times, improve the delivery of aid and ensure that affected communities receive the support they need in a timely manner. The integration of advanced early warning systems and sustainable infrastructure will further enhance the district's capacity to predict, mitigate and recover from flood disasters, reducing long-term socio-economic disruptions. Additionally, the framework promotes environmental sustainability and infrastructure resilience. Through prioritizing sustainable land-use planning and the

preservation of natural buffers, such as wetlands, the framework mitigates flood risks while protecting vital ecosystems. Investments in flood-resistant infrastructure, such as improved drainage systems and reinforced buildings, reduce the physical and financial toll of floods on communities and local governments. Together, these benefits contribute to the achievement of broader development goals, including improved public health, education continuity and economic stability, thereby fostering a more resilient and sustainable Tsholotsho District.

6.5.5 Monitoring and Evaluation of the Framework

Monitoring and evaluation (M&E) of the framework is critical to ensuring its effectiveness and adaptability over time. The process begins with establishing an M&E plan that includes clearly defined performance indicators aligned with the framework's objectives. These indicators should measure key outcomes, such as community awareness levels, stakeholder collaboration efficiency, response times during flood events and the resilience of infrastructure. Baseline data collected at the outset enables comparisons and assessments of progress over time, while periodic evaluations provides insights into the framework's impact and areas needing improvement.

A participatory approach to M&E is essential to fostering accountability and inclusivity. Engaging stakeholders such as local authorities, community members, NGOs and researchers in the M&E process ensures diverse perspectives and shared ownership of results. Regular feedback sessions and focus group discussions can provide qualitative insights into the effectiveness of interventions and highlight unanticipated challenges. Additionally, incorporating community-based monitoring mechanisms empowers local populations to track the implementation of flood management initiatives, fostering transparency and accountability at all levels.

Technological tools play a vital role in the M&E process. Geographic Information Systems (GIS), mobile applications and real-time data collection tools can be used to monitor flood-prone areas, track disaster responses and measure the performance of early warning systems. These tools enable the collection and analysis of precise, timely and actionable data, facilitating evidence-based decision-making.

Digital platforms can be leveraged to disseminate M&E findings, promoting knowledge sharing and collaboration among stakeholders at district, national and international levels. To ensure the framework's sustainability, M&E findings must inform adaptive management practices. Lessons

learned from evaluations should be used to refine strategies, address identified gaps and respond to emerging challenges, such as climate change impacts or shifts in socio-economic conditions. Regular reporting and dissemination of M&E outcomes to stakeholders and decision-makers will build trust, secure continued support and attract additional resources for the framework. Through integrating robust M&E systems into the implementation process, the framework remains dynamic and responsive, effectively enhancing flood disaster management in Tsholotsho District over the long term.

6.7 Recommendations for Further Studies

- 1) Investigate the Long-Term Impact of Climate Change on Flood Frequency and Intensity in Tsholotsho: Future studies should focus on the long-term impacts of climate change on flood frequency and intensity in Tsholotsho District. Research could explore how changing weather patterns, such as shifts in rainfall, temperature and drought cycles, influence flood events and community vulnerability. Such studies help to refine flood prediction models and guide the development of adaptive strategies that can mitigate future flood risks in the region.
- 2) Explore the Socio-Economic Impacts of Flood-Induced Disasters on Vulnerable Populations: Further research should examine the socio-economic impacts of flooding on vulnerable populations, particularly women, children and marginalized groups, in Tsholotsho. These studies can focus on how flooding affects livelihoods, health, access to education and overall well-being. Understanding these impacts provides insights into targeted interventions that can improve disaster resilience for these vulnerable groups and enhance social protection systems in flood-prone areas.
- 3) Assess the Effectiveness of Multi-Stakeholder Collaboration in Flood Risk Management: Additional studies should evaluate the effectiveness of multi-stakeholder collaboration in flood risk management. Research could focus on how government agencies, NGOs, traditional leaders and local communities coordinate efforts during flood response and recovery. This helps identify best practices, barriers to collaboration and opportunities for enhancing inter-agency cooperation in disaster management, ultimately improving the efficiency and impact of flood risk reduction initiatives in Tsholotsho.

6.8 Proposed academic publications from the thesis

6.8.1 Socio-Demographic Factors Influencing Vulnerability to Flooding: Insights from Tsholotsho District, Zimbabwe

This paper explores the socio-demographic factors that influence the vulnerability of households to flooding in Tsholotsho District, Zimbabwe. It examines how variables such as gender, age, household size, education level and duration of residence shape people's experiences and responses to flood events. The findings suggest that women, children and elderly individuals are particularly vulnerable due to socio-economic and cultural factors, including limited mobility, caregiving responsibilities and lack of access to resources. It also reveals how households with higher education levels and longer residence duration tend to have better preparedness and response strategies, highlighting the importance of education and experience in building resilience.

The paper further investigates how marital status, income levels and household composition interact to influence flood vulnerability. For example, larger households, particularly those led by women, are more likely to face greater challenges during floods, including increased need for resources and greater exposure to risk. Through analysing these socio-demographic factors, the paper contributes to understanding the socio-cultural dimensions of disaster risk, providing valuable insights for designing targeted interventions. It calls for tailored flood response policies that address the specific needs of vulnerable groups and recommends incorporating socio-demographic considerations into future flood risk assessments and disaster planning.

6.8.2 The Impact of Flooding on Natural Resources and Social Infrastructure: Implications for Resilient Livelihoods in Rural Zimbabwe

This paper investigates the multifaceted impact of flooding on natural resources and social infrastructure in rural areas of Zimbabwe, specifically in the Tsholotsho District. It examines how flooding disrupts agricultural production, degrades water sources and damages essential infrastructure such as roads, schools and healthcare facilities. The study shows that floods not only cause immediate damage to livelihoods but also lead to long-term consequences, including food insecurity, loss of income and limited access to healthcare and education. Through documenting the types of damage caused by floods, such as soil erosion, crop destruction and water contamination, the paper illustrates how these disruptions undermine community resilience.

The paper also highlights the role of infrastructure in maintaining community functions during floods and how its destruction exacerbates the socio-economic impacts. It discusses the importance of resilient infrastructure in ensuring continuity of services and reducing vulnerability in flood-prone areas. Furthermore, the paper underscores the need for integrated disaster risk management strategies that focus on both environmental sustainability and the rehabilitation of critical infrastructure. It calls for policy reforms aimed at enhancing flood resilience through sustainable land use practices, improved infrastructure planning and stronger disaster recovery mechanisms, with an emphasis on the long-term implications of flooding on rural communities' livelihoods.

6.9 Chapter Summary

In conclusion, this chapter has encapsulated the key findings of the study, emphasizing the significant impacts of flooding on both the natural environment and social infrastructure in Tsholotsho District. The study revealed that flooding severely affects agricultural productivity, disrupts livelihoods, damages vital infrastructure and exacerbates health risks, particularly through waterborne diseases. Despite the presence of various institutional arrangements and stakeholders, challenges such as resistance to change, inadequate resources, poor coordination and the nature of the terrain continue to undermine the effectiveness of flood response mechanisms. However, the study also highlights opportunities for improvement, particularly through enhanced coordination, capacity building and the integration of indigenous knowledge with modern flood management strategies.

The recommendations provided in this chapter offer a pathway toward more effective flood disaster management in Tsholotsho. Strengthening the roles of local institutions, improving early warning systems, enhancing community participation and increasing investment in resilient infrastructure are crucial steps for reducing flood impacts and building long-term resilience. Furthermore, the study identifies areas for future research that will deepen understanding of flood risks, the socio-economic impacts on vulnerable groups and the effectiveness of collaborative disaster management frameworks. Through adopting these recommendations and pursuing further research, Tsholotsho can make meaningful progress in mitigating flood risks and ensuring the safety and well-being of its communities.

REFERENCES

- Adams, B., Dwomoh, F.K., & Amponsah, P. (2013). Community-Based Approaches to Flood Risk Management in Ghana: A Study of Accra and Kumasi Metropolitan Areas. *Journal of Environment and Earth Science*, 3(11), 62-71.
- Adato, M., & Meinzen-Dick, R. (2002). Assessing the impact of agricultural research on poverty using the Sustainable Livelihoods Framework. *Development Policy Review*, 20(4), 422-444.
- Adekola, O., Olayinka, K., & Titilola, S. (2013). Flood disasters in Nigeria: A review of the literature and implications for sustainable development planning. *Journal of Geography and Regional Planning*, 6(4), 78-88.
- Adger, W. N., Hughes, T. P., Folke, C., Carpenter, S. R., & Rockström, J. (2005). *Social-ecological resilience to coastal disasters*. *Science*, 309(5737), 1036-1039.
- Adjei-Boateng, D., Boamah, K. O., & Baffoe, G. (2018). Investigating rural farmers' perception of flood risk and disaster risk reduction in the Upper East region of Ghana. *International Journal of Disaster Risk Reduction*, 27, 290-298.
- Albright, A. E. (2011). Policy change and Learning in response to extreme flood events in Hungary: An Advocacy coalition approach. *Policy Studies Journal* [Online]. 39, 485-511. Available at: <https://doi.org/10.1111/1541-0072.2011.0.04.18>. (Accessed: 08 February 2020).
- Amaratunga, D., Haigh, R., & Sarshar, M. (2015). Disaster risk reduction education in the school curriculum: Case study from Sri Lanka. *International Journal of Disaster Resilience in the Built Environment*, 6(2), 165-177.
- Anielle, T. P. & Marie-Ange, B. (2015). From Yokohama to Sendai. Approaches to participation in International Disaster Risk Reduction Framework. *International Journal of Disaster Risk Reduction Science*. 6, 128-139.
- Ashley, C., & Carney, D. (1999). *Sustainable livelihoods: Lessons from early experience*. Department for International Development (DFID).
- Babbie, E. (2010). *The practice of social research*. 12th ed. Belmont: Wadsworth Cengage Learning.
- Bagozzi, R. P., & Yi, Y. (2012). Specification, evaluation and interpretation of structural equation models. *Journal of the Academy of Marketing Science*, 40(1), 8-34.
- Bebbington, A. (1999). Capitals and capabilities: A framework for analyzing peasant viability, rural livelihoods and poverty. *World Development*, 27(12), 2021-2044.
- Béné, C., & Newsham, A. (2019). Resilience, poverty and development. *Journal of International Development*, 31(8), 613-619.
- Bhattacharjee, A. (2012). *Social Science Research: Principles, Methods and Practices*. Gainesville: University of South Florida.

- Birt, L., Scott, S., Cavers, D., Campbell, C. and Walter, F., 2016. Member checking: A tool to enhance trustworthiness or merely a nod to validation? *Qualitative Health Research*, 26(13), pp.1802–1811.
- Blaikie, P., Cannon, T., Davis, I. & Wisner, B. (2014). *At Risk: Natural hazards, people's Vulnerability and Disasters*. London: Routledge.
- Bogdan, R. C. & Biklen, S. K. (1998). *Qualitative research in education: An introduction to theory and methods*. 3rd ed. Needham Heights, MA: Allyn & Bacon.
- Booyesen, F., Van der Berg, S., Burger, R., Von Maltitz, M. & Du Rand, G., 2018. Using pictorial methods to measure quality of life in developing countries. *Social Indicators Research*, 136(2), pp.659–678.
- Brewer, J. (2003). Observation, overt and covert. In: Robert L.M. & John, D. Brewer, eds.. *The A-Z of social research*. London: SAGE.
- Brislin, R.W., 1970. Back-translation for cross-cultural research. *Journal of Cross-Cultural Psychology*, 1(3), pp.185–216.
- Brouwer, R., Wagtendonk, A. J., & van Beukering, P. (2018). Climate change adaptation in African agriculture: An economic framework. *Environmental Science & Policy*, 87, 132-141.
- Buckle, P., Mars, G., Smale, S., & Vaughan, L. (2000). Community-based emergency management: a review of Australian experience. *Journal of Contingencies and Crisis Management*, 8(4), 197-207.
- Bwanali, W., & Manda, M. (2023). The correlation between social resilience and flooding in low-income communities: A case of Mzuzu City, Malawi. *International Journal of Disaster Resilience in the Built Environment*, 14(4), 495–513. <https://doi.org/10.1108/IJDRBE-09-2022-0093>
- Cannon, T. (1994). Vulnerability analysis and the explanation of "natural disasters". In A. Varley (Ed.), *Disasters, Development and Environment* (pp. 13-30). New York: Wiley.
- Carney, D. (1998). *Implementing the sustainable rural livelihoods approach*. *Natural Resource Perspectives*, 13, 1-7.
- Carpenter, S., Walker, B., Anderies, J. M., & Abel, N. (2001). From metaphor to measurement: resilience of what to what? *Ecosystems*, 4(8), 765-781.
- Chakraborty, A., 2020. The role of local enumerators in improving data quality in rural surveys. *Development in Practice*, 30(7), pp.876–884.
- Chambers, R., & Conway, G. R. (1992). Sustainable rural livelihoods: Practical concepts for the 21st century. Institute of Development Studies Discussion Paper, 296.
- Chan, N. W. & Parker, D. J. (1996). Response to dynamic flood hazard factors in Peninsular: Malaysia. *The Geographical Journal*. 162, 213-225.
- Chari, L. M., Maposa, I., & Tivaringe, T. (2021). The role of gender in disaster preparedness and response in Zimbabwe. *International Journal of Disaster Risk Reduction*, 65, 102480.
- Charnley, S. (2018). Disaster, displacement and dispossession: The ethical implications of climate change. *Ethics, Policy & Environment*, 21(1), 18-34.

- Chenje, M. (2018). Disaster risk management in Zimbabwe: An analysis of policy and legislative frameworks. *Jambá: Journal of Disaster Risk Studies*, 10(1), 1-9. doi: 10.4102/jamba.v10i1.459
- Chew-Graham, C. A., Carl, R. M. & Mark, S. P. (2001). Qualitative Research and the problem of Judgment: Lessons from interviewing fellow professionals. *Family Practice*. 19 (3), 285-289.
- Chipangura, T., Manatsa, D., & Misi, S. (2018). Flood risk management in Zimbabwe: Institutional arrangements and strategies. *Journal of Environmental Management*, 223, 893-902.
- Chitakira, M., Nhamo, L., & Misi, S. (2017). Analysis of institutional arrangements for flood management in Zimbabwe. *International Journal of Disaster Risk Reduction*, 22, 135-143.
- Chitiga, R., Dube, T., & Taruvinga, A. (2019). Community-based approaches to disaster management in Zimbabwe: A review of the policy and legal framework. *Journal of Geography and Regional Planning*, 12(6), 78-90.
- Chiweshe, M. K. (2011). *Farm level Institutions in Emergent communities in Past Fast Track Zimbabwe: Case of Mazowe District*. Ph.D thesis, Rhodes University.
- Chuma, W., & Makoni, F. S. (2021). Gendered impacts of floods on smallholder farmers in Zimbabwe: Insights from the 2016-2017 El Nino-induced floods. *Journal of Gender, Agriculture and Food Security*, 6(2), 1-17.
- Comfort, L., Ko, K., & Zagorecki, A. (2004). Coordination in rapidly evolving disaster response systems. *American Behavioural Scientist*, 48(3), 295-313.
- CPU (Civil Protection Unit). (2022). Tsholotsho District Flood Assessment Report 2021–2022. Harare: Government of Zimbabwe.
- Creswell, J. W. (2013). *Qualitative inquiry and Research Design: Choosing among five approaches*. 3rd ed. Washington DC: Sage Publications.
- Creswell, J. W. (2014). *A concise introduction to Mixed Methods Research*. Washington DC: SAGE Publications.
- Davies, S., & Brown, R. (2007). Managing risks to food and nutrition security: the role of social protection. *Food and Nutrition Bulletin*, 28(2), 169-178.
- Davis, I. & Hall, N. (1999). Ways to measure community Vulnerability. *Natural Disaster Management*. Leicester: Tutor Rose Publications.
- De Leeuw, E., Hox, J. & Dillman, D., 2012. *International Handbook of Survey Methodology*. New York: Routledge.
- Department of Civil Protection. (2017). *Inter-Agency Flooding Rapid Assessment Report*. Harare: Department of Civil Protection.
- Dipasquale, L. and Ebel, R. (2019). The National Flood Insurance Program: History, Administration and Reform Issues. Congressional Research Service.

- Dube, E & Munsaka E. (2018). The Contribution of indigenous knowledge to disaster risk reduction activities in Zimbabwe: A big call to practitioners. *Jamba: Journal of Disaster Risk Studies*. 10, 493.
- Dube, E. (2015). Improving disaster risk reduction capacity of District Civil Protection Unit in managing veld fires: A case of Mangwe District in Matabeleland South Province, Zimbabwe. *Jamba: Journal of Disaster Risk Studies*. 7, 143.
- Dube, E., Mtapuri, O. & Matunhu, J. (2018). Flooding and poverty: Two interrelated social problems impacting rural development in Tsholotsho District of Matabeleland North Province in Zimbabwe. *Jamba: Journal of Disaster Risk Studies*. 10, 1-7.
- Eastmond, M. (2007). Stories as Lived Experience. *Journal of Refugee studies*. 20, 248-264.
- Enarson, E., & Morrow, B. H. (1998). *The gendered terrain of disaster: Through women's eyes*. Westport, CT: Praeger.
- Eriksen, S. H., & Nightingale, A. J. (2019). *Adaptation and development: Livelihoods and climate change in the Eastern Himalayas*. London: Routledge.
- European Commission. (2017). Responding to floods in Europe: New framework to assess effectiveness of Flood Emergency Management Systems. *Science for Environment Policy, Issue 486*, 1-2.
- European Union 7th Framework Programme. (2014). *Star-Flood Project Report*, Brussels: European Union.
- FAO (2020) *Impact of Disasters and Crises on Agriculture and Food Security: 2021*. Rome: Food and Agriculture Organization of the United Nations.
- FAO (Food and Agriculture Organization). (2022). Sustainable Land Management for Climate Resilience in Sub-Saharan Africa. Rome: FAO.
- FAO. (2014). Resilient livelihoods: disaster risk management for food and nutrition security. Retrieved from <http://www.fao.org/3/a-i3875e.pdf>
- Field, A., 2018. *Discovering Statistics Using IBM SPSS Statistics*. 5th ed. London: Sage.
- FRC (International Federation of Red Cross and Red Crescent Societies). (2020). Mozambique: Cyclone Idai Post-Event Review. Geneva: IFRC.
- Füssel, H. M. (2019). Africa in a 4°C+ world: Impacts of global warming on African climate. *Regional Environmental Change*, 19(2), 385-398.
- Gilissen, H. K., Alexander, M., Matczak, P., Pettersson, M. & Bruzzone, S. (2016). A Framework for evaluating the effectiveness of flood emergency management systems in Europe. *Ecology and Society*. 21 (4), 27.
- Gilissen, H.K., Alexander, M., Matczak, P., Pettersson, M. and Bruzzone, S. (2016) 'A framework for evaluating the effectiveness of flood emergency management systems in Europe', *Ecology and Society*, 21(4), p. 27.
- Glass, J.E. (2005). Visceral Verstehen. *Electronic Journal of Sociology*. 2, 1-15.

- Global Facility for Disaster Reduction and Recovery. (2024). City resilience program. Retrieved from <https://www.gfdr.org/en/crp>
- Government of Zimbabwe. (2012). Tsholotsho District profile. Ministry of Local Government, Urban and Rural Development.
- Government of Zimbabwe. (2019). Flood victims to receive food aid. The Chronicle. Retrieved from <https://www.chronicle.co.zw/flood-victims-to-receive-food-aid/>
- Gumbo, B., & Mandizvidza, O. (2018). Assessing the socio-economic impacts of the Tokwe-Mukosi Dam in Masvingo Province, Zimbabwe. *Journal of Hydrology: Regional Studies*, 16, 62-74.
- Gwimbi, P. (2009). Linking rural Community livelihoods to resilience building in flood risk reduction in Zimbabwe. *Jamba: Journal of Disaster Risk Studies*. 2, 71-79.
- Handner, J. W. (2000). Flood Hazard and Sustainable Development. In Parker, D.J ed. *Floods*. London: Routledge Publications, UK. pp. 276-286.
- Harkness, J., Villar, A. & Edwards, B., 2010. Translation, adaptation and design. In: J. Harkness *et al.*, eds. *Survey Methods in Multinational, Multiregional and Multicultural Contexts*. Hoboken: Wiley, pp.115–140.
- Huari, H., & Lebel, L. (2020). Climate adaptation policies and practices in Southeast Asia: A review of planning, implementation and governance. *Environmental Science & Policy*, 105, 212-222.
- Heale, R. and Twycross, A., 2015. Validity and reliability in quantitative studies. *Evidence-Based Nursing*, 18(3), pp.66–67.
- http://www.slis.indiana.edu/hrosenba/www/research/methods/joniak_qual_par.pdf
- IPCC. (2014). Climate Change 2014: Synthesis Report. IPCC.
- IPCC. (2018). Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change. Geneva, Switzerland: IPCC.
- Islam, M.M. and Walker, J.H. (2018). Flood management in Bangladesh: a complex adaptive systems perspective. *International Journal of Disaster Risk Reduction*, 28, 370-378.
- Islam, R., Kamaruddin, R. & Ahmad, A. S. (2016). A Review on Mechanism of FLOOD Disaster Management in Asia. *International Review of Management and Marketing*. 6, 29-52.
- Israel, M., Drenth, P. & Mertens, D., 2013. *Research Ethics in the Social Sciences*. London: SAGE.
- Joniak, L. (2007). *The Qualitative Paradigm: An Overview of some Basic Concepts, Assumptions and Theories of Qualitative Research*. Accessed 27/10/2020
- Kabisch, S., Kunath, A., & Schweizer-Ries, P. (2014). Sustainable flood retention basins—a case study of the retention basin Sandgrube in Leipzig. *Journal of environmental management*, 132, 163-172.
- Kahn, L. H. & Barondness, J. A. (2008). Preparing for Disaster: Response Matrices in the USA and UK. *Journal of Urban Health*. 85, 910-922.

- Kalinda, T. H. (2021). Assessing the effectiveness of community participation in local disaster risk reduction: A case of Tsholotsho District in Zimbabwe. *Journal of Environmental Planning and Management*, 64(9), 1635-1652.
- Kambole, P., Nkonde, E., & Mwale, F. (2018). Flood disaster management in Zambia: An analysis of institutional frameworks and capacities. *International Journal of Disaster Risk Reduction*, 27, 689-696.
- Kanyanga, K. (2019). Flood frequency analysis of the Tsholotsho River catchment in Zimbabwe. *Journal of Water and Climate Change*, 10(3), 533-545.
- Kapangaziwiri, E., Mhizha, A., & Mabaso, E. (2017). Assessing community capacity for disaster risk reduction in Tsholotsho District, Zimbabwe. *Jàmbá: Journal of Disaster Risk Studies*, 9(1), 1-10.
- Kapoor, L., Bhutiani, R., & Mittal, P. (2018). Community participation in disaster risk reduction and management: A case study of India. *International Journal of Disaster Risk Reduction*, 31, 955-962.
- Kaseke, E., & Nhapi, I. (2019). Effects of floods on agricultural productivity in Zimbabwe: A case study of Kadoma District. *African Journal of Agricultural Research*, 14(19), 929-938.
- Kasimu, S., & Adimassu, Z. (2020). Flooding and community resilience in Ethiopia: The case of South Gondar. *Disaster Advances*, 13(9), 1-8.
- Kelman, I. (2015). *Disaster by choice: How our actions turn natural hazards into catastrophes*. London: Oxford University Press.
- Khonje, M. G., Mataga, T., & Mkwambisi, D. (2017). Assessment of community resilience to flood disasters in southern Malawi. *Natural Hazards*, 86(2), 727-748.
- Kimberelis, G. & Dimitriadis, G. (2005). Focus Groups: Strategic Articulations of Pedagogy, Politics and Inquiry. In N. K. Denzin and S. Lincoln, eds. *The Sage Handbook of Qualitative Research*. Thousand Oaks, CA: Sage. Page range??
- Landis, J.R. and Koch, G.G., 1977. The measurement of observer agreement for categorical data. *Biometrics*, 33(1), pp.159–174.
- Lassa, J. A., Olayinka, A. O., Adejumo, A. O., & Popoola, O. T. (2020). Climate change and flooding in Nigeria: A review of the literature. *Journal of Cleaner Production*, 256, 120519.
- Lavell, A. and Maskrey, A. (2014). The future of disaster risk management. *Environmental Hazards*, 13(4), pp.267-281.
- Lenderink, G., Attema, J. and Haarsma, R.J. (2019). Extreme rainfall in the Netherlands: a real-time event analysis. *Hydrology and Earth System Sciences*, 23(4).
- Lindlof, T. & Taylor, B. (2002). *Qualitative Communication Research Methods*. 2nd edition. Thousand Oaks, CA: SAGE.
- Linklater, A. & Suganami, H. (2006). *The English School of International Relations: A contemporary Reassessment*. Cambridge: Cambridge University Press.

- Mabikke, S., Mubaya, C. P., & Nhemachena, C. (2020). Land use planning and policy implementation for climate change adaptation in Zimbabwe. *Journal of environmental management*, 269, 110787.
- Mafimbo, M., Mukonoweshuro, R., & Chikodzi, D. (2018). Climate change adaptation strategies in Zimbabwe: A review. *African Journal of Environmental Science and Technology*, 12(5), 146-153.
- Makurira, H., Mapani, B., & Zhou, G. (2019). Assessing the impacts of floods on socio-economic development in Zimbabwe: A case study of Tsholotsho District. *Water*, 11(9), 1-18.
- Manda, M., & Gwebu, T. D. (2020). An assessment of community-based disaster risk reduction initiatives in Tsholotsho District, Zimbabwe. *Jàmbá: Journal of Disaster Risk Studies*, 12(1), 1-11.
- Manyena, S. B. (2013). Disaster event: Window of opportunity to implement global disaster policies? *Jamba: Journal of Disaster Risk Studies*, 5, 99.
- Manyena, S. B., O'Brien, G., & Tanner, T. (2011). Disaster resilience: a bounce back or forward ability? *Local Environment*, 16(5), 417-424.
- Manyena, S.B., Collins, A.E., & Mudimba, F.D. (2006). An examination of the challenges affecting the implementation of disaster risk reduction initiatives in Zimbabwe: The case of Zvishavane District. *Disaster Prevention and Management: An International Journal*, 15(5), 762-777.
- Marshall, R. (1998). The Key Informant Technique. *Family Practice*, 13 (1), 92-97.
- Masih, I., Maskey, S., & Uhlenbrook, S. (2018). Flood risk assessment in the data-scarce Limpopo River Basin: A comparative study of statistical models and multicriteria decision analysis. *Water*, 10(8), 1033.
- Masiwa, M. L., Magagula, T., & Dube, T. (2020). Assessment of the impacts of floods on the livelihoods of communities in Muzarabani District, Zimbabwe. *Journal of Disaster Risk Studies*, 12(1), 1-11.
- Masikati, P., Mhizha, A., & Senzanje, A. (2020). The role of social capital in building flood resilience in Zimbabwe: Lessons from the Tokwe-Mukosi flood disaster. *Climate Risk Management*, 28, 100230.
- Maskrey, A. (1999). Reducing Global Disasters. In Ingleton, J. ed. *Natural Disaster Management*. Leicester: Tutor Rose Publications. pp. 54-86.
- Massey, E., & Worpole, K. (2018). Flood risk and insurance: The politics of resilience. *Political Geography*, 63, 1-11.
- Masuka, R. T., & Ndlovu, B. (2020). The effectiveness of early warning systems in reducing the impact of flooding in Zimbabwe: A case study of Tsholotsho District. *Jàmbá: Journal of Disaster Risk Studies*, 12(1), 1-10. doi: 10.4102/jamba.v12i1.768
- Masunungure, T., Mufandaedza, E., & Ndiyoi, M. (2021). Local knowledge as a source of resilience to floods in rural communities: the case of Zengeya Ward, Zimbabwe. *African Journal of Environmental Science and Technology*, 15(3), 104-116.

- Matveev, A. V. (2002). The advantages of employing qualitative methods in intercultural research: practical implications from the study of the perceptions of intercultural communication competence by American and Russian managers. *Bulletin of Russian Communication Association*. 1 (168), 59-67.
- Mavhura, E. (2016). Disaster Legislation: A critical review of the Civil Protection Act of Zimbabwe. *Natural Hazards*, 80, 605-621.
- Mavhura, E. and Manatsa, D. (2016). Impacts of floods on natural resources in Zimbabwe. *International Journal of Disaster Risk Reduction*, 16, 358-367.
- Mavhura, E., Manatsa, D., & Manyena, S. B. (2017). Community-based strategies for reducing disaster risk in Zimbabwe. *Jàmbá: Journal of Disaster Risk Studies*, 9(1), 1-9.
- Meis, C. L. (2007). *Colorado Latinos and Information: Key Informant Interviews with Latino Organisations*. Service Learning Project: Colorado State Library.
- Mhizha, A., Masikati, P., & Senzanje, A. (2021). Financing flood disaster risk reduction in Zimbabwe: A review. *Climate Risk Management*, 32, 100312.
- Mitheu, F. K., *et al.* (2023). Impact-based flood early warning for rural livelihoods in Uganda. *Weather, Climate and Society*, 15(3), 567–582. <https://doi.org/10.1175/WCAS-D-22-0089.1>
- Mizutori, M. (2020). Reflections on the Sendai framework for disaster risk reduction: Five years since its adoption. *International Journal of Disaster Risk Science*, 11, 147–151. <https://doi.org/10.1007/s13753-020-00261-2>
- Mlambo, L., Chauke, C., & Mapurisa, B. (2020). Disaster risk reduction in the SADC region: Challenges and opportunities. *International Journal of Disaster Risk Reduction*, 47, 101564. doi: 10.1016/j.ijdr.2020.101564
- Mngumi, L. E. (2020). Exploring the contribution of social capital in building resilience for climate change effects in peri-urban areas, Dar es Salaam, Tanzania. *GeoJournal*. Advance online publication. <https://doi.org/10.1007/s10708-020-10214-3>
- Molnar-Tanaka, K., & Surminski, S. (2024). Nature-based solutions for flood management in Asia and the Pacific. *OECD Development Centre Working Papers*, No. 351. <https://doi.org/10.1787/f4c7bcbe-en>
- Moyo, F. M., & Simbanegavi, W. (2020). The effects of flooding on smallholder farmers in Zimbabwe: A case study of Mwenezi and Mberengwa Districts. *Jàmbá: Journal of Disaster Risk Studies*, 12(1), 1-10.
- Moyo, M., & Dube, T. (2020). Climate change adaptation in Zimbabwe: A review of national policies and strategies. *Climate Policy*, 20(2), 219-235. doi: 10.1080/14693062.2019.1674542
- Mubaya, C. P., Nhemachena, C., Mushunje, A., & Chitiga, R. (2018). Policy and regulatory frameworks for climate change adaptation: Lessons from Zimbabwe. *Environment, Development and Sustainability*, 20(4), 1719-1738.
- Mudimu, G., & Ndebele, T. (2019). The role of traditional leadership in flood preparedness and response: A case of Tsholotsho District, Zimbabwe. *Jàmbá: Journal of Disaster Risk Studies*, 11(1), 1-9. doi: 10.4102/jamba.v11i1.746

- Mugabe, F. T., & Mandizvidza, E. (2019). Floods management in Zimbabwe: A review of institutional frameworks and mechanisms. *Journal of African Studies and Development*, 11(2), 27-38.
- Mukarakate, C., & Gondwe, T. N. (2018). Natural disasters and household welfare in Malawi: The role of social protection. *Natural Hazards*, 94(1), 37-58. doi: 10.1007/s11069-018-3241-2
- Mukwakwami, L., Mukamuri, B. B., & Manyena, S. B. (2019). Disaster risk reduction in Zimbabwe: An analysis of policy frameworks and institutional mechanisms. *International Journal of Disaster Risk Reduction*, 41, 101305. doi: 10.1016/j.ijdrr.2019.101305
- Munyuli, M. M. and Kibiringi, L. (2018). Impacts of floods on agricultural productivity in Tanzania. *International Journal of Disaster Risk Reduction*, 30, 72-79.
- Musiyiwa, K., Njaya, T., & Mapira, J. (2019). Community perception of flood disasters and management strategies in Zimbabwe. *International Journal of Disaster Risk Reduction*, 33, 63-73.
- Mutavayi, R., & Moyo, P. (2019). Assessing the role of social capital in community-based disaster risk reduction in Zimbabwe. *Disaster Prevention and Management: An International Journal*, 28(4), 399-413.
- Mutopo, P., Chikodzi, D., & Nhapi, I. (2020). A review of the role of communities in disaster risk reduction in Zimbabwe. *Jambá: Journal of Disaster Risk Studies*, 12(1), 1-8.
- Mutopo, P., Nhapi, I., & Mashauri, D. A. (2017). The institutional framework for managing urban flooding in Harare, Zimbabwe. *International Journal of Water Resources Development*, 33(4), 564-576.
- Muzamhindo, N., & Ndlovu, E. (2023). Towards a social capital resilience model in coping with floods and droughts: The case of Muzarabani, Zimbabwe. In *The Palgrave Encyclopedia of Urban and Regional Futures* (pp. 1850–1869). Springer.
- Mwale, A. T., & Mjumira, J. K. (2018). Disaster risk management in Malawi: Challenges and prospects. *International Journal of Disaster Risk Reduction*, 27, 494-501.
- Mwalwimba, I. K., Manda, M., & Ngongondo, C. (2024). Flood vulnerability assessment in rural and urban informal settlements: Case study of Karonga District and Lilongwe City in Malawi. *Natural Hazards*. Advance online publication. <https://doi.org/10.1007/s11069-024-06601-5>
- Ndambuki, J. M., & Liyala, R. M. (2020). An investigation of the influence of education on disaster preparedness in Mwingi town, Kitui county, Kenya. *Journal of Disaster Risk Studies*, 12(1), 1-7
- Ndung'u, H. N., Zaba, P., & Ndlovu, E. (2023). Enhancing resilience to recurrent droughts and floods in semi-nomadic communities: A case of CMDRR amongst the Doma community in Mbire District, Zimbabwe. *International Journal of Research and Innovation in Social Science*, 7(8), 1532–1554. <https://doi.org/10.47772/IJRIS.2023.70822>
- Neville, C. (2007). *Introduction to research*. Bradford: University of Bradford.

- Ngongondo, C., Alemaw, B. F., & Wotela, K. (2017). Evaluation of flood risk mitigation measures in the Upper Zambezi River Basin. *Water resources management*, 31(12), 3791-3803.
- Nhamo, G., Hoko, Z., & Muzenda, E. (2019). The role of institutional arrangements in building flood resilience in Zimbabwe. *International Journal of Disaster Risk Reduction*, 35, 101075.
- Nhemachena, C., & Mano, R. (2019). *Climate variability and change in Zimbabwe: Impacts and responses in the agricultural sector*. Springer.
- Nyandoro, G., Masviba, P., & Kamusoko, C. (2020). Evaluating the effectiveness of institutional arrangements in disaster management: A case study of Cyclone Idai in Chimanimani, Zimbabwe. *Jambá: Journal of Disaster Risk Studies*, 12(1), 1-11.
- Nyathi, M. K., & Sibanda, S. (2018). The resilience of smallholder farmers to climate change induced flooding in Muzarabani District of Zimbabwe. *Physics and Chemistry of the Earth, Parts A/B/C*, 107, 107-115.
- Nyong, A., Adesina, F., & Osman, E. (2007). The value of indigenous knowledge in climate change mitigation and adaptation strategies in the African Sahel. *Mitigation and Adaptation Strategies for Global Change*, 12(5), 787-797.
- O'Neal, C. & Schutt, R. (2013). *Doing Data Science*. Farnham: O' Reilly.
- Ogunjobi, K. O., Durowoju, O. A., & Ojelabi, R. A. (2018). An assessment of disaster risk management in Nigeria: Challenges and prospects. *Natural Hazards*, 94(1), 183-199.
- Olsthoorn, A. A., Bakker, M., & Hoekstra, A. Y. (2019). Local climate adaptation in the global south: Exploring the contribution of participatory action research in addressing flooding and water scarcity. *Environmental Science & Policy*, 92, 72-80.
- Olwoch, J. M., Rautenbach, C. J., Botai, J. O., & Adisa, O. M. (2015). Analysis of institutional arrangements for flood management in South Africa. *Natural Hazards*, 77(3), 1943-1965.
- Orellana, M. R., & Rittel, L. A. (2018). Evaluating adaptive capacity to extreme events using agent-based modelling: A case study of flood adaptation in Coatzacoalcas, Mexico. *Environmental Science & Policy*, 88, 1-10.
- Organisation for Economic Co-operation and Development. (2024). Nature-based solutions for flood management in Asia and the Pacific. Retrieved from https://www.oecd.org/content/dam/oecd/en/publications/reports/2024/03/nature-based-solutions-for-flood-management-in-asia-and-the-pacific_da08c7b0/f4c7bcbe-en.pdf
- Phiri, S., Mudavanhu, C. & Mucherera, B. (2014). The complexity of Maladaptation, Strategies to disasters: The case of Muzarabani, Zimbabwe. *Jamba: Journal of Disaster Risk Studies*, 6, 1-12.
- Podsakoff, P.M., MacKenzie, S.B., Lee, J.Y. and Podsakoff, N.P., 2003. Common method biases in behavioural research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), pp.879–903.
- Proverbs, D. & Ahadzi, K.D. (2011). Emerging Issues in the management of Floods in Ghana. *International Journal of Safety and security Engineering*, 1, 182-192.

- Quinlan, A. E., Barbés-Blázquez, M., Haider, L. J., Peterson, G. D., & Dauriach, A. (2016). Advancing systematic cross-case comparison to enhance the transferability of qualitative research. *Ecology and Society*, 21(4).
- Riddell, M. A., & Forster, P. M. (2020). The impact of climate change on drought and flood events in Southern Africa. *Environmental Research Letters*, 15(7), 074009.
- Roger, F. (2003). Flooding, Vulnerability and coping strategies: Local responses to a global threat. *Progress in Development Studies*, 3, 43-58.
- SADC. (2016). Disaster Preparedness and Response in the SADC Region. <https://www.sadc.int/themes/disaster-management/disaster-preparedness-and-response-sadc-region/>
- SADC. (2016). Disaster risk management profile: Zimbabwe. Retrieved from [https://www.sadc.int/files/9014/5292/8824/Zimbabwe DRM Profile 2016.pdf](https://www.sadc.int/files/9014/5292/8824/Zimbabwe_DRM_Profile_2016.pdf)
- Seidu, R., Dziku, P., & Dadzie, J. (2019). Community-based flood management planning in Ghana: Examining institutional roles and responsibilities. *International Journal of Disaster Risk Reduction*, 34, 73-81.
- Seneviratne, S. I., Donat, M. G., Mueller, B., & Alexander, L. V. (2018). No pause in the increase of hot temperature extremes. *Nature Climate Change*, 8(3), 222-227. doi: 10.1038/s41558-018-0060-4
- Shrestha, S. S., Takara, K., & Shrestha, N. R. (2018). Community participation and disaster risk reduction: A review of DRR policies in Nepal. *International Journal of Disaster Risk Reduction*, 31, 668-676.
- Sibanda, N., & Matsa, M. (2020). Flood disaster preparedness and response in Zimbabwe: A case study of Tsholotsho District. *International Journal of Disaster Response and Emergency Management*, 3(2), 13. <https://doi.org/10.4018/IJDREM.2020070103>
- Simatele, D., Gabriel, O., & Nhamo, G. (2020). Institutional arrangements for managing flood risks in South Africa: A case study of the Limpopo River basin. *Jàmbá: Journal of Disaster Risk Studies*, 12(1), a940.
- Simatele, M., Simatele, D., & Mulenga, B. (2021). Building resilience to climate change in Africa: Rural infrastructure, livelihoods and policy responses. *Land Use Policy*, 100, 104925. <https://doi.org/10.1016/j.landusepol.2020.104925>
- Sithole, M. (2021). An assessment of the effectiveness of early warning systems for floods in Zimbabwe: A case of Tsholotsho District. *Journal of Disaster Risk Studies*, 13(1), 1-11.
- Siziba, S., & Mavhura, E. (2020). Revisiting the role of indigenous knowledge in disaster risk reduction in Zimbabwe. *Jàmbá: Journal of Disaster Risk Studies*, 12(1), 1-9.
- Smit, B., & Wandel, J. (2006). Adaptation, adaptive capacity and vulnerability. *Global environmental change*, 16(3), 282-292.
- Soukiazis, E., & Proença, S. (2018). Economic growth and the environment: a review of the theoretical and empirical literature. *Journal of Environmental Management*, 213, 312-326. 17.
- Sukanya, S., & Deka, A. (2019). Flood vulnerability and adaptation strategies in the Brahmaputra river basin of India. *Natural Hazards*, 95(1), 165-183.

- Sultana, F. (2010). Gendered vulnerabilities: women, climate change and disasters. In *Gender and climate change: An introduction* (pp. 18-30). Earthscan.
- Swanson, T. M., & Chhetri, N. (2018). The politics of disaster risk reduction and climate change adaptation: Framing, integration and coherence. *Environmental Science & Policy*, 86, 31-39.
- Szoenyi, M. (2013). *Measuring flood resilience-our approach*. Zurich: Zurich Insurance Group Ltd.
- Taber, K.S., 2018. The use of Cronbach's alpha when developing and reporting research instruments in science education. *Research in Science Education*, 48(6), pp.1273–1296.
- Tawodzera, G., & Chikodzi, D. (2019). Smallholder farmers' adaptive capacity to climate change in Mwenezi District, Zimbabwe. *Climate and Development*, 11(9), 759-768.
- Tchamba, M. N., Zhang, J., Acheampong, R. A., & Kengne, A. N. (2017). Institutional capacity to manage floods in Cameroon: A case study of Yaoundé. *Natural Hazards*, 85(3), 1691-1711.
- Tchawa, P. Y., Doumbe, F. N., Abia, W. L., & Ndam, J. R. (2017). Impacts of flood disasters on socio-economic livelihood of rural households in the Logone valley, Far North Cameroon. *International Journal of Disaster Risk Reduction*, 21, 332-341.
- Tevera, D., & Mandondo, A. (2017). Assessing the impacts of flash floods on urban livelihoods and social capital in Zimbabwe: The case of Budiriro high-density suburb in Harare. *Jàmbá: Journal of Disaster Risk Studies*, 9(1), 1-9.
- The Sphere Project. (2004). *Humanitarian Charter and Minimum standards in Disaster Response*. Geneva: The Sphere Project.
- Tompkins, E. L., Vincent, K., & Wilby, R. L. (2019). Guiding the development and use of climate services through co-production. *International Journal of Climatology*, 39(4), 2473-2488.
- Tshuma, M. (2021). Community characteristics influencing flood recovery: A case of Sipepa and Jimila wards in Tsholotsho District, Zimbabwe during the 2016 to 2017 floods. *International Research Journal of Arts and Social Sciences*, 9(4). Retrieved from <https://www.interesjournals.org/articles/>
- Twigg, J. (2007). Characteristics of a disaster-resilient community: A guidance note. Humanitarian Practice Network.
- Twigg, J. (2015). *Disaster Risk Reduction: Good Practice Review 9*. London: Overseas Development Institute.
- Twigg, J., Benson, C. & Myers, M. (2000). *NGO Initiatives in risk reduction: A summary of the research studies. Technical Report*. London: British Red Cross.
- UN Women. (2021). *Gender-Responsive Disaster Risk Reduction in Practice: Lessons from Asia and the Pacific*. New York: UN Women.
- UNDRR (United Nations Office for Disaster Risk Reduction). (2019). *Global Assessment Report on Disaster Risk Reduction*. Geneva: UNDRR.

- UNHCR. (2024). The UNHCR climate resilience fund. Retrieved from <https://reporting.unhcr.org/spotlight/climate-action/unhcr-climate-resilience-fund>
- UNICEF. (2019). Child-centred disaster risk reduction in Zimbabwe. UNICEF.
- UNISDR. (2015). Sendai Framework for Disaster Risk Reduction 2015-2030. United Nations Office for Disaster Risk Reduction.
- United Nations Development Programme. (2018). Resilient Livelihoods: Disaster Risk Reduction for Sustainable Development. United Nations Development Programme.
- United Nations International Strategy for Disaster Reduction. (2005). Hygo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters. Extract from the final report of the World Conference on Disaster Reduction, United Nations International Strategy for Disaster Reduction, Geneva, Switzerland.
- United Nations office for Disaster Risk Reduction. (2015). *Sendai Framework for Disaster Risk Reduction 2015-2030 Report*. Geneva: United Nations.
- United Nations Office for Disaster Risk Reduction. (2024). Global status of multi-hazard early warning systems 2024. Retrieved from <https://www.undrr.org/reports/global-status-MHEWS-2024>
- United Nations. (2015). Sendai Framework for Disaster Risk Reduction 2015-2030. United Nations.
- USAID. (2024). Disaster resiliency in Central America, FY 2024. Retrieved from <https://www.usaid.gov/reports/disaster-resilience-central-america/fy-2024>
- Van Teijlingen, E. and Hundley, V., 2001. The importance of pilot studies. *Social Research Update*, (35), pp.1–4.
- Willis, G., 2015. *Analysis of the Cognitive Interview in Questionnaire Design*. Oxford: Oxford University Press.
- Wolff, C., Vogl, S., Sauer, I., Huber, L., & Thieken, A.H. (2021) 'The role of risk perception and other factors in risk reduction behaviour in flood-prone areas of Germany', *Journal of Flood Risk Management*, 14(2), e12691.
- Wolff, E., French, M., Ilhamsyah, N., Sawailau, M. J., & Ramirez-Lovering, D. (2021). Collaborating with communities: Citizen science flood monitoring in urban informal settlements.
- Wong, K. & Zhao, X. (2001). Living with flood victims: Perceptions in Beijing Guangdong, China. *Area*. 20, 190-201.
- World Bank (2016) *Malawi Flood Emergency Recovery Project*. Washington DC: The World Bank.
- World Bank. (2024). Building resilience in the face of uncertainty. Retrieved from <https://www.worldbank.org/en/news/immersive-story/2024/06/21/building-resilience-in-the-face-of-uncertainty>
- World Bank. (2024). Disaster risk management. Retrieved from <https://www.worldbank.org/en/topic/disasterriskmanagement>
- Yardley, L. (2008). *Qualitative validity in qualitative psychology*. Washington D.C: Sage Publications.

- Zimbabwe National Water Authority. (2020). Tsholotsho District Water Resources Management Plan 2020-2030. Zimbabwe National Water Authority.
- Zvobgo, G., & Murwendo, T. (2020). The role of indigenous knowledge systems in flood management in Zimbabwe. *Jàmbá: Journal of Disaster Risk Studies*, 12(1), 1-9.

Appendix 1



Institute for Rural Development

Stakeholder Engagement: Ranking Disaster Response Mechanisms

Section A: Current Response Mechanisms

Current response mechanisms	Out of a maximum score of 10, to what extent do you agree with this statement?
1. Migratory response	
a) Evacuation to safe places	MIG1
b) Safe and secure temporary shelter	MIG2
c) Routes to be used to safe places	MIG3
d) Evacuation equipment such as helicopters and other transport means	MIG4
e) Access roads	MIG5
f) Search and rescue teams	MIG6
2. Disaster relief	
a) Food and non-food items	DISREF1
b) Clean water supply	DISREF2
c) Temporary electrical supply	DISREF3
d) Proper sanitary system	DISREF4
e) Waste management system	DISREF5
f) Medical supplies	DISREF6
g) Mandatory survival kits	DISREF7
h) Safe temporary accommodation	DISREF8
3. Recovery efforts	
a) Reconstructing houses	RECOV1
b) Providing financial assistance e.g. loans and grants	RECOV2
c) Provision of building materials	RECOV3
d) Active involvement of affected communities in reconstruction programmes	RECOV4
e) Reconstructing destroyed schools, roads, bridges and other infrastructure	RECOV5
f) Reconstruction and re-establishment of social services	RECOV6

Current response mechanisms	Out of a maximum score of 10, to what extent do you agree with this statement?
g) Reviving social and cultural lives of affected communities	RECOV7
h) Improving social, economic and cultural conditions of affected families and communities	RECOV8
i) Building protective infrastructure e.g. embankments, flood walls, flood levees, dams and reservoirs	RECOV9
j) Restoring communication systems	RECOV10
4. Preventive measures	
A: Institutional arrangements	
a) Institutions for flood management exist at both national and local levels	INST1
b) A well-coordinated organisational structure to clarify everyone's roles and responsibilities during a flood response	INST2
c) Functional local multi-sectoral platform for flood management	INST3
d) Village Contingency Plans (VCP) adopted and implemented	INST4
e) Procedures in place to exchange relevant information during floods and to undertake post-event reviews	INST5
f) Regular training drills and rehearsals to test and develop flood response programmes	INST6
B: Flood monitoring and early warning	
a) Use of regularly updated data on flood disasters	FLOODMO1
b) Generating and utilizing a flood hazard map	FLOODMO2
c) Procedures in place to assess flood impacts especially on infrastructure	FLOODMO3
d) Systems in place to monitor, archive and disseminate data on floods and vulnerabilities	FLOODMO4
e) Early warning systems providing accurate warning information in a timely manner	FLOODMO5
f) Integration of indigenous and scientific information in early warning systems to contribute to community resilience to floods	FLOODMO6
g) Trained and equipped Village Civil Protection Committees (VCPC)	FLOODMO7
C: Policy and legislative environment	
a) Implementation of District flood management plan	POLEG1
b) Land use planning incorporating hazard zones	POLEG2
c) Climate change policy and strategy	POLEG3
d) Flood management as an integral objective of environment-related policies and plans, including for land use, natural resource management and climate change adaptation	POLEG4
e) Economic and production sectoral policies and plans to reduce the vulnerability of economic activities	POLEG5
f) Legislation for local communities with a mandate for flood management	POLEG6

Current response mechanisms	Out of a maximum score of 10, to what extent do you agree with this statement?
g) Institutional and legal framework for flood management with decentralized responsibilities and capacities at all levels	POLEG7
h) Escape routes and safe places for humans and animals	POLEG8
i) Protected ecosystems and natural buffers to mitigate flood disasters and adopt to climate change	POLEG9
j) Carefully planned coordination amongst stakeholders	POLEG10
k) Flood insurance and reinsurance facilities	POLEG11
D: Resource mobilization e.g. funding	
a) Financial reserves and contingency mechanisms in place to enable effective response and recovery when required	RESMOB1
b) Dedicated and adequate resources for flood management at all administrative levels	RESMOB2
c) A budget and incentives for homeowners, low-income families and private sector to invest in flood management	RESMOB3
d) Building inspection practices ensuring compliance and incorporating insurance classification	RESMOB4
e) Facilitating people's access to assets and enhancing their ability to learn, self-organize and innovate (human, sociocultural, institutional, financial, natural and physical assets)	RESMOB5
E: Infrastructure planning, development and maintenance	
a) Investment in flood risk reducing infrastructure such as storm drainage	INFRA1
b) Secure medical facilities	INFRA2
c) Planning and management of human settlements	INFRA3
d) Codes of conduct for buildings in flood-prone areas	INFRA4
e) Land use planning incorporating specifications for hazard zones	INFRA5
F: Awareness creation, education and training	
a) Local public awareness strategy	AWARE1
b) Education programmes and training on flood management in place in schools and communities	AWARE2
c) Increased awareness of vulnerabilities and capacities of local communities	AWARE3
G: Social protection	
a) Dedicated provision for children, women, disabled and elderly in relief, shelter and emergency medical facilities	SOCPRO1
b) Social development policies and plans implemented to reduce the vulnerability of populations most at risk	SOCPRO2
c) Implementing poverty reduction strategy	SOCPRO3
d) Mobilising and stockpiling relief supplies	SOCPRO4
e) Safety of all schools and health facilities is guaranteed	SOCPRO5
f) Needs and participation of affected people at centres of reconstruction	SOCPRO6

Current response mechanisms	Out of a maximum score of 10, to what extent do you agree with this statement?
g) Safe land for flood victims	SOCPRO7

Section B: Strengths and weaknesses of current response mechanisms

Strengths/weaknesses	Out of a maximum score of 10, to what extent do you agree with this statement?
1. Migratory response	
<i>Nature of responsiveness</i>	
a) Evacuation equipment and personnel readily available and easily accessible	NATRESP1
b) Trained and equipped Village Civil Protection Committees who offer search and rescue services and provide first aid where needed	NATRESP2
c) Needs of women, children, the elderly and disabled highly prioritised during evacuation	NATRESP3
<i>Community mobilization and coordination</i>	
a) Increased ability of communities to organize effective flood response	COMMOB1
b) Mobility of affected communities during the disaster is guaranteed	COMMOB2
c) Village Contingency Plans (VCP) to coordinate the evacuation from the affected areas to designated shelters as per village level contingency plan	COMMOB3
d) Affected communities are evacuated timely to safe places	COMMOB4
<i>Communication and education of community</i>	
a) Easy access to information and resources during floods	COMEDU1
b) Increased awareness of vulnerabilities and capacities of local communities	COMEDU2
c) Communities are made aware of escape routes and safe places for both humans and animals during a flood disaster	COMEDU3
Disaster relief: There are dedicated means of supplying basic necessities to disaster- stricken communities such as:-	
a) Clean water supply	REL1
b) Temporary electrical supply	REL2
c) Proper sanitation	REL3
d) Waste management system	REL4
e) Adequate food and non-food items	REL5
f) Adequate medical supplies	REL6
g) Safe temporary shelter	REL7
Recovery efforts	
a) Constructing flood-proof houses	RECEF1
b) Availability of financial assistance such as loans and grants to construct destroyed houses	RECEF2
c) Provision of building materials	RECEF3
d) Involvement of affected communities in the reconstruction programme	RECEF4
e) Reconstruction of flood proof schools and health facilities	RECEF5
f) Reconstruction done and finished within specified times	RECEF6

g) Rehabilitation services such as counselling are offered	RECEF7
h) Social, economic and cultural conditions are improved	RECEF8
Preventive measures	
Policy and legislative environment	
a) Flood management laws with laid down legal framework for the flood management system which cover all phases of disaster management i.e. preparedness, prevention, mitigation, response and recovery/rehabilitation phases	POLEG1
Equipment and infrastructure	
a) A purpose-built relief centre and dedicated food storage facility	EQUINF1
b) Provision of landing craft that can be loaded with supplies of water and food to assist in the humanitarian effort	EQUINF2
c) Land use planning incorporating flood hazard zones	EQUINF3
d) Building code for prevalent flood hazards	EQUINF4
e) Building inspection practices for code compliance and insurance classification	EQUINF5
Monitoring and early warning system	
a) Existing early warning systems for flood providing accurate warning information in a timely manner	EARWAR1
b) Integration of indigenous and scientific information in early warning systems	EARWAR2
c) Availability of meteorological and hydrological equipment for predicting or detecting flooding	EARWAR3
d) Adequate temporal and spatial hazard information	EARWAR4
e) Flood early warning systems for major rivers	EARWAR5
f) No warning and communication challenges	EARWAR6
g) Early release of seasonal forecasts	EARWAR7
h) Translation of scientific and technical early warning jargon	EARWAR8
Institutions for disaster preparedness and response	
a) Weak or non-existent local level structures	INSDIS1
b) Institutional and legal frameworks for flood management exist with decentralized responsibilities and capacities at all levels	INSDIS2
c) Flood Operation Centres established for gathering, analyzing and disseminating information to get to the right people	INSDIS3
d) Increased ability of communities to organize effective disaster response	INSDIS4
Resources	
a) Dedicated budget for flood management	RESO1
b) Dedicated and adequate resources are available to implement flood management plans at all administrative levels	RESO2
c) Ecosystems are protected to mitigate floods disasters	RESO3

Section C: Stakeholders Designated Roles

	Out of a maximum score of 10, to what extent do you agree with this statement?
1. Central Government	
a) Ensures that the plans, budget and programmes of individual ministries contribute to a coherent recovery and reconstruction implementation effort	CENTGOV1
b) Develops policies and frameworks for use in facilitating disaster management	CENTGOV2
c) Coordinates activities of all departments and provides decision support system	CENTGOV3
d) Allocates budget, personnel and other resources	CENTGOV4
e) Undertakes rescue, relief and rehabilitation measures	CENTGOV5
2. Department of Civil Protection	
a) Revives and updates National Contingency Plan	CIVPRO1
b) Carry out flood response simulation exercises	CIVPRO2
c) Ensures Provincial, District and local plans are up to date and structures are in place	CIVPRO3
d) Leads public awareness creation and early warning on possible hazards determined through risk profiling	CIVPRO4
e) Mobilizes resources needed for emergency relief	CIVPRO5
f) Pre-positions humanitarian aid resources to affected areas	CIVPRO6
g) Ensures availability of logistical support which can be efficiently accessed when needed	CIVPRO7
h) Convenes meetings of stakeholders to deal with flood matters	CIVPRO8
i) Ensures that assessment tools are in place and team members are ready to act	CIVPRO9
j) Reviews and updates possible flooding and response scenarios	CIVPRO10
k) Updates inventory of resources and where applicable prepositions resources	CIVPRO11
l) Identifies priority sector needs	CIVPRO12
m) Conducts situational and rapid assessments	CIVPRO13
n) Carries out regular seasonal awareness campaigns using both print and electronic media	CIVPRO14
o) Builds flooding response capacity	CIVPRO15
3. Disaster victims	
a) Participate in preparing a disaster risk analysis	DISVIC1
b) Assisting others	DISVIC2
c) Providing information to other victims or response and recovery agencies	DISVIC3
d) Applying for disaster recovery assistance	DISVIC4
e) c) Participating in a community or neighborhood – level disaster preparedness	DISVIC5

	Out of a maximum score of 10, to what extent do you agree with this statement?
4. Non-Governmental Organisations (NGOs)	
a) Supporting funding and human resources	NGO1
b) Provide specialized knowledge and advice in support of national efforts to develop or sustain the operational capabilities of the Government	NGO2
c) Raise awareness among individuals and organisations involved in early warning and in the implementation of early systems, particularly at the community level	NGO3
d) Advocacy role to help ensure that early warning stays on the agenda of Government policy makers	NGO4
e) Provision of relief aid- food, clothing and water to flood victims	NGO5
f) Crisis intervention	NGO6
g) Certification and staffing of disaster shelters	NGO7
h) Assisting with the reconstruction of damaged housing	NGO8
i) Provision of educational assistance	NGO9
j) Leadership development	NGO10
k) Coordination and cooperation with Government agencies	NGO11
l) Search and rescue operations	NGO12
m) Identification of damages	NGO13
n) Empowering communities	NGO14
o) Bridging the gap between Government and the community	NGO15
5. Media	
a) Disseminating information on preparedness, recovery and mitigation following disasters	MEDIA1
b) Supplying information and directions to the public	MEDIA2
c) Focus on local effects of the incident	MEDIA3
d) Stimulating volunteerism and donations	MEDIA4
e) Stimulating increased participation among elected officials	MEDIA5
f) Disclosing the need for improvements in the disaster recovery delivery system	MEDIA6
g) Withholding information that could be counter-productive to the recovery effort	MEDIA7
h) Can influence the Government to prioritise flood risk issues	MEDIA8
i) Facilitate creation of Early Warning Systems (EWS) – owing to the extensive outreach, the media can help disaster mitigation experts create EWS by providing information on risks and existing technologies that can aid the development of useful concepts and systems	MEDIA9

	Out of a maximum score of 10, to what extent do you agree with this statement?
j) Emergency Alert Systems through radio, televisions and cable services	MEDIA10
k) Trigger donations from the international community subsequent to the occurrence of a flood disaster as well as push the Government to increase budgetary allocations to flood response programmes	MEDIA11
l) Improve coordination of activities amongst stakeholders	MEDIA12
m) Uncovering issues and weaknesses	MEDIA13
6. Faith Based Organisations	
a) Promotes awareness and on the importance of environment protection and management of risk and vulnerability	FBO1
b) Offer moral support to affected communities	FBO2
c) Provide psychological and social relief and assistance during the event of disaster	FBO3
d) Assists affected individuals by playing internal roles, that is, self-control, sense of purpose and hope, optimism and emotional consolation	FBO4
e) Assist with external functions such as access to social resources, opportunity for social involvement and support to connect with and help others while building identity and positive sense of self	FBO5
f) Can contribute in persons to help people affected by the disaster, provide shelter, food, water and information	FBO6
g) Provide post disaster reconstruction	FBO7
h) Engagement and collaboration with local and international communities to mobilize aid and ensure the availability of funds for emergency response	FBO8
7. Tsholotsho Rural District Council	
a) Actively involved in the design and maintenance of early warning systems	TSHODIS1
b) Instruct and engage the local communities in a manner that increases their safety and reduces the potential loss of resources on which the community depends on	TSHODIS2
8. District Development Coordinator	
a) District Coordinating Officer – coordinate all response activities	DDC1
b) Execute all disaster management activities in the District	DDC2
c) Assess recovery needs	DDC3
d) Determine the level and type of damage	DDC4
e) Implement recovery programmes – individual and community assistance	DDC5
f) Chairs the District Civil Protection Committee	DDC6
g) Identify those in need of assistance	DDC7

	Out of a maximum score of 10, to what extent do you agree with this statement?
h) Public information officer during disasters	DDC8
i) Community liaison	DDC9
j) Conduct outreaches	DDC10
k) Develop District disaster management plans	DDC11
9. The Private sector	
a) Provide skilled services in the form of technical manpower and donations of goods and services	PRIVSEC1
b) Supporting the Government with aid – financial support and non-monetary support	PRIVSEC2
10. The Military/Army	
a) Provide personnel, equipment and facilities for search and rescue operations	ARMY1
b) Involved in reconstruction activities	ARMY2
11. Zimbabwe Republic Police (ZRP)	
a) Search, rescue and security operations	ZRP1
b) Protecting public and private property	ZRP2
12. Universities and Research Institutions	
a) Providing policy advice to practitioners	RESEA1
b) Conducting research to identify problems or gaps in literature	RESEA2
c) Post-data collection and analysis	RESEA3
d) Generating research reports	RESEA4
e) Training and mentoring future emergency management professionals	RESEA5
13. International agencies or bodies	
a) Provide support for national early warning activities and foster the exchange of data and knowledge	INTAGE1
b) Support in the form of provision of advisory information, technical assistance, policy and organisational support necessary to ensure the development and operational capabilities of agencies responsible for flood response	INTAGE2
14. Councillors	
a) Distribution of assistance	CLLR1
b) Publicizing community needs	CLLR2
c) Approving or denying proposed policy changes	CLLR3
d) Assisting in search and rescue operations	CLLR4

Section D: Suggest appropriate interventions for effective response to flooding

Intervention	Out of a maximum score of 10, to what extent do you agree with this statement?
1. Community education, awareness, training and involvement	
a) Reinforce implementation of programmes on awareness of flood disasters	INTERV1
b) Strengthen community mobilization for increased participation in flood management	INTERV2
c) Mount a functional flooding response knowledge and skills development programme	INTERV3
2. Flood monitoring and early warning	
a) Integrate indigenous knowledge systems into western scientific knowledge when developing Early Warning Systems	INTERV4
b) Carry out participatory hazard profiling, which helps to build local preparedness and capacity and anchors sustainable hazard–resilient development	INTERV5
c) Conduct regular research and needs assessments relating to flood disasters	INTERV6
3. Institutional arrangements and coordination	
a) Introduce mandatory insurance for flood disasters	INTERV7
b) Develop an improved community safety system	INTERV8
c) Facilitate planning on how keys institutions and organisations can respond faster to flood disasters	INTERV9
d) Develop flood management standards incorporating indicators of timeliness of response	INTERV10
4. Infrastructure provision and maintenance	
a) Rehabilitation and maintenance of river banks and embankments	INTERV11
b) Relocate settlements from flood-prone areas	INTERV12
5. Policy and legislative environment	
a) Review or develop more effective flood risk management policy, legislation and organizational structures	INTERV13
b) Strengthen regulatory regimes for rural and urban settlement and infrastructure	INTERV14
c) Developing an integrated climate response strategy, releasing accurate early warning information and action guidance, sharing flood-related information and applying the advantages of online social networking	INTERV15
d) Adopt flood response and community development plans	INTERV16
6. Relief	
a) Set up and strengthen management of social safety nets	INTERV17
b) Invest in adaptive and resilience–building measures to protect vulnerable groups such as children, the sick, elderly and people with disabilities	INTERV18

c) Offer counseling and psychosocial support, casework and child protection support, orphan care and family tracing	INTERV19
d) Provide educational assistance to children including safe places/shelter	INTERV20
e) Offer psychosocial support services	INTERV21
f) Build local capacity for ongoing psychosocial and material support to deal with the long-term effects of flood disasters on specific social groups	INTERV22
7. Resource mobilization and utilization	
a) Clear funding for flood risk assessments and analysis	INTERV23
b) Strengthen capacities and mobilise resources for key agencies of state responsible for flood management	INTERV24
c) Establish a dedicated ring-fenced fund that is run in a transparent manner	INTERV25
d) Procure advanced search and rescue equipment	INTERV26

Appendix 2

MINISTRY OF LOCAL GOVERNMENT AND PUBLIC WORKS

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REF: ADM/23/8



ZIMBABWE

Office of The Secretary
P. Bag 7706
Causeway,
Harare

24 May 2021

Mr Simbarashe Sibanda
University of Venda

AUTHORITY TO UNDERTAKE ACADEMIC RESEARCH: MR SIMBARASHE SIBANDA. VENDA UNIVERSITY STUDENT

The above subject matter refers.

Please be advised that on 24 May 2021, the Head of Ministry approved your application to undertake a field research on the topic;

Effectiveness of response mechanisms to flooding for resilient livelihoods in Tsholotsho District of Zimbabwe

Kindly, be advised that the research findings should not be subject to external consumption and must be solely used for academic purposes. You are required to sign for Official Secrecy before commencement of the research project. In addition, a copy of the completed research project should be submitted to the Office of the Permanent Secretary of this Ministry.

It is hoped that the research findings and recommendations will help the Ministry in coming up with relevant strategies in addressing challenges in the study area.



H. Chinyengetere
Director, Human Resources

FOR: PERMANENT SECRETARY FOR LOCAL GOVERNMENT AND PUBLIC WORKS



Cc: The Provincial Development Coordinator, Matabeleland North Province
Director, Civil Protection Department