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FACULTY OF SCIENCE AND ENGINEERING

DEPARTMENT OF GEOSCIENCES



**THE ROLE OF COMMUNITY ENGAGEMENT IN FLOOD RISK
MANAGEMENT IN THE CONTEXT OF CLIMATE CHANGE: CASE OF
CHADEREKA IN MUZARABANI**

BY

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**A DISSERTATION SUBMITTED TO THE DEPARTMENT OF
GEOSCIENCES SUSTAINABLE DEVELOPMENT AND DISASTERS IN
PARTIAL FULFILMENT FOR THE REQUIREMENTS FOR THE MASTER
OF CLIMATE CHANGE AND SUSTANABLE DEVELOPMENT**

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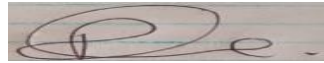
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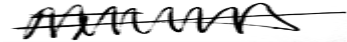
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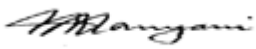
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DEDICATION

I dedicate this research to my late father and my mother who nurtured and cultivated the culture of hardwork and resilience and in me.

ABSTRACT

The main purpose of the study was to examine the role of community engagement in flood risk management in the context of climate change using the case study of Chadereka in Muzarabani district. To achieve the main purpose, the research sought to assess the existing level of community engagement in flood risk management in the context of climate change in Chadereka, Muzarabani, to establish the barriers to community engagement in flood risk management in the context of climate change in Chadereka, Muzarabani, to examine the impacts of community engagement in flood risk management in the context of climate change in Chadereka, Muzarabani and to develop strategies for enhancing community engagement in flood risk management in the context of climate change in Chadereka, Muzarabani. The study employed the mixed-method approach where the cross-sectional descriptive research design was employed. Primary data were collected using survey questionnaires and key informant interviews. Participants were selected using simple random and purposive sampling techniques. Data were analysed using descriptive, Chi-square and content analyses. The results indicated moderate level of community engagement in flood risk management where 41.1% of the participants agreed. The main barriers to effective community engagement in flood risk management in Chadereka in Muzarabani district were found to include ineffective communication channels ($\chi^2 = 140.209$; $p = 0.000$), lack of knowledge and awareness on flood risk management ($\chi^2 = 58.844$; $p = 0.000$), power dynamics and imbalances ($\chi^2 = 159.660$; $p = 0.000$) and different cultural beliefs ($\chi^2 = 125.681$; $p = 0.000$). The study concluded that community engagement has significant positive impacts on flood risk management. The study recommended relevant authorities such as NGOs and government agencies to continuously conduct community awareness and education programmes to raise awareness among the communities regarding the importance of community engagement in flood risk management.

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LIST OF ABBREVIATIONS AND SYMBOLS

CBDRR	Community-Based Disaster Risk Reduction
DRM	Disaster Risk Management
IPCC	Intergovernmental Panel on Climate Change
NEWMAP	Nigerian Erosion and Watershed Management Project
NGOs	Non-Governmental Organisations
SPSS	Statistical Package for Social Sciences
UNDRR	United Nations Office for Disaster Risk Reduction
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNISDR	United Nations International Strategy for Disaster. Reduction
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Introduction

This introductory chapter focuses on providing the background of the study and statement of the problem. The chapter also contains the objectives of the study, the research questions, significance of the study, delimitations of the study and definitions of key terms

1.2 Background of the study

The importance of community engagement in flood risk management extends beyond the context of Chadereka, Muzarabani and resonates globally. Communities worldwide are grappling with the challenges posed by climate change and increasing flood risks (Michael, 2024). For instance, in the Netherlands, a country renowned for its expertise in water management, community engagement plays a pivotal role in the implementation of flood risk reduction strategies (Matczak, 2020). The Dutch government actively involves local residents, businesses and organizations in decision-making processes, encouraging their participation in shaping policies, developing flood response plans and implementing flood resilience measures (Matczak, 2021). Similarly, in the United States, communities in flood-prone areas, such as those along the Mississippi River, have embraced community engagement as an essential component of flood risk management (Blázquez, 2021).

Through collaborative initiatives, involving local governments, residents and non-profit organizations, these communities have developed comprehensive strategies that incorporate early warning systems, floodplain zoning and community education to enhance resilience and minimize the impacts of flooding (Blázquez, 2021; Puzyreva & de Vries, 2021). Community engagement in flood risk management in the context of climate change is of particular significance within the African context, where many

communities face the dual challenges of climate change impacts and vulnerable socio-economic condition (Ziga-Abortta & Kruse, 2023).

In addition to Mozambique and Ghana, other African countries have also recognized the importance of community engagement in flood risk management in the context of climate change (Gaisie, 2023). In Nigeria, the Nigerian Erosion and Watershed Management Project (NEWMAP) has engaged local communities in addressing erosion and flood-related issues (Alpha *et al.*, 2024). Through community-driven initiatives, NEWMAP has implemented sustainable land management practices, constructed erosion control structures and provided training and capacity building to enhance community resilience. Similarly, in Ethiopia, the Community-Based Participatory Watershed Development approach has been implemented to manage water resources and mitigate flood risks (Addisie, 2021). This approach involves active participation from local communities in decision-making processes, fostering ownership and sustainable management of water resources. These examples, along with those from Mozambique and Ghana, underscore the significance of community engagement in Africa, allowing communities to actively adapt to climate change, reduce vulnerability and promote sustainable development.

In the Zimbabwean context, community engagement in flood risk management in the context of climate change is critical, particularly in regions that are highly susceptible to the impacts of climate change (Mavhura *et al.*, 2022). One such region is Masvingo, located in the southeastern part of Zimbabwe. Masvingo experiences recurrent droughts and erratic rainfall patterns, leading to water scarcity and agricultural challenges (Mavhura, 2022). Through community engagement initiatives, such as the Masvingo Adaptation Project, local communities have been actively involved in identifying climate risks, implementing sustainable farming practices and adopting water management strategies to enhance resilience (Mubaya, 2020).

Another region affected by climate change in Zimbabwe is Matabeleland, situated in the southwestern part of the country. This region is prone to both droughts and floods, causing significant disruptions to agricultural activities and livelihoods (Matsa, 2021). Community engagement programs, such as the Matabeleland Zambezi Water Project, have been instrumental in mobilizing local communities to participate in water

management and irrigation schemes, improving water access and mitigating the impacts of drought and floods. These examples from Masvingo and Matabeleland highlight the significance of community engagement in Zimbabwe.

The importance of community engagement in flood risk management in the context of climate change is particularly evident in Chadereka, Muzarabani (Manyani & Bob, 2018; Manyani *et al.*, 2019) and the focal point of this study. Chadereka, located in the northern part of Zimbabwe, faces unique socio-economic and geographical challenges that make it highly vulnerable to the impacts of climate change, specifically increased flood risks (Dube & Manyani, 2022). With a heavy reliance on agriculture, predominantly subsistence farming, the community in Chadereka confronts limited access to basic amenities and inadequate infrastructure, exacerbating their vulnerability to climate-related events (Tanyanyiwa, 2022). However, despite these challenges, Chadereka exhibits strong social cohesion, relying on traditional values and cultural practices to shape decision-making processes (Kasimba, Muqayi & Chirisa, 2023).

Acknowledging the significance of community engagement within the context of Chadereka, this study aims to understand how involving local residents, community leaders and stakeholders can effectively manage climate change and flood risk information. The study seeks to contribute to enhancing community resilience, promoting sustainable development and addressing the unique challenges faced by Chadereka and similar communities by conducting comprehensive research and analysis.

This research emphasizes the significance of customizing climate change and flood risk management strategies to meet the specific needs and circumstances of vulnerable communities, ultimately contributing to a future that is more resilient and sustainable. It emphasizes the significance of modifying tactics to solve the special difficulties encountered by these communities by looking at the specific situation of Chadereka, Muzarabani. It is evident that meaningful community engagement plays a crucial role in climate policy. This importance stems not only from the fact that communities deserve to have their perspectives incorporated into policies that will affect their futures but also because it enhances the effectiveness and long-term sustainability of

policies and programs. However, no empirical researches have been done to establish the role of community engagement in flood risk management in the context of Chadereka in Muzarabani. Hence, against the backdrop, this study aims to examine the role of community engagement in flood risk management in the context of climate change using the case of Chadereka in Muzarabani.

1.3 Statement of the problem

The community of Chadereka in Muzarabani is faced with the dual challenge of climate change and flood risk, which significantly affect the lives and livelihoods of its residents (Kasimba *et al.*, 2023; Manyani *et al.*, 2019). To effectively manage these challenges, it is crucial to understand the role of community engagement in flood risk management in the context of climate change. However, there is a lack of comprehensive research and understanding regarding the specific ways in which community engagement can contribute to addressing these issues in the context of Chadereka. Therefore, the problem statement for this study is to explore and analyze the role of community engagement in flood risk management in the context of climate change in Chadereka, Muzarabani, with the aim of identifying effective strategies and recommendations for enhancing community resilience and adaptive capacity in the face of these environmental challenges.

1.4 Objectives of the study

1.4.1 Main objective

- To examine the role of community engagement in flood risk management in the context of climate change in Chadereka area.

1.4.2 Specific objectives

The objectives of the study are as follows:

- 1) To assess the existing level of community engagement in flood risk management in the context of climate change in Chadereka, Muzarabani

- 2) To establish the barriers to community engagement in flood risk management in the context of climate change in Chadereka, Muzarabani.
- 3) To examine the impacts of community engagement on flood risk management in the context of climate change in Chadereka, Muzarabani
- 4) To develop strategies for enhancing community engagement in flood risk management in the context of climate change in Chadereka, Muzarabani.

1.5 Research questions

1.5.1 Main research question

- What is the role of community engagement in flood risk management in the context of climate change in Chadereka area?

1.5.2 Specific research questions

The research questions of the study are as follows:

- 1) What is the current level of community engagement in flood risk management in the context of climate change in Chadereka, Muzarabani?
- 2) What are the main barriers that hinder community engagement in flood risk management in Chadereka, Muzarabani?
- 3) What are the impacts of community engagement on flood risk management in the context of climate change in Chadereka, Muzarabani?
- 4) What are the most effective strategies for enhancing community engagement in flood risk management in Chadereka, Muzarabani?

1.6 Significance of the study

This study investigates the role of community engagement in flood risk management in the context of climate change in Chadereka, Muzarabani, through assessing current engagement levels, identifying barriers, examining impacts and developing strategies. The study aims to provide valuable insights and recommendations to enhance

community resilience, adaptive capacity and sustainable development, benefiting stakeholders including community members, local government, NGOs, researchers and policy makers in addressing these pressing environmental challenges.

The study aimed to increase awareness and understanding of these environmental challenges among community members. It will empower them to actively participate in decision-making processes related to climate change adaptation and flood risk management. Additionally, the study will provide community members with improved access to relevant information and resources, enabling them to take proactive measures to protect their lives, livelihoods and properties from climate change impacts and flood events.

For local government and authorities in Chadereka, Muzarabani (Muzarabani Rural District Council), this study's significance lies in its potential to inform decision-making processes regarding climate change adaptation and flood risk management strategies. Through the identification of successful community engagement strategies, the research will yield insightful information that can improve policies, initiatives, and interventions.

Further, NGOs and development agencies working in Chadereka, Muzarabani, will find significant value in this study. Furthermore, the study's findings will help NGOs and development agencies target their resources and support more effectively towards vulnerable communities, ensuring that interventions are contextually relevant and tailored to community needs.

Researchers and academics can utilize these findings to inform their work, enriching the understanding of community engagement practices in the broader field of climate change and disaster management.

The research also aimed to facilitate efficient communication and cooperation between policymakers and community stakeholders. Additionally, policy makers and planners, would articulately align their policies and strategies with community needs and priorities though providing evidence-based recommendations for integrating community engagement into climate change adaptation and flood risk management

policies and plans. . This aids in the creation of more sustainable and inclusive plans and policies that tackle the unique difficulties encountered in Chadereka, Muzarabani.

1.7 Delimitations of the study

This study focuses on community engagement in flood risk management in the context of climate change in the Chadereka area in Ward 1 of Muzarabani district. The theoretical framework draws from existing models and frameworks in these domains, while other perspectives may not be fully explored. Quantitative and qualitative research methods, such as surveys, key informant interviews and document analysis, are employed, but other methods are not included. The findings may have limited generalizability to other regions due to the specific context and unique socio-cultural, political and economic factors of Chadereka.

1.7.1 Theoretical Delimitations

The study focuses specifically on the role of community engagement in flood risk management in the context of climate change. It does not encompass other dimensions of community engagement unrelated to these specific domains. The theoretical framework of the study draws from existing models and frameworks related to community engagement, climate change and flood risk management. While these frameworks provide a solid foundation, other relevant theoretical perspectives or frameworks were not be fully explored or integrated into the study's analysis.

1.7.2 Methodological Delimitations

The study employs a combination of quantitative and qualitative research methods, such as surveys, key informant interviews and document analysis, to collect and analyze data. However, the study does not encompass other research methods, such as experimental studies or participatory action research, which could provide additional insights. Furthermore, due to practical constraints, the study may have limitations in sample size, potentially affecting the representativeness of the findings. The conclusions drawn from the study may not fully capture the diverse range of views and experiences within the community.

1.7.3 Geographical Delimitations

The study's geographical focus is on the Chadereka area in Muzarabani. This study focuses on community engagement in flood risk management in the context of climate change in the Chadereka area in Ward 1 of Muzarabani district. While this allows for an in-depth analysis of community engagement within this specific context, the findings may not be directly applicable to other regions or communities facing different climate change and flood risk dynamics. The study assumes a particular geographic context with its unique socio-cultural, political and economic factors that influence community engagement. Therefore, the generalizability of the findings to other geographical settings with distinct contextual factors may be limited.

1.8 Definition of terms

The following terms are key to the study:

1.8.1 Climate Change

Climate change refers to long-term shifts in weather patterns and average temperatures caused by human activities, such as the burning of fossil fuels, deforestation and industrial processes (Naz *et al.*, 2022). It leads to changes in temperature, precipitation, sea levels and extreme weather events, affecting ecosystems, societies and economies.

1.8.2 Community Engagement

Community engagement refers to the active involvement and participation of local residents, community leaders and stakeholders in decision-making processes, planning and implementation of initiatives (Benneworth, 2018).

1.8.3 Flood Risk

Flood risk refers to the potential for flooding to occur in a specific area (Mai *et al.*, 2020). It encompasses the probability of a flood event happening and the potential consequences, including damage to infrastructure, loss of lives, destruction of property and disruptions to livelihoods and ecosystems (Mai *et al.*, 2020).

1.8.4 Flood Risk Management

Flood risk management refers to the strategic planning and implementation of measures or strategies to reduce or mitigate the impacts or consequences of flood risks on people, infrastructure and the natural environment (Mai *et al.*, 2020).

1.9 Research outline

The research consists of five chapters. Chapter 1 introduced the study, providing background and context for the research on community engagement in flood risk management in the context of climate change. Chapter 2 conducts a literature review, analyzing existing knowledge to establish a theoretical framework and identify research gaps. Chapter 3 outlines the research methodology, detailing the design, data collection methods and analytical techniques used. Chapter 4 presents and analyses the study's results, using visual aids to enhance understanding. Finally, chapter five concludes the research by summarizing findings, discussing implications and offering recommendations for future actions and research in community engagement, climate change and flood risk management.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This Chapter provides a comprehensive literature review on the topic. The chapter introduces the concept of community engagement and its significance in various fields, including community development, public health, urban planning and social work. It emphasizes the importance of inclusive decision-making, collaboration and respect for diverse viewpoints in achieving common goals. The chapter also defines disaster risk management, community engagement and climate change. The chapter aims to enhance understanding of the complex nature of community engagement, flood risk management and climate change, laying the foundation for the subsequent chapters.

2.2 Definitions of Terms

2.2.1 Community Engagement Defined

Community engagement is a dynamic and collaborative process that involves active participation and collaboration between community members, organizations and institutions to address shared issues and achieve common goals (De Weger *et al.*, 2018). It is a vital concept in various fields, including community development, public health, urban planning and social work (Benneworth, 2018). Community engagement goes beyond consultation and emphasizes the value of inclusive decision-making, where all stakeholders have a voice (Nugroho *et al.*, 2022). It values diversity, fosters collaboration and creates an environment that respects multiple viewpoints to find comprehensive solutions that meet the needs of the entire community (De Weger *et al.*, 2018).

Community participation creates a sense of shared duty, accountability and ownership by giving community members the authority to influence outcomes and create lasting solutions (Rolfe, 2018). It also emphasizes building relationships and collaboration

among stakeholders, transcending boundaries to strengthen social capital (Nugroho *et al.*, 2022). Arnstein's (1969) "ladder of citizen participation" provides a framework to understand the levels of community engagement, from non-participation to genuine collaboration and power-sharing (Willness *et al.*, 2023).

The World Health Organization (WHO) (2022) defines community engagement as a collaborative process that works through groups of people affiliated by proximity or similar situations to address well-being issues (WHO, 2022). It recognizes the importance of geographic proximity, collaboration, local responsiveness and resource mobilization (Goodman *et al.*, 2017). In the context of sustainable development, community involvement actively engages people in decision-making, values local knowledge and promotes inclusivity, transparency and accountability (Rijal, 2023). Decision-makers and policymakers can access the collective knowledge and resources of communities by embracing community engagement and involvement, leading to more inclusive, efficient and sustainable outcomes (Thompson *et al.*, 2024).

2.2.2 Disaster Risk Management Defined

Disaster risk management is a comprehensive and systematic process that involves analyzing, reducing and transferring risks to prevent, mitigate and prepare for disasters (Sheikhi *et al.*, 2021). It begins with thorough assessments of potential hazards and vulnerabilities, identifying risks and understanding their social, economic and environmental contexts. Measures are then implemented to minimize risks, such as enforcing building codes, establishing early warning systems and promoting hazard-informed land-use planning (Mai *et al.*, 2021). Disaster risk management also focuses on enhancing preparedness and response capabilities through strategies like emergency response plans, drills and communication systems. Furthermore, it recognizes the importance of risk transfer, including insurance schemes and international cooperation, to alleviate the financial burden and provide support for recovery (Almutairi, Mourshed & Ameen, 2020).

Alexander (2020) emphasizes the crucial role of resilience and proactive risk management in effectively addressing and mitigating the impacts of disasters. This perspective advocates for a paradigm shift from reactive approaches that primarily

focus on response and recovery after a disaster strikes to a more comprehensive and forward-looking approach centered on building the capacity to withstand and recover from disasters (Almutairi *et al.*, 2020). Resilience refers to the ability of individuals, communities and systems to anticipate, absorb, adapt and recover from the impacts of disasters (Alexander, 2020). It involves understanding and acknowledging the inherent risks and vulnerabilities that exist within a given context and taking proactive measures to minimize their potential consequences (Cardona, Bernal & Escovar, 2023). The emphasis is placed on integrating risk reduction measures into everyday practices and promoting adaptive strategies to enhance overall resilience (Alexander, 2020).

Cardona *et al.* (2023) stress the need for a holistic perspective in disaster risk management, recognizing that vulnerability and risk are influenced by multiple interconnected factors across social, economic and environmental dimensions. Effective risk management techniques can be created by taking a holistic approach that takes these factors into account, highlighting the incorporation of catastrophe risk reduction into larger development planning and policy-making procedures (Cardona *et al.*, 2023). Taking a holistic perspective means going beyond a narrow focus on physical hazards and immediate impacts, considering underlying drivers of vulnerability such as poverty, inequality and environmental degradation (Cardona *et al.*, 2023). The effectiveness and sustainability of risk management techniques can be increased by comprehending and addressing these underlying reasons.

Wisner and Alcántara-Ayala (2023) advocate for a people-centered approach in disaster risk management, emphasizing the need to understand the social, economic and political factors that contribute to vulnerability and exposure to hazards. They argue that effective risk management requires engaging with local communities, empowering individuals and addressing underlying social inequalities (Wisner, 2020). Disaster risk management can be more successful in lowering risks and building resilience in this way. Taking a people-centered approach means recognizing the agency and knowledge of individuals and communities in managing their own vulnerabilities and capacities (Wisner & Alcántara-Ayala, 2023).

The United Nations Office for Disaster Risk Reduction (UNDRR) (2021) defines disaster risk management as a comprehensive and systematic process that brings together various components and stakeholders to address the challenges posed by natural hazards and related environmental and technological disasters. It encompasses a wide range of activities, including administrative decisions organizational structures, operational skills and capacities, all aimed at implementing policies, strategies and coping mechanisms within society (UNDRR, 2021). The primary goal of disaster risk management is to proactively reduce the impacts of disasters by identifying, assessing and mitigating risks through thorough risk assessments. Central to disaster risk management is the concept of resilience, which involves enhancing the adaptive capacity of communities and nations to anticipate, respond to and recover from disasters (UNDRR, 2021).

Disaster risk management encompasses a broad range of perspectives and considerations that collectively emphasize the complexity and multi-dimensional nature of addressing and reducing the risks associated with disasters. It goes beyond a reactive approach and highlights the importance of a proactive, systematic and comprehensive approach to disaster management. This includes recognizing the significance of resilience, adopting a holistic understanding, implementing people-centered strategies and integrating risk reduction measures into development processes (UNDRR, 2021; Alexander, 2020; Cardona, 2004; Wisner, 2020). Through cooperation, creativity and ongoing learning, society can use these strategies to prevent, mitigate and prepare for disasters, lessening their effects and increasing overall resilience (UNDRR, 2021; Alexander, 2020; Cardona *et al.*, 2023; Wisner, 2020). In this study, flood risk management refers to the strategic planning and implementation of measures or strategies to reduce or mitigate the impacts or consequences of flood risks on people, infrastructure and the natural environment.

2.2.3 Climate Change

Climate change is a pressing global issue with far-reaching implications for the environment, societies and economies (IPCC, 2014). This literature review aims to provide an overview of key concepts, theories and research related to climate change, highlighting its causes, impacts and potential solutions. This study aims to improve

knowledge of the complex nature of climate change and its implications for different sectors by looking at a variety of academic studies. The concept of climate change refers to long-term shifts in weather patterns and average temperatures, primarily caused by human activities and natural processes (IPCC, 2014). The anthropogenic causes of climate change, such as the burning of fossil fuels, deforestation and industrial activities, have led to an increase in greenhouse gas emissions, resulting in the greenhouse effect and subsequent global warming (IPCC, 2014).

Scientific studies have provided overwhelming evidence of climate change and its impacts on various aspects of the Earth's system (IPCC, 2014). These impacts include rising global temperatures, sea-level rise, melting glaciers, more frequent and intense extreme weather events, disruptions to ecosystems, biodiversity loss and changes in agricultural productivity (IPCC, 2014). Furthermore, vulnerable populations, particularly in developing countries, are disproportionately affected by the adverse consequences of climate change (IPCC, 2014). Efforts to address climate change involve both mitigation, which aims to reduce greenhouse gas emissions and adaptation, which focuses on building resilience and adapting to the changing climate (IPCC, 2014).

Mitigation strategies include transitioning to renewable energy sources, improving energy efficiency and implementing sustainable land-use practices (IPCC, 2014). Adaptation measures involve enhancing infrastructure, developing early warning systems, implementing climate-resilient agricultural practices and promoting sustainable water management (IPCC, 2014). The global response to climate change is guided by a series of international agreements and frameworks that have become crucial in addressing this pressing issue. Among these, the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement stand out as significant milestones in global efforts to combat climate change (UNFCCC, 1992; Paris Agreement, 2015).

The UNFCCC, established in 1992, serves as the foundation for international cooperation on climate change, with the objective of stabilizing greenhouse gas concentrations in the atmosphere (UNFCCC, 1992). The Paris Agreement, adopted in 2015, builds upon the UNFCCC and sets more ambitious goals, aiming to limit the

global temperature rise well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 degrees Celsius (Paris Agreement, 2015). These agreements play a pivotal role in fostering international collaboration, as they provide a platform for countries to come together and collectively address the challenges posed by climate change (UNFCCC, 1992; Paris Agreement, 2015). They emphasize the importance of both mitigation and adaptation actions, recognizing the need for a comprehensive approach to reduce greenhouse gas emissions and enhance resilience to climate impacts (UNFCCC, 1992; Paris Agreement, 2015).

Additionally, the agreements highlight the principle of common but differentiated responsibilities, acknowledging that developed countries should take the lead in combating climate change and supporting developing countries in their efforts (UNFCCC, 1992; Paris Agreement, 2015). These agreements emphasize the provision of financial resources and technological support to developing countries, recognizing that they may face greater challenges in addressing climate change due to limited resources and capacities (UNFCCC, 1992; Paris Agreement, 2015).

Climate change is a complex issue intertwined with various social, economic and political factors (IPCC, 2014). It poses challenges to sustainable development, exacerbates existing inequalities and requires collective action and cooperation at local, national and global levels (IPCC, 2014). The literature explores a wide range of topics related to climate change, providing insights into critical aspects of this multifaceted problem. Climate justice is a concept that examines the fairness and equity of climate action, emphasizing the responsibility of developed countries in addressing the impacts of climate change on vulnerable populations (Schlosberg *et al.*, 2020). The role of governance and policy-making is another crucial area of research, focusing on the design and implementation of effective climate policies and the need for international cooperation to achieve global climate goals (Bäckstrand *et al.*, 2017). Stakeholder engagement is also highlighted as an essential element in climate change governance, as it involves the active participation of diverse actors, including governments, civil society organizations and the private sector, in decision-making processes (Wamsler *et al.*, 2020).

Furthermore, the literature explores the socio-economic implications of climate change mitigation and adaptation efforts, analyzing the potential benefits and challenges associated with transitioning to low-carbon economies and building resilience against climate impacts (IPCC, 2014; Stern, 2007). This literature review highlights the multidimensional nature of climate change and its profound impact on the environment, societies and economies. It underscores the urgent need for comprehensive and coordinated strategies to mitigate greenhouse gas emissions, adapt to the changing climate and build resilience. Effective climate change policies and actions require interdisciplinary approaches, international collaboration and the active involvement of various stakeholders to address this global challenge and create a sustainable future.

2.3 Relationship between Community Engagement and Disaster Risk Management

Community engagement plays a crucial role in effective disaster risk management (DRM) by involving local communities as active participants in the identification, assessment and reduction of risks (Ryan *et al.*, 2020). This literature review aims to explore the relationship between community engagement and DRM, examining key concepts, theoretical frameworks and empirical evidence. This review aims to improve knowledge of the significance of community participation in lowering disaster risks and creating resilient communities by examining a variety of academic studies.

2.3.1 Conceptualizing Community Engagement in DRM

Community engagement in disaster risk management (DRM) entails the active participation and involvement of local communities, including individuals, households, community-based organizations and local authorities (Twigg, 2020). It recognizes the importance of including diverse stakeholders, tapping into local knowledge and expertise and leveraging social networks to enhance community resilience and reduce vulnerability to disasters (IFRC, 2020). Community engagement goes beyond mere consultation by fostering collaboration, empowerment and ownership among community members (Béné *et al.*, 2012). At its core, community engagement in DRM recognizes that communities are not passive recipients of disaster

response and recovery efforts. Instead, they are active agents who possess valuable insights and resources to contribute to effective DRM (Twigg, 2007). Community involvement allows people of the community to actively design strategies and activities that address their unique needs, capacities and goals by giving them a voice and including them in decision-making processes (IFRC, 2020).

Furthermore, community engagement acknowledges the significance of local knowledge and social networks in disaster management. Local communities possess a wealth of knowledge and experience regarding the hazards, vulnerabilities and coping mechanisms specific to their locality (Twigg, 2007). Community participation guarantees that interventions are successful and appropriate for the given environment by incorporating this local knowledge into DRM procedures (IFRC, 2020). Additionally, community engagement leverages existing social networks and community structures to facilitate communication, coordination and support during all phases of DRM, from preparedness to response and recovery (Béné *et al.*, 2012).

A key aspect of community engagement is the promotion of collaboration and partnership among stakeholders. It recognizes that effective DRM requires the collective efforts of various actors, including community members, local authorities, non-governmental organizations and other relevant stakeholders (Twigg, 2007). These partnerships enable the pooling of resources, expertise and capacities, leading to more comprehensive and sustainable DRM initiatives (IFRC, 2020). Collaboration also fosters a sense of ownership and shared responsibility among stakeholders, enhancing the long-term resilience of communities (Béné *et al.*, 2012).

2.3.2 Community Engagement in Risk Assessment and Preparedness

Effective risk assessment requires the active involvement of communities to identify and understand local hazards, vulnerabilities and capacities (Mitchell *et al.*, 2009). This approach, known as participatory risk assessment, recognizes that communities possess valuable knowledge and perspectives that can contribute to a comprehensive understanding of risks (Wisner *et al.*, 2012). Participatory approaches involve community members in data collection, analysis and decision-making processes,

enabling them to have a direct say in shaping risk management strategies (Renn *et al.*, 2011).

One method of community engagement is community mapping, where local residents actively participate in mapping out their environment, including identifying areas prone to hazards and key community assets (Cutter *et al.*, 2003). This process not only helps to create spatial awareness of risks but also empowers community members by involving them in the assessment and planning process (Johnson *et al.*, 2017). Hazard and vulnerability assessments are another participatory approach used to engage communities in risk assessment. Community members, together with experts, systematically evaluate the specific hazards they face, the vulnerabilities of their community and their capacities to cope with and adapt to those risks (Blaikie *et al.*, 2014). A more accurate and nuanced image of the dangers can be generated by incorporating the community into this process, taking into account local knowledge and experiences (Few *et al.*, 2007).

Participatory scenario planning is another valuable tool for community engagement in risk assessment. It involves collaborative discussions and simulations that allow community members to explore and evaluate different future scenarios based on various risk factors (IPCC, 2012). This process helps communities envision potential risks, understand their potential impacts and develop appropriate strategies to mitigate and adapt to those risks (Davoudi *et al.*, 2009).

Community engagement also plays a vital role in disaster preparedness. Local authorities can create early warning systems at the community level that are customised to the unique requirements and features of the community by include community members in the process. (Basher *et al.*, 2014). These systems can include mechanisms for disseminating timely and accurate information about impending hazards, as well as protocols for community response and evacuation (UNISDR, 2015). In addition, community engagement contributes to the development of effective emergency response plans. Plans for emergency responses can be created with the input of the community, taking into account its particular requirements and resources (Comfort *et al.*, 2004). Community members can provide valuable insights into local communication networks, existing response capacities and potential

challenges during emergencies (Paton *et al.*, 2008). Community engagement supports the implementation of training programs aimed at building community resilience. Community members can get the skills and knowledge required to respond to emergencies by participating in the planning and execution of the training (Aldrich, 2012). This can include first aid training, search and rescue techniques and community-based initiatives for post-disaster recovery and reconstruction (Béné *et al.*, 2012).

2.3.3 Community-Based Disaster Risk Reduction

Community engagement plays a vital role in community-based disaster risk reduction (CBDRR) strategies (IFRC, 2012). These tactics enable communities to take charge of their own resilience and improve their ability to prevent, respond to and recover from catastrophes by actively incorporating community members in various CBDRR activities (UNISDR, 2005). One key aspect of community engagement in CBDRR is through participatory approaches (Cannon *et al.*, 2003). This entails involving community members in the planning, decision-making, implementation and monitoring of CBDRR activities (Twigg, 2009). Communities' distinct knowledge, experiences and viewpoints can be incorporated into the planning and implementation of initiatives, increasing their effectiveness and contextual suitability, by being given a voice and integrating them in these processes (Wisner *et al.*, 2012).

CBDRR activities that promote community engagement often include training programs that equip community members with essential skills and knowledge (IFRC, 2012). Training in first aid and search and rescue techniques empowers individuals to provide immediate assistance to those affected by disasters, potentially saving lives and reducing the severity of injuries (CRED, 2015). In addition, involving community members in the construction of resilient infrastructure ensures that their needs and priorities are considered and that the infrastructure meets their specific requirements (UNISDR, 2009). Ecosystem-based approaches are another example of community engagement in CBDRR. These approaches involve communities in the conservation and restoration of ecosystems, which can provide natural protection against disasters such as floods, landslides and storm surges (CBD, 2009).

Furthermore, livelihood diversification initiatives empower communities to reduce their dependence on vulnerable livelihoods and explore alternative income-generating activities (RESCCUE, 2019). Communities become more robust to economic shocks and disruptions brought on by disasters by diversifying their sources of revenue (UNDP, 2004). Social safety nets are also an important aspect of community engagement in CBDRR. These safety nets provide support mechanisms, such as social assistance programs, insurance schemes or community-based funds, to help vulnerable community members cope with the impacts of disasters (IFRC, 2012). Active community participation in CBDRR initiatives fosters a sense of collective responsibility (Béné *et al.*, 2012). When communities are actively engaged in disaster risk reduction, they develop a stronger sense of ownership, responsibility and resilience (Twigg, 2009). This collective responsibility strengthens social cohesion, encourages mutual support and promotes a culture of preparedness and resilience that extends beyond individual disaster events (IFRC, 2012).

2.3.4 Communication, Information Sharing and Education

Effective communication and information sharing are crucial components of community engagement in Disaster Risk Management (DRM) (UNDRR, 2017). These programmes improve community preparedness and response capabilities in the event of catastrophes by actively incorporating communities in risk communication, early warning distribution and public awareness campaigns (CRED, 2015).

Risk communication is a fundamental aspect of community engagement in DRM (IFRC, 2013). It involves the exchange of information about potential hazards, their impacts and appropriate mitigation and response measures between disaster management authorities and community members (UNDRR, 2019). Effective risk communication ensures that communities have access to accurate and timely information, enabling them to make informed decisions and take appropriate actions to reduce their vulnerability to disasters (IFRC, 2013). Engaging communities in risk communication processes takes their specific needs, concerns and cultural contexts into account, resulting in more effective and relevant communication strategies (UNDRR, 2019).

Early warning dissemination is another critical component of community engagement in DRM (UNDRR, 2017). Timely and reliable dissemination of early warning messages is essential to ensure that communities have sufficient time to prepare and respond to impending disasters (UNDRR, 2015). Engaging communities in the early warning dissemination process involves establishing communication channels, such as sirens, text messages or community-based networks, to reach community members in a timely manner (CRED, 2015). Communities' local knowledge and networks can be utilised to increase the efficacy and reach of warning signals by incorporating them in the design and implementation of early warning systems (UNDRR, 2015).

Public awareness campaigns are instrumental in promoting preparedness and building a culture of safety within communities (CRED, 2015). These campaigns aim to raise awareness about disaster risks, educate community members about appropriate preparedness measures and encourage proactive behaviors (UNDRR, 2017). Effective public awareness campaigns utilize various communication channels, such as mass media, community meetings, social media and local networks, to reach diverse segments of the population (CRED, 2015). These campaigns maximise their impact by addressing individual informational demands, cultural sensitivities and communication preferences by customising messages for various age groups and socioeconomic backgrounds (UNDRR, 2017).

Education and awareness programs form an integral part of community engagement in DRM (UNDRR, 2019). These programs provide structured learning opportunities for community members, focusing on disaster risk reduction, preparedness and response (IFRC, 2013). Education programs enable people to make educated decisions and respond appropriately in the event of a disaster by dispensing knowledge and skills (UNDRR, 2019). These programs are often designed to be interactive and participatory, encouraging community members to actively engage in learning activities (IFRC, 2013). Education and awareness programmes guarantee that knowledge and behavioural change reach all parts of the community by addressing diverse age groups and socioeconomic backgrounds. This helps to develop a collective culture of safety and resilience (UNDRR, 2019).

2.3.5 Challenges and Enablers of Community Engagement

Community engagement in Disaster Risk Management (DRM) brings about significant benefits, but it also comes with its fair share of challenges. Addressing these challenges is crucial to ensuring effective and inclusive community engagement (Kapucu *et al.*, 2019). Factors such as unequal power dynamics, limited resources, cultural and linguistic barriers and the exclusion of marginalized groups can hinder the success of community engagement efforts (Twigg *et al.*, 2017; Aldrich, 2019). However, several key enablers can facilitate effective community engagement, including strong community leadership, capacity building, trust building, institutional support and the recognition of local knowledge and expertise (Gupta *et al.*, 2020; Tierney *et al.*, 2015). Additionally, establishing partnerships between communities, governments, non-governmental organizations (NGOs) and other stakeholders is essential for sustaining community engagement over the long term (Birkmann *et al.*, 2022; Manyena *et al.*, 2019).

Unequal power dynamics pose a significant challenge to community engagement in DRM. Power imbalances, whether related to gender, socio-economic status or other factors, can marginalize certain community members and limit their meaningful participation in decision-making processes (Collins, 2017). Addressing power dynamics requires creating inclusive spaces where all community members have an equal voice and their perspectives and concerns are genuinely considered (Blaikie *et al.*, 2014). Limited resources can also hinder effective community engagement. Communities may lack the financial, technical or human resources necessary to actively participate in DRM initiatives (Béné *et al.*, 2016). Capacity building programs that provide communities with the knowledge, skills and resources they need to engage effectively can help overcome these limitations (Paton *et al.*, 2017). Capacity development projects enable communities to actively participate in decision-making and implementation processes by improving members' abilities to contribute to DRM activities (Birkmann *et al.*, 2022).

Cultural and linguistic barriers can impede communication and understanding between DRM practitioners and community members. These barriers may arise from differences in language, cultural norms or traditional knowledge systems (Cutter *et*

al., 2019). Overcoming these challenges requires culturally sensitive approaches that respect and incorporate local customs, practices and languages (Wisner *et al.*, 2012). Engaging community leaders and translators who can bridge these gaps can help ensure effective communication and meaningful engagement with diverse communities (Aldrich, 2019).

Exclusion of marginalized groups is a significant concern in community engagement. Vulnerable populations, including women, children, the elderly, people with disabilities and ethnic minorities, often face additional barriers to participation (Collins, 2017). It is essential to proactively address these barriers and ensure that the voices and needs of marginalized groups are included in decision-making processes (IFRC, 2022). Efforts should be made to create inclusive spaces, provide targeted support and address specific challenges faced by these groups to ensure their meaningful engagement (Twigg *et al.*, 2017).

Several key enablers can support effective community engagement in DRM. Strong community leadership plays a crucial role in mobilizing and empowering communities to participate actively in DRM initiatives (Béné *et al.*, 2016). Building the capacity of community members through training and education programs equips them with the necessary skills and knowledge to contribute effectively (Paton *et al.*, 2017). Trust building between communities and DRM practitioners is fundamental for fostering collaboration, open communication and long-term engagement (Tierney *et al.*, 2015). Institutional support is vital to create an enabling environment for community engagement. This includes establishing policies, frameworks and funding mechanisms that prioritize and support community participation in DRM (Birkmann *et al.*, 2022). Recognizing and valuing local knowledge and expertise is essential, as communities often possess valuable insights and traditional practices that can inform DRM strategies (Wisner *et al.*, 2012).

Partnerships between communities, governments, NGOs and other stakeholders are crucial for sustained community engagement in DRM. Collaboration and coordination among these entities ensure a multi-sectoral approach, pooling resources and expertise to address complex challenges (Aldrich, 2019; Birkmann *et al.*, 2022). Such

partnerships foster shared responsibility, collective decision-making and long-term sustainability of community engagement efforts (Manyena *et al.*, 2019).

This literature review demonstrates the critical role of community engagement in DRM, highlighting its potential to enhance resilience, reduce vulnerability and promote sustainable development. Active community participation in risk assessment, preparedness, CBDRR, communication and education foster a sense of ownership, empowerment and collective responsibility. However, challenges must be addressed to ensure inclusive and meaningful community engagement. DRM initiatives may capitalise on the wealth of resources and expertise found within communities by appreciating the importance of local knowledge, developing capacity and encouraging cooperative collaborations. This will ultimately result in more effective disaster risk reduction and long-term resilience.

2.4 The existing level of community engagement in flood risk management in the context of climate change

Community engagement is crucial for effective climate change and flood risk management (Fekete *et al.*, 2020). This literature review explores the level of community engagement in these areas, examining concepts, challenges and opportunities. Research shows that community engagement enhances understanding, promotes behavioural change and fosters resilient communities (Moser and Dilling, 2011; Pidgeon *et al.*, 2014). Engaging communities empowers them to participate in decision-making, co-creating relevant knowledge aligned with their needs (Wibeck, 2014). Challenges to community engagement include limited resources, capacity constraints and power dynamics (Koontz *et al.*, 2004; Sultana, 2010). Capacity building programs can address resource and expertise gaps (Cundill *et al.*, 2011). Inclusive spaces, transparent processes and the empowerment of marginalized groups are needed to overcome power imbalances (Murphy *et al.*, 2019; Gupta *et al.*, 2010).

Opportunities for community engagement lie in digital technologies, participatory approaches and collaborative governance models (Davies *et al.*, 2022; Hecker *et al.*, 2022; Armitage *et al.*, 2009). Investment in capacity building, inclusive decision-making, recognition of diverse knowledge and integration of community perspectives

into policy are crucial (Wamsler *et al.*, 2020). Building trust and long-term relationships among stakeholders are essential for effective community engagement (Hurlimann *et al.*, 2015).

2.5 Community Engagement in Flood risk management

Flood risk management necessitates active community engagement to enhance preparedness, response and recovery efforts. Engaging communities in flood risk management involves the timely and accurate provision of information regarding flood hazards, vulnerability assessments, evacuation plans and early warning systems. This review aims to explore the importance of community engagement in flood risk management, highlighting its role in empowering individuals and households, enhancing community resilience and fostering a culture of safety.

Effective community engagement in flood risk management is crucial for several reasons. Firstly, it ensures that individuals and communities are well informed about the potential risks and hazards associated with flooding (Grothmann and Patt, 2005). Communities can comprehend their susceptibility to floods, the possible effects on their lives and property and the essential actions to reduce risks by being given clear and easily accessible information (Thieken *et al.*, 2016). This knowledge empowers individuals to make informed decisions regarding protective measures, such as flood insurance, land-use planning and emergency preparedness (Bubeck *et al.*, 2012).

Furthermore, community engagement facilitates the development and dissemination of comprehensive flood risk assessments. Local knowledge and experiences are invaluable in understanding the specific vulnerabilities and capacities of a community in relation to flooding (Brouwer *et al.*, 2022). Engaging community members allows for the integration of their insights into risk assessments, ensuring that they are context-specific and representative of local conditions (Jonkman *et al.*, 2008). This participatory approach enhances the accuracy and relevance of flood risk information, supporting effective decision-making and risk reduction strategies (Aerts *et al.*, 2022).

Engaging communities in flood risk management also entails the provision of evacuation plans and early warning systems. Timely and clear communication of evacuation routes, shelters and procedures is essential for ensuring the safety of

community members during flood events (Paton *et al.*, 2008). Early warning systems, including alerts via mobile phones, sirens or community networks, enable individuals to take swift action and evacuate to safer areas (Basher *et al.*, 2014). Community engagement ensures that these systems are accessible, culturally appropriate and effectively communicated to all segments of the population, including marginalized groups (Morrow and Mock, 2014).

In addition to immediate response efforts, community engagement in flood risk management contributes to long-term community resilience. Participating in decision-making processes, such as infrastructure design and land-use planning, allows community people to contribute their local expertise and viewpoints to flood risk management plans (Fekete *et al.*, 2020). Engaged communities are more likely to adopt resilient behaviors and practices, such as flood-proofing structures, implementing green infrastructure and participating in community-based flood monitoring initiatives (Paton *et al.*, 2017). This bottom-up approach to resilience-building recognizes the importance of local context, social networks and community cohesion in effectively managing flood risks (Aldunce *et al.*, 2022).

Community engagement in flood risk management fosters a culture of safety by promoting collective responsibility and preparedness. Through ongoing communication and dialogue, communities develop a shared understanding of their flood risks and the actions required to mitigate them (Bichard and Kazmierczak, 2012). This shared responsibility encourages community members to take proactive measures, such as maintaining emergency kits, conducting drills and participating in community resilience-building initiatives (Mushkatel *et al.*, 2013). Ultimately, community engagement helps to create a culture where flood risk reduction becomes a societal norm, leading to responses that are more effective and a reduced vulnerability to flood events (Cutter *et al.*, 2008).

2.6 Barriers to community engagement in flood risk management in the context of climate change

Community engagement in flood risk management in the context of climate change faces challenges that hinder its effectiveness. These challenges include limited access

to reliable information, inadequate communication channels, language and cultural barriers, low levels of community awareness and understanding, unequal distribution of resources, power dynamics and social inequities (Bach *et al.*, 2019; Paton *et al.*, 2008; Bickerstaff *et al.*, 2008; Adger *et al.*, 2013; Aldunce *et al.*, 2022; Brouwer *et al.*, 2022).

Henderson, Steiner, Farmer, and Whittam (2020) explored the complexities of community engagement in rural areas, specifically focusing on the effects of flood protection and policy and found that limited access to reliable information is a significant challenge. Communities may lack up-to-date and accurate climate change and flood risk information due to limited resources, inadequate infrastructure or geographical isolation (Bach *et al.*, 2019). Overcoming this challenge requires improving information dissemination mechanisms, investing in data collection and sharing systems, establishing community-based monitoring networks and utilizing various communication channels (Grothmann and Patt, 2005, Shah *et al.*, 2023). As observed by Sunarharum, Sloan and Susilawati (2014), the key barriers to effective community engagement for flood risk management in Indonesia include lack of communication and coordination, inadequate, inaccessible or unreliable communication channels, lack of knowledge and awareness on flood risk management and power dynamics and imbalances in flood risk management.

Inadequate communication channels hinder community engagement. Inaccessible or unreliable communication channels limit the flow of information and community participation (Paton *et al.*, 2008). Diversifying communication channels, including local radio stations and mobile phone-based platforms and tailoring methods to community preferences are necessary (Wibeck, 2014; Thieken *et al.*, 2016). Language and cultural barriers impede engagement. Lack of information in local languages and cultural insensitivity hinder effective communication (Bickerstaff *et al.*, 2008). Translation, cultural adaptation, involving community members as translators or interpreters and cultural brokers can address these barriers (Morrow and Mock, 2014; Lemos and Morehouse, 2005).

Low levels of community awareness and understanding present challenges. Communities may lack knowledge and awareness to recognize climate change and

flood risks, hindering appropriate actions (Adger *et al.*, 2013). Targeted awareness campaigns, educational programs and community training initiatives are needed to enhance understanding (Cash *et al.*, 2003). Unequal distribution of resources poses challenges, particularly in marginalized communities. Limited access to resources hinders effective engagement (Aldunce *et al.*, 2022). Addressing social inequities and providing targeted assistance and capacity-building can promote more equitable engagement (Armitage *et al.*, 2009).

Power dynamics and social inequities further hinder engagement. Power imbalances and exclusion of marginalized groups limit their involvement (Brouwer *et al.*, 2022). Inclusive and participatory approaches, involving marginalized groups in decision-making processes, can address these challenges (Pelling *et al.*, 2017). To overcome these challenges, efforts should focus on addressing information gaps, building trust, promoting inclusivity and tailoring communication approaches to local contexts. Actively tackling these issues can improve community engagement and enable localities to adapt to flood hazards and climate change in a fair and inclusive way.

Effective community engagement is crucial for managing climate change and flood risk information (Adger *et al.*, 2009). However, several barriers can impede participation and involvement. Understanding these barriers is essential for developing strategies to promote meaningful engagement (IPCC, 2014). Some common barriers include limited access to information, communication gaps and language barriers, socioeconomic disparities and power dynamics, lack of awareness and understanding, time and resource constraints, cultural and social norms, lack of trust and mistrust and institutional and policy constraints (UNESCO, 2022).

Communities, especially those in low-income or marginalized areas, face challenges in accessing reliable climate change and flood risk information. Factors such as limited availability of information, lack of internet access or communication technologies, language barriers and low literacy levels hinder community members' ability to understand and engage with relevant information (IPCC, 2014; UNESCO, 2022). Communication gaps and language barriers can hinder information sharing and understanding. Technical jargon, complex scientific language and unfamiliar terminology make climate change and flood risk information inaccessible and difficult

to comprehend, particularly for community members with limited scientific or technical backgrounds (UNESCO, 2022).

Socioeconomic disparities and power dynamics within communities create barriers to engagement. Communities with limited resources, low socioeconomic status or historically marginalized groups may struggle to participate in decision-making processes or access resources for effective engagement. Power imbalances, unequal distribution of resources and limited representation of diverse community voices further hinder meaningful engagement (Adger *et al.*, 2009; IPCC, 2014).

Limited awareness and understanding of climate change and flood risks can be significant barriers to community engagement. Without a clear understanding of the causes, impacts and potential actions, community members may not perceive these issues as immediate or relevant to their lives. Lack of awareness undermines motivation and willingness to engage in related activities (Adger *et al.*, 2009; IPCC, 2014). Community members often face time and resource constraints that limit their ability to actively engage in flood risk management in the context of climate change. Work demands, family responsibilities and other daily obligations leave little time or energy for community engagement. Additionally, limited financial resources or competing priorities affect individuals and communities' capacity to participate effectively (UNESCO, 2022).

Cultural and social norms influence community engagement. Traditional beliefs, social hierarchies and gender roles shape community members' attitudes, behaviors and willingness to participate in decision-making processes. Overcoming these barriers may require challenging existing norms and fostering inclusive and participatory approaches (Adger *et al.*, 2009). Lack of trust between communities and external stakeholders, such as government agencies, scientists or non-governmental organizations, hampers community engagement. Historical experiences of marginalization, broken promises or lack of transparency erode trust and create scepticism among community members. Building trust through transparent and inclusive processes is crucial for overcoming this barrier (IPCC, 2014; UNESCO, 2022).

Institutional and policy constraints create barriers to community engagement. Bureaucratic processes, rigid decision-making structures and inadequate policies or legislation limit opportunities for meaningful participation. Lack of financial support, limited institutional capacity and fragmented governance arrangements hinder effective community engagement (Adger *et al.*, 2009; UNESCO, 2022). Barriers to community engagement in flood risk management in the context of climate change are interconnected and multifaceted. Overcoming these barriers requires collaborative efforts from governments, organizations and communities themselves. Strategies for promoting engagement should address issues of information accessibility, communication gaps, socioeconomic disparities, awareness-building, capacity-building, cultural sensitivity, trust building and policy reform. Through actively addressing these barriers (Adger *et al.*, 2009; IPCC, 2014; UNESCO, 2022), stakeholders can foster inclusive and meaningful community engagement, leading to more effective climate change and flood risk management at the community level.

2.7 Impacts of community engagement on flood risk management

Community engagement plays a vital role in flood risk management in the context of climate change, with significant and wide-ranging impacts (Burch *et al.*, 2014; Few *et al.*, 2017). When communities actively participate in these processes, it leads to numerous positive outcomes, enhancing the effectiveness of climate change and flood risk management strategies. One key impact of community engagement is the improvement of awareness and understanding among community members regarding climate change and flood risks (Cutter *et al.*, 2008). Through information sharing, dialogue and participatory processes, individuals gain knowledge about the causes, impacts and potential actions related to these issues (Arvai *et al.*, 2016). This increased awareness enables informed decision-making, appropriate actions and the prioritization of resources for adaptation and mitigation efforts. The study by Puzyreva *et al.* (2022) found that effective community engagement significantly resulted in effective flood risk management in the context of European countries.

Moreover, active community engagement promotes a better understanding of local climate change and flood risks, resulting in improved risk perception (Grothmann and Patt, 2005). Community members become more aware of the specific hazards they

face and the vulnerabilities of their community, as well as the potential impacts on their livelihoods and well-being (Bubeck *et al.*, 2013). This heightened risk perception encourages the implementation of proactive measures, such as the development of early warning systems, evacuation plans and resilient infrastructure. An essential aspect of community engagement is its facilitation of the integration of local knowledge into climate change and flood risk management processes (Cash *et al.*, 2003). Local communities possess valuable insights and traditional knowledge about their environment, weather patterns and historical experiences with floods and climate variability (Ford *et al.*, 2016). This knowledge is added to scientific data and understanding to improve the relevance and accuracy of risk assessments, adaption plans and decision-making procedures.

Engaged communities are more resilient and better equipped to adapt to climate change and flood risks (Adger *et al.*, 2005). Through community engagement, individuals and communities develop their adaptive capacity by identifying and implementing context-specific solutions (Pelling, 2011). This may involve the implementation of nature-based approaches, diversification of livelihoods, improvement of water management practices or strengthening of social networks and support systems (Barnett *et al.*, 2008). Community engagement empowers communities to take ownership of their resilience, fostering self-reliance and collective action. In addition, community engagement fosters inclusive and participatory decision-making processes related to climate change and flood risk management (Bickerstaff *et al.*, 2008). Incorporating a range of stakeholders, such as members of the community, local government officials and pertinent organisations, enhances the transparency, accountability and contextual appropriateness of choices. (Willness *et al.*, 2020). The consideration of community perspectives, needs and aspirations leads to the development of policies, strategies and action plans that better reflect the local context and priorities (Dilling and Lemos, 2011).

Furthermore, community engagement builds trust and social cohesion within communities (Kasperson *et al.*, 2003). When community members are actively involved in decision-making processes, their sense of ownership and empowerment increases (Pretty, 2003). Engaged communities develop stronger social networks, cooperation and mutual support, which are crucial for effective response and recovery

during and after climate-related events (Aldunce *et al.*, 2018). Trust building between communities and external stakeholders also enhances collaboration and partnerships for climate change and flood risk management (Pahl-Wostl, 2009). Lastly, community engagement promotes long-term sustainability in flood risk management in the context of climate change (Reed *et al.*, 2009). Engaged communities become more committed to sustainable practices, such as resource conservation, climate-friendly behavior and ecosystem protection (Berkes, 2009). Planning and implementing adaptation and mitigation strategies with communities fosters long-term ownership and accountability, which produces more significant and durable results (Reed *et al.*, 2010).

2.8 Strategies for enhancing community engagement in flood risk management in the context of climate change

Enhancing community engagement in flood risk management in the context of climate change is crucial for effective and inclusive decision-making and action (Burch *et al.*, 2014; Few *et al.*, 2017). To promote and strengthen community engagement, several strategies can be implemented. Firstly, it is essential to tailor communication and information to the needs and preferences of the community (Bickerstaff *et al.*, 2008). This can be achieved by developing accessible and clear communication materials using plain language, visual aids and local examples (Cinner *et al.*, 2011). Utilizing multiple communication channels such as community meetings, workshops, social media and local media outlets can help reach diverse audiences within the community (Serrao-Neumann *et al.*, 2018).

Building trust and relationships between communities, government agencies, non-governmental organizations and other stakeholders is another vital strategy (Kasperson *et al.*, 2003). Open and transparent communication, along with active listening and addressing community concerns, helps establish and nurture trust (Pahl-Wostl, 2009). Involving communities in decision-making processes from the early stages and maintaining regular communication and feedback loops fosters long-term relationships (Arnstein, 1969).

Ensuring inclusivity and equity is crucial in community engagement efforts (Dilling and Lemos, 2011). It is important to reach all segments of the community, including marginalized groups and vulnerable populations (Biesbroek *et al.*, 2018). This can be achieved by recognizing and addressing their specific needs, perspectives and experiences. Overcoming language barriers, cultural biases and power imbalances through translation services, culturally sensitive approaches and meaningful participation platforms is essential (Dutta *et al.*, 2019).

Investing in community capacity building is another effective strategy (Reed *et al.*, 2010). Providing training, workshops and educational programs enhances community members' understanding of climate change and flood risks (Burch *et al.*, 2014). Empowering communities with knowledge and skills to interpret scientific information and participate effectively in decision-making processes is crucial (Adger *et al.*, 2005). Developing local champions and leaders who can advocate for community interests and engage in ongoing dialogue with external stakeholders is also important (McNamara *et al.*, 2018). Recognizing and valuing local knowledge and expertise within communities is essential (Ford *et al.*, 2016). Incorporating traditional and indigenous knowledge systems alongside scientific information enhances the accuracy and relevance of climate change and flood risk assessments and management strategies (Cash *et al.*, 2003).

Supporting community-led initiatives and projects related to climate change and flood risk management is another effective strategy (Armitage *et al.*, 2011). Providing funding, technical assistance and resources enables communities to implement their own adaptation and mitigation measures (Berkes, 2009). Recognizing and amplifying successful community-driven initiatives as examples of best practices and learning opportunities for others is important (Pelling, 2011). Creating platforms for ongoing dialogue, collaboration and knowledge exchange is crucial (Burch *et al.*, 2014). Facilitating community-based organizations, climate change committees or working groups serves as forums for continuous engagement and decision-making (Arvai *et al.*, 2016). Valuing community members' voices and considering them in policy and planning processes fosters an environment of meaningful participation (Dilling and Lemos, 2011).

Leveraging technology can enhance community engagement (Serrao-Neumann *et al.*, 2018). Utilizing mobile phone applications, online platforms and social media, helps disseminate information, collect community feedback and facilitate dialogue (Burch *et al.*, 2014). Interactive mapping tools or citizen science platforms involve communities in data collection and monitoring efforts, fostering a sense of ownership and empowerment (Cinner *et al.*, 2011). Regular evaluation of community engagement processes is necessary to assess effectiveness and identify areas for improvement (Reed *et al.*, 2009). Seeking feedback from community members on their experiences and perceptions of engagement efforts helps adapt and refine strategies, ensuring continuous learning and improvement (Few *et al.*, 2017).

2.9 Theories underpinning the study

The main theories underpinning the research are the social capital theory and the participation theory.

2.9.1 Social Capital Theory

Social capital theory, first defined by Bourdieu (1985), is highly relevant to understanding the dynamics of community engagement in flood disaster risk management (Aldrich and Meyer, 2015). It emphasizes the importance of social networks, relationships and trust within communities. In the context of the study, social capital theory can help explain how community engagement and collaboration foster social cohesion, trust and collective action (Pretty and Ward, 2001). Researchers can evaluate the degree of community resilience and pinpoint tactics to improve community engagement for improved flood risk management by looking at the function of social capital (Aldrich, 2012).

Social capital theory provides insights into how strong social connections and networks enable communities to effectively respond to and recover from floods (Adger, 2003). Within the framework of social capital theory, the concept of social networks highlights the importance of community members' interactions, shared experiences and mutual support (Adger *et al.*, 2005). These networks serve as channels for information dissemination, resource mobilization and coordination during flood events. Strong social networks facilitate the flow of knowledge, resources and

assistance, enabling communities to make informed decisions and take collective action (Aldrich and Meyer, 2015).

Moreover, social capital theory emphasizes the role of relationships and trust in community engagement (Leach *et al.*, 2010). Trust is a crucial element that underpins effective collaboration and cooperation among community members, government agencies, NGOs and other stakeholders involved in flood risk management (Cutter *et al.*, 2008). Building and maintaining trust through open and transparent communication, active listening and addressing community concerns are essential for successful community engagement efforts (Barnett and O'Neill, 2010). Community involvement projects have the potential to enhance the community's fabric and improve its ability to adapt and cope with flood threats by promoting social cohesiveness and trust (Aldrich *et al.*, 2008). The collective action that arises from these initiatives can lead to the development of shared goals, increased social resilience and the mobilization of resources for effective flood risk management (Pelling, 2011).

Applying social capital theory in the study of community engagement in flood risk management allows researchers to assess the social dynamics that contribute to community resilience (Aldrich and Meyer, 2015). It provides a lens through which to understand how social connections, trust and collective action influence the ability of communities to prepare for, respond to and recover from flood events (Aldrich, 2012). Ultimately, the insights gained from examining social capital can inform strategies to enhance community engagement. Practitioners and policymakers can create interventions that support community resilience and efficient flood risk management by realizing the value of social networks, connections and trust-building (Aldrich *et al.*, 2008). This may involve investing in community capacity building, fostering inclusive decision-making processes and leveraging local knowledge and expertise.

2.9.2 Participation Theory

Participation theory, propounded by Ross *et al.* (2000), places emphasis on involving communities in decision-making processes that affect their lives. It recognizes that meaningful participation leads to more equitable and sustainable outcomes. In the

context of the study, participation theory can be used to explore how community engagement in flood disaster risk management enables community members in Chadereka to have a voice, contribute local knowledge and influence decisions related to climate change adaptation and flood risk reduction (Reed, 2008). Researchers can evaluate the degree of community empowerment, pinpoint participation barriers and create plans to improve community involvement and influence in decision-making processes by utilizing participation theory (Pretty, 1995). Meaningful participation goes beyond mere consultation and tokenistic involvement; it involves active engagement and collaboration with community members at all stages of decision-making (Cooke and Kothari, 2001).

Participation theory recognizes that community members possess valuable knowledge and insights derived from their lived experiences and local context (Chambers, 1997). In the context of flood risk management, community members in Chadereka may have specific knowledge about local flood patterns, vulnerable areas and traditional coping mechanisms. Through their participation in decision-making procedures, their knowledge can be incorporated into the creation of efficient and situation-specific tactics (Blaikie *et al.*, 2014). Moreover, participation theory highlights the importance of empowering communities and giving them agency in decision-making processes (Cornwall, 2008). It acknowledges that communities are not passive recipients of interventions but active participants who can contribute to shaping their own future. Participating in decision-making gives community members a sense of accountability, control and ownership that strengthens their commitment to putting flood risk management measures in place and keeping them up to date (Hickey and Mohan, 2004).

Applying participation theory allows researchers to assess the level of community empowerment and identify barriers that hinder meaningful participation (Pretty, 1995). These barriers can include power imbalances, lack of access to information and resources, language and cultural barriers and limited opportunities for marginalized groups to engage (Cooke and Kothari, 2001). Understanding these barriers helps in designing strategies to overcome them and ensure that all community members are included in decision-making processes (Reed *et al.*, 2009). Furthermore, participation theory recognizes the potential benefits of inclusive decision-making processes.

Results that are more equitable can be obtained by incorporating a diverse range of community members, especially vulnerable and marginalized populations, in flood risk management (Arnstein, 1969). Inclusive decision-making processes consider different perspectives, address social inequalities and promote social justice. This approach fosters a sense of ownership, trust and social cohesion within the community, leading to sustainable and resilient outcomes (Reed, 2008).

2.10 Gaps in Literature

From the review of empirical studies, the link between community engagement and flood risk management has been a subject of extensive research in both developed and developing countries. While there is a growing body of research on community engagement in flood risk management, there are still some gaps in the existing literature. For example, there is limited research on the role of community engagement in flood risk management in the context of climate change, particularly in the context of developing economies such as Zimbabwe. Most of the studies have been done in other countries from Europe and Asia, whilst very few have been done in the context of Zimbabwe. Additionally, there is limited research on role of community engagement in flood risk management in the context of climate change in the context of Chadereka area in Muzarabani. Furthermore, the findings from previous studies are mixed and inconclusive regarding the role of community engagement in flood risk management in the context of climate change. Hence, this study seeks to address the gaps in the literature by examining the role of community engagement in flood risk management in the context of climate change focusing on Chadereka area in Muzarabani district.

2.11 Chapter summary

The chapter focused on a comprehensive literature review on community engagement, disaster risk management and climate change. It highlighted the importance of community engagement in addressing shared issues and achieving common goals, emphasizing inclusive decision-making and collaboration. The chapter defined disaster risk management. It further explored the concept of climate change and community engagement. Empirical studies have reviewed leading to the research gaps

which the study aims to fill whilst the conceptual and theoretical frameworks were presented. The following chapter presents the methodology for the study.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter focuses on the methodology of the study. It covers the instruments, methods and approaches employed to gather and analyze the necessary data to accomplish the research objectives. This chapter covers a description of the study area, the target population and the sampling techniques used. Additionally, it addresses the research instruments, study design, research subjects, data collection processes, data presentation and analysis. Furthermore, the chapter concludes with a discussion on the measures taken to ensure the validity and reliability of the instruments, as well as the ethical considerations arising from the research. The effectiveness of an investigation's findings is substantiated by its methodology.

3.2 Description of study area

This study was carried out in Chadereka area in Ward 1 of Muzarabani district in Mashonaland Central Province situated about 250 km north of Harare, Zimbabwe's capital city. The map of the study area is shown in Figure 3.1. Chadereka Ward 1 (Figure 3.1) is situated in the northern lowveld of Zimbabwe which experience extreme climatic conditions (Manyani *et al.*, 2019). Manyani and Bob (2018) state that Chadereka area in Ward I falls within agroecological zone IV which is characterized by little annual rainfall averaging 550 mm and extremely high temperatures. Thus, this area is prone to prolonged and severe seasonal droughts and dry spells in summer (Manyani *et al.*, 2019).

According to ZIMSTATS (2022) census report, has a population of 1,864 households. These households mainly depend on smallholder rain-fed agriculture; they grow maize, small grains and otton. The crop productivity is very low due to recurrent droughts and poor soils (Mavhura *et al.*, 2022). Generally, Muzarabani district is prone to flood risks as it is located along the flood plains of the Zambezi River, the Lake

Kariba upstream and the Lake Cabora Bassa downstream at the confluence of Zambezi and Msengezi rivers about 400 mean seal level (Ncube-Phiri, Mudavanhu & Mucherera, 2014).

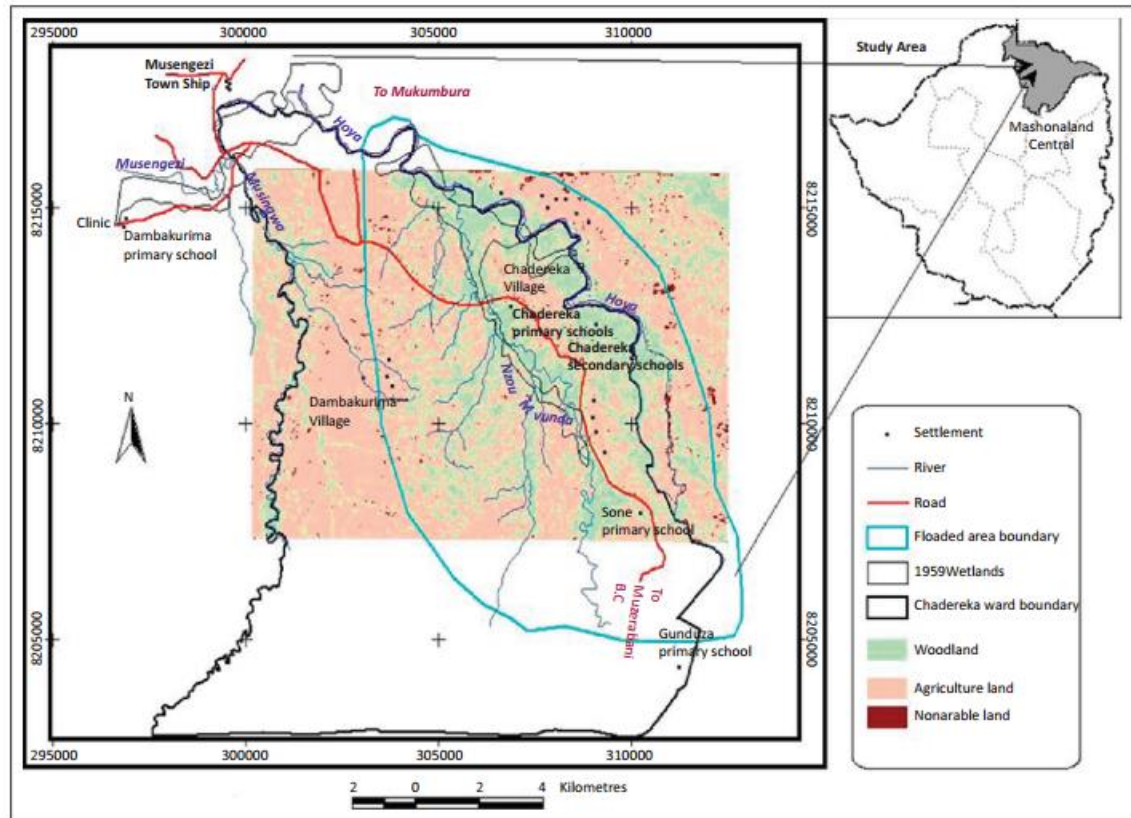


Figure 3.1: Map showing Chadereka in Ward 1 in Muzarabani Rural District, Mashonaland Central Province

Source: Ncube-Phiri *et al.* (2014)

3.3 Research design

The study employed the descriptive research design. This research design was found appropriate in this study as it permitted the researcher to determine characteristics and relationships between variables of interest in the study. This research design was applicable where the researcher sought to collect and analyze data from a diverse group of individuals in order to gain a better understanding of a particular phenomenon or issue.

The researcher adopted both the qualitative and quantitative research approaches in order to answer the research objectives that is the mixed-method approach. The mixed

research methodology enabled the research to apply both qualitative and quantitative methods of gathering data to adequately answer the research questions. Precisely, the concurrent mixed-method approach summarised in Figure 3.2 was followed in collecting, interpreting and analysing data.

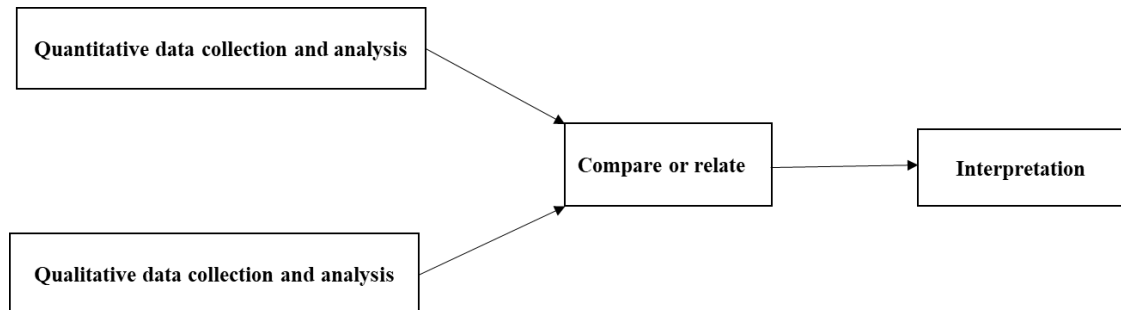


Figure 3.2: Concurrent mixed method adopted

Source: Creswell (2020)

3.4 Target population

In this study, the target population consisted of community members (1864), local leaders (14), representatives from NGOs (12) and government officials from Muzarabani Rural District Council in Chadereka (10), Ward 1, Muzarabani district. These were found to have first-hand experience or knowledge related to community engagement and flood risk management as they had experienced flooding events or participated in disaster risk management.

3.5 Description of study sample

The study sample consisted of a purposively selected subset of individuals from the target population (Saunders *et al.*, 2020). The sample included residents of diverse age groups, genders, occupations and socio-economic backgrounds, ensuring a comprehensive representation of the community. Additionally, community leaders, government officials and representatives from local organizations actively involved in climate change and flood risk management initiatives were included. The sample size was determined based on the Krejcie and Morgan (1970) table. Given the population size of 1900. The representative sample size for the study was 320. This sample size was therefore proportionally distributed as shown in Table 3.1.

Table 3.1: Sampling frame

Target Population	Population size	Sample size
Community members	1,864	313
Community Leaders	14	3
Government Officials	10	2
Local Organizations	12	2

As shown in Table 3.1, a total of 313 community household heads were targeted for survey questionnaires whilst seven key stakeholders were targeted for the key informant interviews.

3.6 Sampling techniques

In the case of this research, simple random and purposive sampling techniques were employed. According to Alvi (2015), simple random sampling is a sampling strategy where every member of the population had an equal chance of being included in the sample. Saunders *et al.* (2020) defined it as a strategy for selecting a subset of a statistical population, with each member having an equal chance of being chosen. In this research, simple random sampling was used to select household heads in Chaderaka Ward 1. The researcher chose to use simple random sampling due to its ability to select sample research participants without bias towards any specific group, ensuring fairness and equal opportunities for potential research participants.

The study also adopted purposive sampling method to select participants to the key informant interviews. In purposive sampling the researcher has enough knowledge about the topic hence is alert of the requisite participants in the research.

3.7 Data collection methods

Data collection is a fundamental aspect of research, which enabled the researcher to gather information necessary for their study (Creswell, 2020). This section explores the data collection methods employed in this study, including both primary and secondary data collection approaches.

In this study, the researcher employed survey questionnaires and key informant interviews as the primary data collection methods. Questionnaires allowed the research to gather information from a large number of participants in Chadereka, Muzarabani. The research designed semi-structured questionnaires consisting of closed-ended and open-ended questions to capture data on the participants' knowledge, perceptions, attitudes and behaviors regarding community engagement and flood risk management. The questionnaires were administered to community members through face-to-face interactions. By utilizing survey questionnaires, the research collected quantitative data systematically, enabling statistical analysis and quantifiable insights. The benefits of using survey questionnaires were manifold. Firstly, they allowed data collection from a large sample size, providing a broader representation of the community's perspectives, enhancing generalizability and increasing statistical power. Secondly, questionnaires facilitated standardized data collection, ensuring consistency in responses, which was advantageous for comparing and analyzing data across different variables or subgroups within the community.

Additionally, the inclusion of closed-ended and open-ended questions enabled comprehensive exploration of participants' views, with closed-ended questions providing easily tabulated and analysed quantitative data and open-ended questions encouraging detailed insights. Overall, the use of survey questionnaires as the primary data collection method provided a systematic approach to gather diverse data from community members, facilitating statistical analysis, ensuring response consistency and fostering a comprehensive understanding of participants' perspectives, knowledge, attitudes and behaviors concerning community engagement and flood risk management in Chadereka, Muzarabani. On the other hand, key informant key informant interviews were used to collect qualitative primary data from key personnel such as community leaders including village heads, councillors, representatives from the government, Muzarabani rural district council and representatives from NGOs operating in Chadereka area. The key informant interviews provided qualitative data that triangulated the survey data thereby enhancing validity of the findings. In addition, the key informant interviews allowed the researcher to probe further thereby in-depth data was gathered.

3.8 Data collection instruments

This study employed the questionnaires and key informant interview guide for collecting data. To address the research questions and gather primary data, this study will employ self-administered questionnaires. The questionnaire was divided into three sections. Section A consisted of demographic questions to ensure the respondent's characteristics align with the sample. The subsequent sections focused on the study's objectives. A five-point Likert-type scale was used; with "strongly disagree" assigned, a value of five (5) and "strongly agree" assigned a value of one (1). The Likert scale approach was used as it is an effective tool for measuring research participants' attitudes.

The decision to use self-administered questionnaires is based on several justifications. Firstly, it reduces the researcher's influence in the data collection process, allowing research participants to answer the questionnaire independently. Additionally, this approach offered flexibility to research participants, allowing them to complete the questionnaire at their convenience, which can lead to a higher response rate. Self-administration also saved time for the researcher, eliminating the need for appointments between the researcher and research participants, as research participants can complete the surveys on their own time. In addition, key informant guides (Appendix II) with open ended questions were developed to help in carrying out the key informant key informant interviews.

3.9 Data analysis

The data analysis process involved several steps. Firstly, the collected data was prepared by cleaning and organizing it, checking for missing values and outliers. Descriptive analysis was conducted to summarize the key characteristics of the data, providing an overview of the dataset. SPSS version 27 was employed. Data were analysed using descriptive and Chi-square analyses using the following Chi-square (χ^2) formula:

$$\chi^2 = \frac{\sum (O_i - E_i)^2}{E_i} \dots\dots\dots(1)$$

Where; O_i = observed frequencies and E_i = expected frequencies.

Hypothesis testing was carried out using appropriate statistical tests to examine relationships or differences between variables. Statistical analysis involved applying relevant techniques to analyze the data, including inferential statistics. The results were interpreted by examining statistical outputs and relating them to the research questions. Conclusions were drawn based on the results, providing insights into the role of community engagement in climate change and flood risk management. The findings were documented in a research report and disseminated to relevant stakeholders. Throughout the process, data integrity and ethical guidelines were ensured and appropriate statistical software (SPSS) was used for accurate and efficient analysis. Data from key informant interviews was analysed using content analysis.

3.10 Reliability and validity

The study ensured the validity and reliability of the research through various approaches. Validity, which referred to the accuracy of measuring what the study claimed to measure, was addressed. The validity criteria, rooted in the positivist tradition, were considered (Gill, 2018; Golafshani, 2013). Additionally, in qualitative research, precision, credibility, transferability, dependability, confirmability and rigor or trustworthiness were important aspects of validity (Ali & Yusof, 2011; Davies, 2021).

To enhance the validity of the study, pilot testing was conducted. The questionnaire and interview guide were pre-tested to 30 household heads, allowing for refinement and targeting of the questions. This process increased the trustworthiness of the instruments. This comprehensive approach ensured that the collected data attained an acceptable level of validity.

While there was no consensus on the ideal cutoff point for reliability tests, a widely accepted standard was a minimum value of 0.7 for good reliability (Field, 2019). Another commonly used guideline was the rule of thumb presented by George and Mallery (2003). These approaches were used to assess the reliability of the study measures. Table 3.2 guided the interpretation.

Table 3.2: Cronbach's alpha for reliability tests

Cronbach's alpha	Reliability strength
$\alpha < 0.5$	Unacceptable
$0.5 \leq \alpha < 0.6$	Poor
$0.6 \leq \alpha < 0.7$	Questionable
$0.7 \leq \alpha < 0.8$	Acceptable
$0.8 \leq \alpha < 0.9$	Good
$0.9 \leq \alpha \leq 1.0$	Excellent

3.11 Ethical considerations

The utilization of essential ethical principles in conducting study activities, including research design and implementation, respect for society and others, resource outputs and scientific misconduct, is referred to as research ethics. In this study, the principles of informed consent, confidentiality, anonymity and beneficence were observed.

3.11.1 Anonymity

Anonymity of data collected from study participants meant that the project did not gather identifiable information about research participants and individual responses could not be linked to participants' identities (Kara, 2018). To ensure anonymity, codes were used on the questionnaire instead of participants' names to identify research participants. Similarly, interviewees were identified by their interview numbers rather than their names.

3.11.2 Informed consent

Informed consent required the researcher to obtain acknowledgment from the research subjects before their participation in the study. In the case of secondary data, permission from the custodians of the data was required (Saunders, 2017). The participants were asked to sign informed consent sheets prior their participation.

3.11.3 Confidentiality

Confidentiality ensured that the information provided by study participants was kept safe from unauthorized exposure to avoid harm that could result from widespread

disclosure (Oliver, 2010). The researcher entered into a non-disclosure agreement with the participants to guarantee the confidentiality of the information. This agreement bound the researcher to protect the privacy of the participants' provided information. The researcher acted in accordance with the provisions of the non-disclosure agreement to ensure that this ethical standard was followed.

3.12 Chapter summary

This chapter provided a comprehensive explanation of the research methodology employed in the study. Key aspects of the procedure were meticulously described, including the study design, research approach, research population, sample and sampling methodologies, data collection methods, validity and reliability considerations and the data analysis plan. Furthermore, the chapter extensively discussed the procedures implemented to ensure adherence to the ethical principles that guide the researcher in conducting the study. The presentation and analysis of the study's findings is covered in the next chapter.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

The preceding chapter presented the research methodology followed to answer the research questions. This chapter therefore presents the results obtained from the key informant interviews, survey questionnaires and document analysis. Tables and charts are employed to present the quantitative data whilst qualitative data are presented using themes. The chapter presents the response rate analysis, reliability and validity analysis, demographic information of the research participants and lastly the descriptive analysis for the main findings.

4.2 Response rate analysis

Based on the sample size of the study, the researcher administered a total of 313 survey questionnaires and targeted to interview a total of seven key informants. The survey response rate for the study is summarised in Table 4.1.

Table 4.1: Survey response rate

	Frequency (n)	Percentage (%)
Questionnaires administered	313	100.0
Questionnaires not returned	26	8.4
Questionnaires returned	287	91.6
Returned but incomplete questionnaires	22	7.0
Returned and fully completed questionnaires	265	84.6

As shown in Table 4.1, the researcher distributed a total of 313 questionnaires to household heads in Chadereka Ward 1 in Muzarabani district. However, 26 questionnaires were not returned while 287 questionnaires were collected back by the researcher. Among the 287 questionnaires returned, 22 questionnaires were partially completed and were discarded in the analysis. Through the comprehensive data

cleaning process, a total of 265 survey questionnaires were completely filled resulting in a successful survey response rate of 84.6%. On the other hand, the researcher targeted to carry out seven key informant interviews. However, two of them did not make it to participate in the interviews due to their busy schedules resulting in the researcher successfully interviewing five key informants representing an interview response rate of 71.4%. These response rates were considered good for the analysis as Saunders *et al.* (2020) state that response rates of at least 70% are good for analyses and drawing conclusions from data.

4.3 Reliability statistics

The researcher successfully pilot-tested the survey questionnaire to thirty household heads in Chadereka Ward 1 who were not part of the final sample. The data from the pilot study was employed to carry out the Cronbach's Alpha test for reliability. The results are reported in Table 4.2.

Table 4.2: Reliability test results

Construct	N of Items	Cronbach's Alpha
Community engagement in flood risk management	8	0.849
Barriers to community engagement in flood risk management	6	0.868
Community engagement and flood risk management	9	0.930
Strategies for enhancing community engagement in flood risk management	5	0.926
Overall	29	0.970

The results in Table 4.2 reveal that the constructs of the questionnaire had Cronbach's statistics above 0.7 whilst the overall questionnaire with 29 items had the Cronbach's statistic of 0.926. Since the Cronbach's alpha statistics were at least 0.7, it is inferred

that the questionnaire was reliable. In overall, the questionnaire exhibited excellent reliability.

4.4 Demographic information of research participants

In total, the participants to the survey were 270. This study collected information of the research participants pertaining to gender, age, level of education, years of residing in Chadereka Ward 1 community. The findings obtained are presented in Table 4.3:

Table 4.3: Demographic profile of respondents

Variable		Frequency (n)	Percentage (%)
Gender	Male	148	54.8
	Female	122	45.2
Age	18-25 years	15	5.6
	26-34 years	25	9.3
	35-44 years	29	10.7
	45-54 years	115	42.6
	Above 55 years	87	31.9
Education	Primary education	24	8.9
	Secondary education	114	42.2
	Certificate	70	25.9
	Diploma	20	7.4
	Bachelor's degree	27	10.0
	Master's degree	15	5.6
Years of residence in Chadereka area	5 years and below	12	4.4
	6-10 years	10	3.7
	11-15 years	18	6.7
	16-20 years	87	32.2
	More than 20 years	143	53.0

The results presented show that 54.8% of the research participants were females representing the majority whilst 45.2% were males. From the findings presented, 42.6% of the research participants indicated that they were aged between 45 and 54 years whilst those aged 18 to 25 years constituted 5.6% of the sample. In addition,

42.2% of the research participants representing the majority indicated that they secondary education whilst 8.9% had only reached primary education. The results reported in Table 4.3 show that 53% of the participants had been residing or operating in the Chadereka community for more than 20 years whilst 32.2% indicated that they had been in the area for 16 to 20 years.

4.5 Existing level of community engagement in flood risk management in the context of climate change in Chadereka, Muzarabani

The majority of the research participants (41.9%) strongly agreed that communities in Chadereka Ward 1 were engaged in flood risk management whilst 28.7% disagreed that communities were being engaged in flood risks management. In addition, 15.8% agreed whilst 9.8% strongly disagreed and 3.8% were not sure (Figure 4.1).

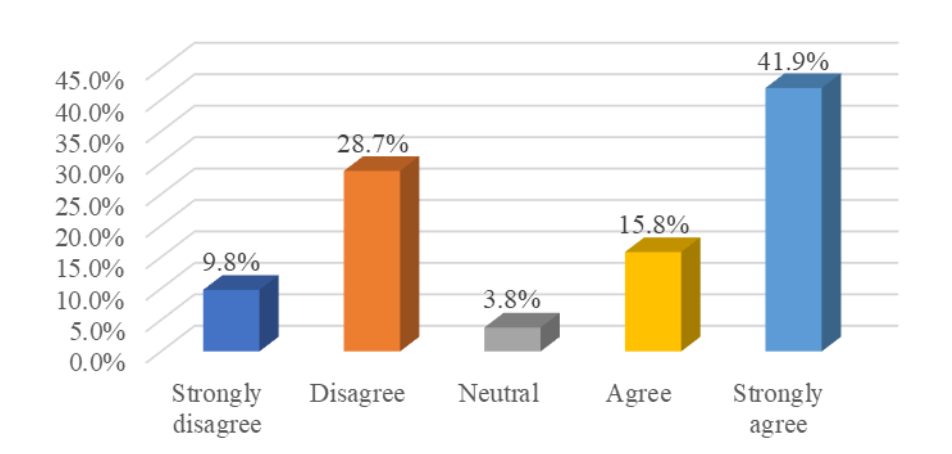


Figure 4.1: Existing level of community engagement in flood risk management

In overall, the results indicate some level of community engagement in flood risk management. Furthermore, Table 4.4 presents the findings pertaining to the level of community engagement in flood risk management.

Table 4.4: Existing level of community engagement in flood risk management

Level of community engagement in flood risk management	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Community members are provided the opportunity to participate in flood risk management decision-making	0.0%	0.0%	7.9%	15.1%	77.0%
Communities participate in flood risk management policy making	0.0%	5.7%	5.7%	39.6%	49.1%
Community members participate in community meetings or workshops related to flood risk management	1.1%	0.0%	7.9%	43.0%	47.9%
Flood risk management institutions and organisations seek and use the inputs of community members	0.0%	1.1%	6.8%	28.3%	63.8%
Communities are engaged at planning phase in flood risk management	0.0%	4.5%	9.1%	32.8%	53.6%
Communities are engaged at implementation phase in flood risk management	0.0%	0.0%	7.9%	39.6%	52.5%
Communities are actively engaged at monitoring and evaluation phase in flood risk management	0.0%	0.0%	15.5%	57.0%	27.5%

The results in Table 4.4 show that majority of the research participants agreed strongly that community members in Chadereka community were provided the opportunity to participate in flood risk management decision-making. In addition, a significant number of the participants were in agreement that communities participate in flood risk management policy making. As also shown, majority of the participants strongly agreed that community members in Chadereka community participate in community meetings or workshops related to flood risk management. Additionally, majority of the participants strongly agreed that flood risk management institutions and organisations in Chadereka community seek and use the inputs of community members.

As also reported in Table 4.4, more than half of the participants strongly agreed that communities in Chadereka area were engaged at planning phase in flood risk management whilst over 50% agreed that communities are engaged at implementation phase in flood risk management. Also, more than half of the participants agreed that communities in Chadereka community were actively engaged at monitoring and evaluation phase in flood risk management. In overall, the findings show high levels

of community engagement in flood risk management in Chadereka Ward 1 in Muzarabani district.

However, most of the participants to the key informant interviews reported that the level of community engagement in flood risk management was moderate. For instance, one of the village heads in Chadereka interviewed stated:

“The level of community engagement and participation in flood risk management in Muzarabani Chadereka is currently at a moderate level. Although local authorities and NGOs are working to engage communities in disaster preparedness and relief efforts, there is still room for improvement” [Participant 1; Community leader].

The other key informant, a government official from the district’s Civil Protection Unit remarked:

“While the level of community engagement in flood risk management in Chadereka community is still moderate, several efforts are being made by stakeholders such as the local authority towards enhanced community engagement [Participant 3; Government official].

Similar sentiments were also provided by representative from one of the NGOs that participate in flood risk management in Chadereka Ward 1. The key informant had this to say:

“Over the past years, we have witnessed a significant improvement in local communities developing interests to participate in disaster risk management. However, the level of community engagement in Chadereka is still average through its promising that in the near future it will be high” [Participant 5; NGO representative].

4.6 Barriers to community engagement in flood risk management in the context of climate change in Chadereka, Muzarabani

Majority of the research participants (50.9%) strongly agreed that inadequate, inaccessible or unreliable communication channels inhibited effective community

engagement in flood risk management. Additionally, 69.4% of the survey participants agreed that lack of knowledge and awareness on flood risk management among community members was among the barriers to community engagement in flood risk management (see Table 4.5)

Table 4.5: Barriers to community engagement in flood risk management

Barriers to community engagement in flood risk management	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Inadequate, inaccessible or unreliable communication channels	0.0%	0.0%	10.2%	38.9%	50.9%
Lack of knowledge and awareness on flood risk management among community members	0.0%	0.0%	0.0%	69.4%	30.6%
Power dynamics and imbalances impede effective engagement of marginalized groups in flood risk management.	0.0%	5.7%	1.1%	19.2%	74.0%
Different cultural beliefs, values, and practices influence active community engagement	0.0%	0.0%	16.2%	35.1%	48.7%
Misunderstandings and conflicts among community members influence community engagement in flood risk management	3.4%	1.1%	14.7%	47.5%	33.2%
Lack of communication and coordination between government institutions and communities	0.0%	0.0%	0.0%	46.2%	53.6%

As also reported in Table 4.5, almost three quarters of the research participants were in strong agreement that power dynamics and imbalances impede effective engagement of marginalized groups in flood risk management in Chadereka area of Ward 1 in Muzarabani district. In addition, significant proportions of the participants agreed that misunderstandings and conflicts among community members influence community engagement in flood risk management. Furthermore, majority of the participants to the survey strongly agreed that lack of communication and coordination between government institutions and communities influenced community engagement in flood risks management in Chadereka, Muzarabani district. Different cultural

beliefs, values, and practices were also highlighted by majority of the participants as one of the barriers to active community engagement.

Further, the study carried out the Pearson Chi-square to determine significance of the barriers to community engagement. The results are displayed in Table 4.6.

Table 4.6: Chi-square results

Factors that limit community engagement	Pearson Chi-square	P-value
Level of education	237.538	0.000
Age	179.746	0.000
Gender	34.180	0.002
Ineffective communication	140.209	0.000
Lack of knowledge and awareness	58.844	0.000
Power dynamics and imbalances	159.660	0.000
Different cultural beliefs, values, and practices	125.681	0.000
Misunderstandings and conflicts	261.792	0.000
Lack of communication and coordination	109.538	0.000

The Chi-square results reported in Table 4.6 have confirmed that the education, age, gender, ineffective communication, lack of knowledge, lack of knowledge, power dynamics, different cultural beliefs, conflicts and lack of coordination represent significant factors which limit effective community engagement in flood risk management. From the survey results, the main barriers to effective community engagement in flood risk management in Chadereka in Muzarabani district include inadequate, inaccessible or unreliable communication channels, lack of knowledge and awareness on flood risk management among community members, power dynamics and imbalances impede effective engagement of marginalized groups in flood risk management, different cultural beliefs, values, and practices influence active community engagement, misunderstandings and conflicts among community members influence community engagement in flood risk management and lack of communication and coordination between government institutions and communities. These survey results were complemented by the findings from the key informant

interviews and document review. For instance, one of the representatives from the Muzarabani Rural District Council's Civil Protection Unit stated:

“There are several barriers based on my observations and experiences in working with communities in disaster management. One of the main challenges facing community participation in flood risk management in Chadereka is the lack of awareness and education among residents about potential risks and how to mitigate them. Many people don't know what they can do to protect themselves and their property during a flood. These residents lack willingness and interests in participating in flood risk management planning and implementation initiatives”.

[Participant 3; Government official].

Another key informant highlighted that there are several barriers to effective community engagement in flood risk management in Chadereka area making the following arguments:

“Undoubtedly, meaningful community participation and engagement in flood risk management in Chadereka is hampered by several key barriers. One of the main obstacles is the lack of knowledge and understanding of the society about the importance of participating in disaster risk management programmes. Many residents may not fully understand the importance of their collaborative efforts and participation, leading to a lack of motivation to participate in community disaster risk management initiatives. In addition, cultural, religious and traditional beliefs and practices can also hinder community participation in flood risk management programmes.”

[Participant 1; Community leader].

In addition, a representative from one of the NGOs operating in Chadereka village claimed that there were several barriers to effective community engagement in flood risk management. The key informant averred:

“Despite that community engagement in flood risk management is essential for building resilience and reducing the impact of flood

disasters, there are several barriers that hinder effective participation and engagement of community members in this process. One major barrier is inadequate and ineffective communication channels. For instance, although, use of community radio stations has been increasing, this mode of communication does not reach all the grassroots population as not all residents have radios or time to listen to radio. This could have been hampering effective community engagement and participation in flood risk management programs. Additionally, a lack of knowledge and awareness on flood risk management among community members could also be preventing communities from actively engaging in disaster planning and preparedness efforts. Furthermore, different cultural and religious beliefs, values, and practices complicate community engagement by influencing how community members perceive and respond to flood risks". [Participant 4; NGO representative].

The abovementioned accounts of the key informant interviews support the quantitative findings from the survey regarding the barriers to effective community engagement in flood risk management in Chadereka. Supporting evidence was also obtained from the document review undertaken by the researcher. For instance, review of the research by Mudavanhu (2019) revealed that power dynamics and imbalances were the key barriers to effective community engagement in Chadereka Ward 1 as marginalized groups such as children lack equal access to disaster risk management planning, decision-making and implementation processes. In its 2022 report, the Zimbabwe Red Cross Society (ZRCS) reported lack of community participation in flood response operations in Chadereka village due to fear and beliefs among residents that the floods were as a result of the anger of the mermaids and ancestors. Such cultural and traditional beliefs hamper participation of local communities in flood risks management in the area as concluded in the ZRCS (2022) report.

The aforementioned quantitative and qualitative findings from the survey, key informant interviews and document review indicate that there are several barriers that prevent effective and meaningful community engagement in flood risk management in Chadereka Ward 1 in Muzarabani district. These results support earlier results of

previous studies. For instance, the results support earlier findings by Sunarharum *et al.* (2014) who found that the key barriers to effective community engagement for flood risk management in Indonesia include lack of communication and coordination, inadequate, inaccessible or unreliable communication channels, lack of knowledge and awareness on flood risk management and power dynamics and imbalances in flood risk management. Other previous studies also revealed that inadequate communication channels and cultural beliefs hinder community engagement in disaster risk management (Bickerstaff *et al.*, 2008; Paton *et al.*, 2008; Wibeck, 2014; Thieken *et al.*, 2016). Similarly, power dynamics and social inequities were also found to be among key factors that hinder community engagement by Brouwer *et al.* (2022) and Pelling *et al.* (2017). The findings also corroborate the findings by Adger *et al.* (2009) that power imbalances and limited representation of diverse community voices hinder meaningful community engagement.

4.7 Impacts of community engagement in flood risk management

Further, the research aimed to examine the impacts of community engagement in flood risk management in the context of climate change in Chadereka, Muzarabani. The results are presented in Figure 4.2.

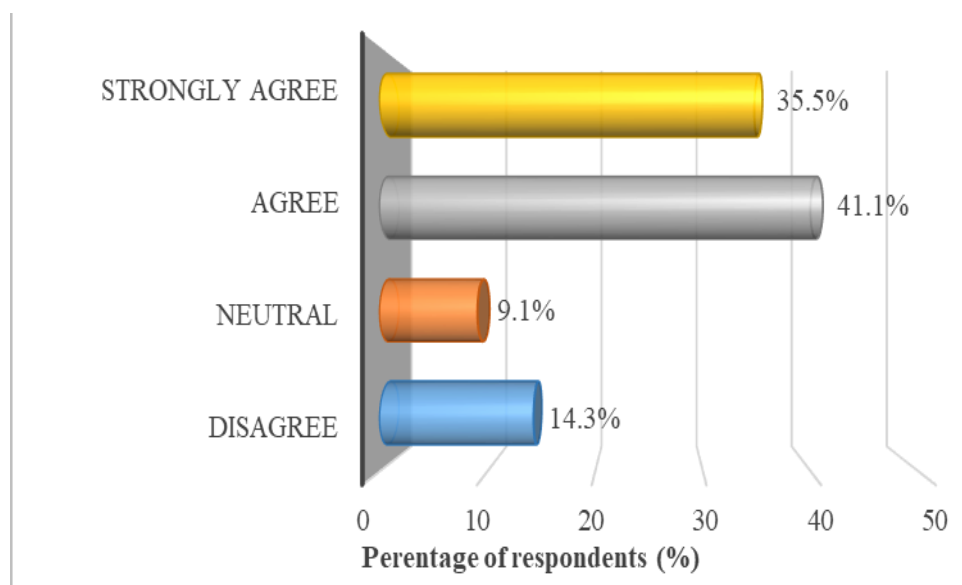


Figure 4.2: Impacts of community engagement in flood risk management

The results reported in Figure 4.2 show that the research participants agreed that community engagement promotes effective flood risk management in Chadereka. However, the minority remained neutral. In overall, these findings showed that community engagement is key in promoting effective flood risk management in the flood prone area of Chadereka. Furthermore, the survey participants were asked to indicate their levels of agreement to which community engagement promotes effective flood risk management in Chadereka Ward 1. The results obtained from the survey are presented in Table 4.7.

The results presented in Table 4.7 show that majority of the research participants agreed that active community engagement promotes better understanding of flood risks leading to effective flood risk management. More so, a significant proportion of the participants strongly agreed that community engagement facilitate transparency and democratic decision-making flood risks management. Significant proportions of the survey participants strongly agreed that community engagement promotes resilience leading to effective flood risk management. As also depicted in Table 4.7, majority of the survey participants strongly agreed that community engagement builds trust and social cohesion within communities leading to effective flood risk management.

Table 4.7: Impacts of community engagement in flood risk management

Impacts of community engagement in flood risk management	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Active community engagement promotes better understanding of flood risks leading to effective flood risk management	0.0%	0.0%	12.5%	52.1%	35.5%
Community engagement facilitate transparency and democratic decision-making flood risks management	0.0%	5.7%	4.5%	32.8%	57.0%
Community engagement promotes resilience leading to effective flood risk management	0.0%	4.5%	13.6%	38.5%	43.4%
Community engagement builds trust and social cohesion within communities leading to effective flood risk management	0.0%	0.0%	0.0%	47.5%	52.5%

Community engagement leads to effective flood risk management as local members possess specific knowledge on flood patterns and vulnerable areas	0.0%	1.1%	15.8%	43.0%	40.0%
Community engagement results in empowerment of local people leading to effective flood risk management	0.0%	0.0%	0.0%	44.2%	55.8%
Community engagement enhances adaptive capacities to flood risks	0.0%	0.0%	17.0%	49.8%	33.2%
Community engagement facilitates development and dissemination of flood risk information	1.1%	0.0%	14.7%	39.6%	44.5%

The survey participants also indicated that community engagement leads to effective flood risk management as local members possess specific knowledge on flood patterns and vulnerable areas. The results presented in Table 4.7 also show that majority of the research participants strongly agreed that community engagement results in empowerment of local people leading to effective flood risk management. In addition, the largest proportion of the survey participants agreed that community engagement enhances adaptive capacities to flood risks. More so, the survey participants strongly agreed that community engagement facilitates development and dissemination of flood risk information. In overall, the results in Table 4.6 have shown that community engagement promotes effective flood risk management in Chadereka area in Muzarabani district.

In overall, the results from the survey have shown that community engagement initiatives have significant impacts on flood risk management in Chadereka in Muzarabani district. In support of these findings, results from the key informant interviews also indicated that community engagement play a critical positive role in flood risk management in Chadereka. The following are some of the substantiating responses from the key informants:

“There is no doubt that community engagement plays a crucial role in promoting effective flood risk management in Chadereka. By involving the local community in decision-making processes and implementing strategies to mitigate flood risks, the chances of successful disaster response and recovery are significantly increased. To add on, when communities are actively engaged in flood risk management processes

and programs, they are more likely to understand potential hazards they face and take proactive measures to reduce their vulnerability to disasters such as floods. This can include initiatives such as evacuation plans, infrastructure improvements and early warning systems. Furthermore, community engagement fosters a sense of ownership and responsibility among residents in Chadereka, leading to greater cooperation and collaboration during times of flooding. By working together with local authorities and NGOs, communities develop sustainable solutions that address their specific needs and challenges in flood risk management” [Participant 1; Community leader].

“Community engagement and participation initiatives in flood risk management in Chadereka have shown promising results for effective flood mitigation and adaptation. One of the observed results is an increase in awareness and knowledge among community members about flood risks and how to reduce them. Through workshops, training and information sharing sessions, residents have learned about early warning systems, evacuation procedures, and ways to protect their homes and livelihoods during floods thereby making significant contribution in DRM initiatives” [Participant 2; Government official].

“Well, community engagement is essential for promoting effective flood risk management in Chadereka, an area prone to flood disaster risks. It empowers residents in the community to take control of their own safety and resilience, ultimately creating a more prepared and resilient society. In short, meaningful community engagement is key towards effective flood risk management in the area”. [Participant 4; NGO representative].

“Community engagement plays a crucial role in flood risk management in Chadereka, Muzarabani. By involving the local community in decision-making processes and implementing flood prevention measures, the impact of floods can be minimized. One way community

engagement influences flood risk management is through knowledge sharing and awareness campaigns. When residents are informed about potential risks and how to prepare for them, they are better equipped to respond effectively when floods occur. Furthermore, community engagement can lead to the development of innovative solutions tailored to the specific needs of the people in Chadereka”.

[Participant 5; NGO representative].

4.8 Strategies for enhancing community engagement in flood risk management in the context of climate change in Chadereka, Muzarabani

Lastly, the study aimed to develop strategies for enhancing community engagement in flood risk management in the context of climate change in Chadereka in Muzarabani district. The results obtained from the survey are presented in Table 4.8.

Table 4.8: Strategies for enhancing community engagement in flood risk management

Strategies for enhancing community engagement in flood risk management	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Increased government and institutional support	0.0%	6.8%	12.5%	29.4%	51.3%
Education and awareness campaigns in communities	0.0%	1.1%	4.5%	26.0%	68.3%
Establishing community-based monitoring networks	4.5%	1.1%	5.7%	29.4%	59.2%
Improved communication using various communication channels	0.0%	5.7%	11.3%	24.9%	58.1%
Use of digital communication tools such as social media	0.0%	6.8%	13.6%	40.8%	38.9%
Fostering collaboration between community members, local government agencies and other stakeholders	0.0%	0.0%	13.6%	56.6%	29.8%

The results presented in Table 4.8 show that majority of the research participants indicated that increased government and institutional support can enhance effective

community engagement in flood risk management. Additionally, majority of the research participants agreed that education and awareness campaigns in communities can enhance community engagement in flood risk management. The results in Table 4.8 also show that more than half of the research participants strongly agreed that establishing community-based monitoring networks can aid in enhancing community engagement in flood risk management.

Significant proportions of the participants agreed that use of digital communication tools such as social media can enhance community engagement in flood risk management in Chadereka. In addition, majority of the participants strongly agreed that improved communication using various communication channels can enhance effective community engagement in flood risk management. The results also indicate that more than 50% of the participants representing the majority agreed that community engagement in flood risk management in Chadereka may be enhanced through fostering collaboration between community members, local government agencies and other stakeholders

In overall, the survey findings showed that there are several strategies that can be employed to enhance community engagement in flood risk management in Chadereka. In addition, the findings from the key informant interviews also indicated several strategies as observed in the following verbatim responses of the key informants:

“In my own understanding, there is a need for more collaboration between government agencies, NGOs, civil society organisations and community members to develop comprehensive flood risk management plans that address the specific needs of the area. In addition, education awareness campaigns are critical towards educating the local communities on the importance of participating in flood risk management” **[Participant 1; Community leader]**

“To enhance community engagement in flood risk management, several effective strategies can be implemented. Firstly, raising awareness through community meetings and workshops can help educate residents about the risks of flooding and the importance of

preparedness. Providing information on EWS and evacuation procedures can empower residents to take proactive measures. Secondly, involving community members in decision-making processes can increase their sense of ownership and responsibility towards flood risk management. Consulting with local leaders and stakeholders when developing mitigation plans ensures that solutions are tailored to the specific needs of the community” [Participant 2; Government official].

“With the advancement of technology, various communication channels have emerged to facilitate effective community engagement. Social media platforms have become powerful tools for connecting people from different backgrounds and locations. Hence, by utilizing digital communication tools such as social media, NGOs and government agencies many reach a wider audience and engage with community members from Chadereka in real-time. These platforms allow for instant feedback, collaboration, and information sharing, making it easier to organize events, share important updates, and gather input from community members towards effective flood risk management. Ultimately, effective communication through digital tools enhances community engagement and creates a more connected society”. [Participant 4; NGO representative].

Based on the aforementioned findings on impacts of community engagement on flood risk management and guided by the participation theory, the following conceptual framework presented in Figure 4.3 was developed.

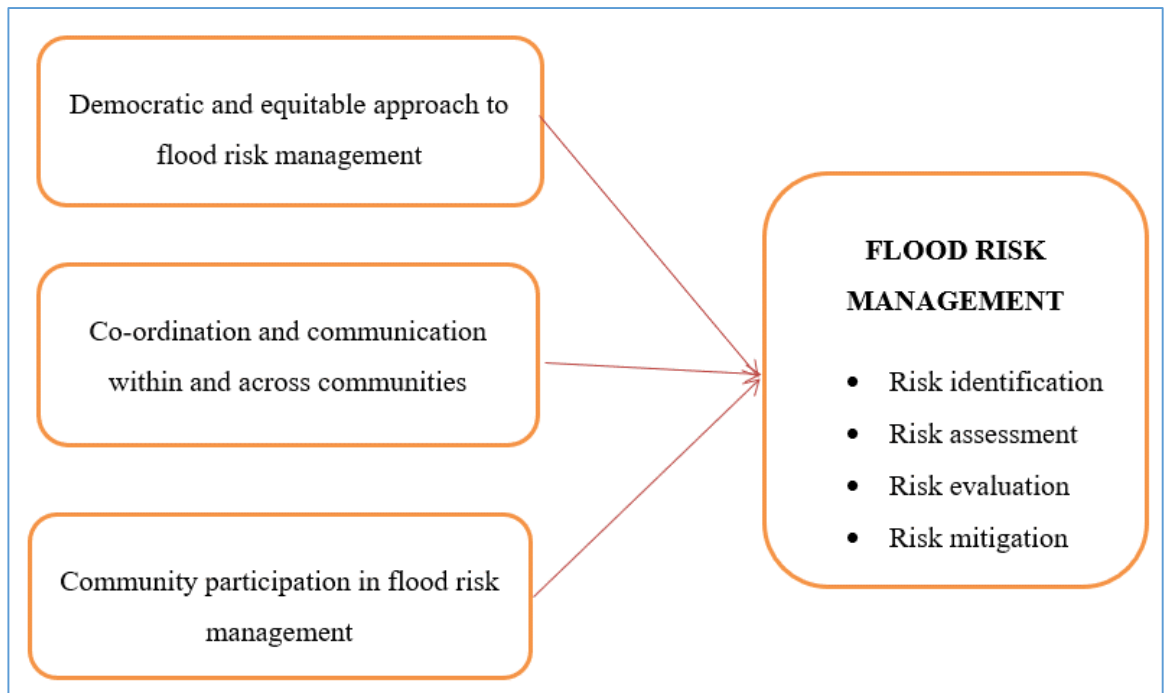


Figure 4.3: Conceptual framework for the study

Source: Researcher (2024)

4.9 Discussion of findings

The discussion of the findings is presented according to the research objectives as follows:

4.9.1 Existing level of community engagement in flood risk management in the context of climate change in Chadereka, Muzarabani

The study revealed moderate levels of community engagement in flood risk management in Chadereka. The findings support the results from existing literature. For instance, the study by Manyani *et al.* (2019) which studied the governance in climate change in Chadereka, revealed active participation by local communities and the civil society in climate change induced disaster risk management initiatives.

However, the research by Mudavanhu (2019) revealed passive participation, engagement and consultation of children in DRM in Chadereka community. In the study conducted by Manyani and Bob (2018) on stakeholder participation in climate change adaptation and mitigation in Chadereka Ward 1 of Muzarabani Rural District,

it was also revealed that level of involvement of key stakeholders particularly local communities was still low. Manyani and Bob (2018) concluded that there was lack of meaningful engagement of key stakeholders such as government agencies, NGOs and local communities in Chadereka Ward 1. Nevertheless, it can be settled that the level of community engagement in the area has been improving through comparing present primary findings and findings from secondary sources. The findings therefore disagree with findings from previous studies which documented low levels of community engagement in disaster risk management (Bach *et al.*, 2019; Adger *et al.*, 2013; Aldunce *et al.*, 2022; Brouwer *et al.*, 2022).

4.9.2 Barriers to community engagement in flood risk management in the context of climate change in Chadereka, Muzarabani

The study indicated that there are several barriers that prevent effective and meaningful community engagement in flood risk management in Chadereka Ward 1 in Muzarabani district. These results support earlier results of previous studies. For instance, the results support earlier findings by Sunarharum *et al.* (2014) who found that the key barriers to effective community engagement for flood risk management in Indonesia include lack of communication and coordination, inadequate, inaccessible or unreliable communication channels, lack of knowledge and awareness on flood risk management and power dynamics and imbalances in flood risk management.

Other previous studies also revealed that inadequate communication channels and cultural beliefs hinder community engagement in disaster risk management (Bickerstaff *et al.*, 2008; Paton *et al.*, 2008; Wibeck, 2014; Thieken *et al.*, 2016). Similarly, power dynamics and social inequities were also found to be among key factors that hinder community engagement by Brouwer *et al.* (2022) and Pelling *et al.* (2017). The findings also corroborate the findings by Adger *et al.* (2009) that power imbalances and limited representation of diverse community voices hinder meaningful community engagement.

4.9.3 Impacts of community engagement in flood risk management

From the findings, it is clear that community engagement significantly promotes effective flood risk management in Chadereka. From the findings effective and meaningful community engagement can result in effective flood risk management. The findings support the findings from previous research studies. For instance, Ryan *et al.* (2020) found that community engagement plays a crucial role in effective DRM by involving local communities as active participants in the identification, assessment and reduction of risks. Mitchell *et al.* (2009) also supports the positive impacts of community engagement in disaster risk management stating that effective disaster risk assessment requires active involvement of communities to identify and understand local hazards, vulnerabilities and capacities. The findings of the study are also in line with findings of previous studies which revealed that community engagement plays a vital role in flood risk management in the context of climate change, with significant and wide-ranging impacts (Burch *et al.*, 2014; Few *et al.*, 2017).

4.9.4 Strategies for enhancing community engagement in flood risk management in the context of climate change in Chadereka, Muzarabani

From the findings, it is evident that there are several strategies that can effectively enhance community engagement in flood risk management. These strategies include increased government and institutional support, education and awareness campaigns in communities, establishing community-based monitoring networks, improved communication using various communication channels, use of digital communication tools such as social media and fostering collaboration between community members, local government agencies and other stakeholders.

These strategies are supported in existing literature. For instance, Gupta *et al.* (2020) and Tirney *et al.* (2015) reported that there are several key enablers that facilitate effective community engagement which include capacity building and institutional support. Additionally, Birkmann *et al.* (2022) and Manyena *et al.* (2019) also indicated that establishing partnerships between communities, governments, NGOs and other stakeholders is essential for sustaining community engagement in DRM. Comparably, previous studies also showed partnerships between communities, governments, NGOs

and other stakeholders are crucial for sustained community engagement in DRM (Aldrich, 2019; Birkmann *et al.*, 2022).

4.10 Chapter Summary

The chapter has presented, analysed and discussed the results of the study. The data from the questionnaire, key informant interviews and document analysis were presented according to the research objectives and interpreted and discussed making use of literature presented and reviewed in Chapter two. The following chapter presents the summary of the findings, conclusions and recommendations for the study.

CHAPTER FIVE

SUMMARY, CONCLUSIONS & RECOMMENDATIONS

5.1 Introduction

This final chapter presents the summary of the entire research, summary of the key findings and conclusions drawn from the findings. The chapter also presents the recommendations for policy and practice as well as suggestions for areas for further study.

5.2 Summary

The main purpose of the study was to examine the role of community engagement in flood risk management in the context of climate change using the case study of Chadereka in Muzarabani district. To achieve the main purpose, the research sought to assess the existing level of community engagement in flood risk management in the context of climate change in Chadereka, Muzarabani, to establish the barriers to community engagement in flood risk management in the context of climate change in Chadereka, Muzarabani, to examine the impacts of community engagement in flood risk management in the context of climate change in Chadereka, Muzarabani and to develop strategies for enhancing community engagement in flood risk management in the context of climate change in Chadereka, Muzarabani.

To achieve these objectives, the study employed the mixed-method approach where the cross-sectional descriptive research design was employed. Primary data were collected using survey questionnaires and key informant interviews. The data collected were analysed using descriptive, Chi-square and content analyses. Through these analyses, answers to the research questions and propositions were established. The key findings for the study are summarised as follows:

5.2.1 Existing level of community engagement in flood risk management in the context of climate change in Chadereka, Muzarabani

The study assessed the existing level of community engagement in flood risk management in the context of climate change in Chadereka in Muzarabani. The results indicate some moderate level of community engagement in flood risk management. It was established that the current level of community engagement in flood risk management was moderate and promising. The results showed that community members were allowed to participate in flood risk management implementation, decision making and planning.

5.2.2 Barriers to community engagement in flood risk management in the context of climate change in Chadereka, Muzarabani

Furthermore, the study established the barriers to community engagement in flood risk management in the context of climate change in Chadereka in Muzarabani district. From the results, the main barriers to effective community engagement in flood risk management in Chadereka in Muzarabani district were found to include inadequate, inaccessible or unreliable communication channels, lack of knowledge and awareness on flood risk management among community members, power dynamics and imbalances impede effective engagement of marginalized groups in flood risk management, different cultural beliefs, values, and practices influence active community engagement, misunderstandings and conflicts among community members influence community engagement in flood risk management and lack of communication and coordination between government institutions and communities. Impacts of community engagement in flood risk management.

5.2.3 Impacts of community engagement in flood risk management

Further, the research examined the impacts of community engagement in flood risk management in the context of climate change in Chadereka, Muzarabani. The findings showed that community engagement is key in promoting effective flood risk management in the flood prone area of Chadereka. In overall, the results showed that community engagement promotes effective flood risk management in Chadereka area

in Muzarabani district. Furthermore, the results showed that community engagement has significant positive impacts on flood risk management.

5.2.4 Strategies for enhancing community engagement in flood risk management in the context of climate change in Chadereka, Muzarabani

Lastly, the study determined the strategies for enhancing community engagement in flood risk management in the context of climate change in Chadereka in Muzarabani district. The findings revealed several strategies that can effectively enhance community engagement in flood risk management. These strategies were found to include increased government and institutional support, education and awareness campaigns in communities, establishing community-based monitoring networks, improved communication using various communication channels, use of digital communication tools such as social media and fostering collaboration between community members, local government agencies and other stakeholders.

5.3 Conclusions

From the findings, several conclusions were drawn and the key conclusions are presented in this section. The overarching conclusion drawn from the findings is that community engagement plays a significant role in flood risk management in the context of climate change in Chadereka in Muzarabani district.

5.3.1 Existing level of community engagement in flood risk management in the context of climate change in Chadereka, Muzarabani

The researcher concludes that the existing level of community engagement in flood risk management in the context of climate change in Chadereka, Muzarabani is moderate though promising.

5.3.2 Barriers to community engagement in flood risk management in the context of climate change in Chadereka, Muzarabani

Furthermore, the researcher concludes that there are several barriers acting as inhibitors to effective community engagement in flood risk management in the context of climate change in Chadereka in Muzarabani.

5.3.3 Impacts of community engagement in flood risk management

Further, the other conclusion reached is that there are significant positive impacts of community engagement in flood risk management in the context of climate change in Chadereka in Muzarabani.

5.3.4 Strategies for enhancing community engagement in flood risk management in the context of climate change in Chadereka, Muzarabani

Additionally, the research concludes that there are several effective strategies that can be employed for enhancing community engagement in flood risk management in the context of climate change in Chadereka, Muzarabani.

5.4 Recommendations

Based on the findings and conclusions, the following recommendations were made:

- The study recommends relevant authorities such as NGOs and government agencies to continuously conduct community awareness and education programmes to raise awareness among the communities regarding the importance of community engagement in flood risk management.
- The study also recommends collaboration between community members, local government agencies and other stakeholders to ensure and promote effective community engagement.
- Additionally, the study recommends authorities such as the civil protection unit and NGOs to provide capacity building and training on emergency response procedures to equip community members with necessary skills and knowledge for them to effectively participate in flood risk management.

5.5 Areas for Further Research

The study focused on the role of community engagement in flood risk management in the context of climate change in Chadereka Ward 1 in Muzarabani. Hence, the findings may not be generalised to other areas in Muzarabani district and other districts prone

to flood disasters. Further studies may be conducted in other areas in the district. More so, similar researches may also be conducted on other climate change induced disasters in Chadereka area in Muzarabani district.

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APPENDICES

Appendix 1: Survey Questionnaire



Dear participant:

My name is **Rutendo Chadehumbe**, I am a final year student in Master of Science in Climate Change and Sustainable Development at in Geosciences Department, School of Geosciences, Sustainable Development and Disasters, Faculty of Science and Engineering at Bindura University of Science Education. I am carrying out a study on **‘The role of community engagement in flood risk management in the context of climate change a case of Chadereka in Muzarabani’**. I assure you that your responses shall be used only for the purpose of this academic research and your identity shall be kept a secret. The questionnaire is divided into sub-divisions with the first one aiming at acquiring knowledge of your demographic data while other sections relate to the research questions of the study. You are kindly requested to be as objective and realistic as possible and your commitment in the success of this study is greatly appreciated.

SECTION A: DEMOGRAPHICS

A1: Indicate your gender

Male	Female
<input type="checkbox"/>	<input type="checkbox"/>

A2: Indicate your age range

18 – 25 years	26 – 34 years	35 – 44 years	45 – 54 years	Above 55 years
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

A3: Indicate your highest educational qualifications

Primary	Secondary	Certificate	Diploma	Bachelors	Masters	Other
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

A4: Designation

Resident	Community leader	Government official	Local organisation	Other (specify) _____
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

A6: Indicate the number of years you have been residing in Chadereka, Muzarabani

5 years and below	6-10 years	11-15 years	16-20 years	More than 20 years
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SECTION B: EXISTING LEVELS OF COMMUNITY ENGAGEMENT IN FLOOD RISK MANAGEMENT IN CHADEREKA, MUZARABANI

B1: In your opinion and experiences, to what extent do you agree or disagree that communities are engaged in flood risk management in Chadereka, Muzarabani?

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B2: The statements provided in the following table relate to existing levels of community engagement in flood risk management in Chadereka. Kindly indicate your level of agreement to each statement using the provided five-point Likert Scale where:

1= Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree and 5 = Strongly agree

Code	Statements	1	2	3	4	5
B21	Community members are provided the opportunity to participate in flood risk management decision-making					
B22	Communities participate in flood risk management policy making					
B23	Community members participate in community meetings or workshops related to flood risk management					
B24	Flood risk management institutions and organisations seek and use the inputs of community members					
B25	Communities are engaged at planning phase in flood risk management					
B26	Communities are engaged at implementation phase in flood risk management					
B27	Communities are actively engaged at monitoring and evaluation phase in flood risk management					

5. What else can you add regarding the level of community engagement in flood risk management in Chadereka, Muzarabani

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SECTION C: BARRIERS TO COMMUNITY ENGAGEMENT IN FLOOD RISK MANAGEMENT

C1: The statements provided in the following table relate to the barriers to community engagement in flood risk management in Chadereka. Kindly indicate your level of agreement to each statement using the provided five-point Likert Scale where:

1= Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree and 5 = Strongly agree						
Code	Statements	1	2	3	4	5
C11	Inadequate, inaccessible or unreliable communication channels					
C12	Lack of knowledge and awareness on flood risk management among community members					
C13	Power dynamics and imbalances impede effective engagement of marginalized groups in flood risk management.					
C14	Different cultural beliefs, values, and practices influence active community engagement					
C15	Misunderstandings and conflicts among community members influence community engagement in flood risk management					
C16	Lack of communication and coordination between government institutions and communities					

C2: What are the other barriers to community engagement influences flood risk management in Chadereka, Muzarabani

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SECTION D: THE IMPACTS OF COMMUNITY ENGAGEMENT ON FLOOD RISK MANAGEMENT IN CHADEREKA, MUZARABANI

D1: In your opinion and experiences, to what extent do you agree or disagree that community engagement promotes effective flood risk management in Chadereka, Muzarabani?

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

D2: This section seeks to examine the impacts of community engagement on flood risk management. To this regard, the statements in the Table below contain information about the impacts of community engagement on flood risk management to which you are requested to show your opinion on a five-point Likert Scale where:

1= Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree and 5 = Strongly agree

Code	Statements	1	2	3	4	5
D21	Active community engagement promotes better understanding of flood risks leading to effective flood risk management					
D22	Community engagement facilitate transparency and democratic decision-making flood risks management					
D23	Community engagement promotes resilience leading to effective flood risk management					
D24	Community engagement builds trust and social cohesion within communities leading to effective flood risk management					
D25	Community engagement leads to effective flood risk management as local members possess specific knowledge on flood patterns and vulnerable areas					
D26	Community engagement results in empowerment of local people leading to effective flood risk management					
D27	Community engagement enhances adaptive capacities to flood risks					
D28	Community engagement facilitates development and dissemination of flood risk information					

D3: In what other ways does community engagement influences flood risk management in Chadereka, Muzarabani

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**SECTION E: STRATEGIES FOR ENHANCING COMMUNITY ENGAGEMENT
 IN FLOOD RISK MANAGEMENT**

E1: This section seeks to develop strategies for enhancing community engagement in climate change and flood risk information management. To this regard, the statements in the Table below contain some strategies for enhanced community engagement in flood risk management to which you are requested to show your opinion on a five-point Likert Scale where:

1= Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree and 5 = Strongly agree						
Code	Statements	1	2	3	4	5
E11	Increased government and institutional support					
E12	Education and awareness campaigns in communities					
E13	Establishing community-based monitoring networks					
E14	Improved communication using various communication channels					
E15	Use of digital communication tools such as social media					

E16	Fostering collaboration between community members, local government agencies and other stakeholders					
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E2: What other strategies may be put in place to ensure community engagement in flood risk management in Chadereka, Muzarabani

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Thank you for spending your time on the questionnaire to make this research a success!

Appendix 2: Key Informant Interview Guide



Dear participant:

My name is **Rutendo Chadehumbe**, I am a final year student in Master of Science in Climate Change and Sustainable Development at in Geosciences Department, School of Geosciences, Sustainable Development and Disasters, Faculty of Science and Engineering at Bindura University of Science Education. I am carrying out a study on **‘The role of community engagement in flood risk management in the context of climate change a case of Chadereka in Muzarabani’**. I assure you that your responses shall be used only for the purpose of this academic research and your identity shall be kept a secret.

You have been selected as one of the participants to the interviews to provide with information for the study. You are free not to answer questions that seem controversial and also you may quit the interview session at any point you wish. The interview session should take about 30 to 50 minutes. You are kindly requested to be as objective and realistic as possible and your commitment in the success of this study is greatly appreciated. Should you agree to participate on the basis of having read and understood the nature and conditions of this research study, please sign the designated section below.

Participant Declaration

I hereby confirm that I understand the contents and nature of the research and it is my consent to participate in the research study. I understand that I am at liberty to withdraw my participation at any time, should I so desire.

Signature:.....Date:.....

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Interview Questions

- 1) What is your gender?
- 2) What is your age or age range?
- 3) How far have you gone with your education?
- 4) For how many years have you been residing in Chadereka, Muzarabani?
- 5) For how long have you been participating in flood risk management in Chadereka, Muzarabani?
- 6) What is your understanding by the term 'community engagement'?
- 7) In your experiences and observations, to what extent is Chadereka community prone to flood risks?
- 8) In your view, what is the current level of community engagement in flood risk management in Chadereka, Muzarabani?
- 9) What are the main barriers that hinder community engagement in flood risk management in Chadereka, Muzarabani?
- 10) In your opinion, what are the observed outcomes of community engagement initiatives in flood risk management in Chadereka, Muzarabani?
- 11) Are there any strategies or measures that have been put in place to enhance community engagement in flood risk management in Chadereka, Muzarabani?
- 12) If so, how effective have been the strategies in enhancing community engagement in flood risk management in Chadereka, Muzarabani?
- 13) In your opinion, what else can be done to enhance community engagement in flood risk management in Chadereka, Muzarabani?