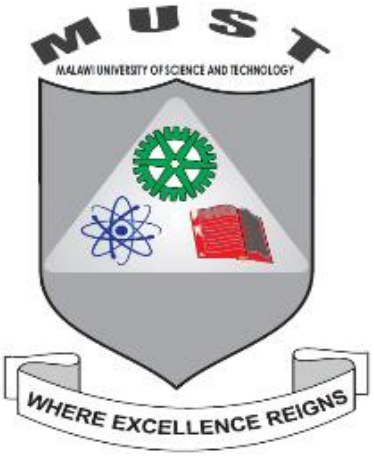


ASSESSING SOCIO-ECONOMIC VULNERABILITY TO FLOODS IN CHIKWAWA DISTRICT

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Dissertation submitted to Ndata School of Climate and Earth Sciences of the Malawi University of Science and Technology in partial fulfilment of the requirements for the Bachelor of Science degree in Disaster Risk Management.

October, 2022

DISSERTATION APPROVED BY:

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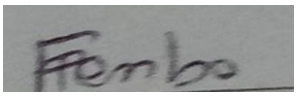


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ABSTRACT

Disasters cause significant impacts on the household poverty and national economic growth trends through economic losses and shocks to livelihood systems. The water-related extremes such as floods, account for the greatest share of global natural disasters inflicting economic damage and death toll. The study assessed the socio-economic vulnerability to floods in Chikwawa district. The study sought to find out the impacts that floods have on education and trade, to identify factors that determine the flood vulnerability in the area and to identify the coping strategies that people employ during floods. The study was carried out in Bereu village of T/A Maseya because it is one of the most affected areas by floods in Chikwawa. This was achieved by using questionnaires and observations for data collection. The data was analysed using Microsoft Excel, Statistical Package for Social Sciences and content analysis was also done do develop themes from the data. The results have been presented in bar graphs, pie charts and tables. The socio-economic spectrum is highly affected by floods in the district. While geographical vulnerability is generally the same for all the people in the area, socio-economic vulnerability tends to vary for a group of individuals within the same locality. This is because different socio-economic groups have different coping capacities and different kinds of exposure to the hazard. Those with some coping capacities quickly recover from the hazard while some wait for relief from government and non-governmental organizations. To reduce vulnerability to floods in this area, there is need to implement community-initiated mitigation measures and clearly assess the implication of these developments so that they do not increase the flood risk of the communities. There is also need for capacity building and community empowerment by either giving them mitigation or reconstruction loans so that they can construct strong houses using durable materials that can withstand future floods and for people to diversify their livelihoods.

ACKNOWLEDGEMENTS

I would like to thank God Almighty for giving me time, strength and courage to do this wonderful work. I give thanks to my loving parents for their invaluable love, support, encouragement and working prayers. Also, special thanks to my brothers and sisters Symon, Lucky, Edna and Mary for their endless support both morally and financially. Your words of encouragement kept me going until I have finished this dissertation. I also wish to express my great appreciation and special gratitude to my supervisor, Mrs T. Nthara for the support and encouragement throughout the duration of this research project. Furthermore, many thanks to all that contributed to the success of this work and all my friends who were always there to encourage, support and motivate me to keep working hard, I really appreciate your support.

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ACRONYMS/ABBREVIATIONS

DoDMA	Department of Disaster Management Affairs
DRR	Disaster Risk Reduction
GoM	Government of Malawi
MDGS	Malawi Development and Growth Strategy
MDGs	Millennium Development Goals
NGOs	Non-Governmental Organizations
NSO	National Statistics Office
SDGs	Sustainable Development Goals
T/A	Traditional Authority
UN-ISDR	United Nations International Strategy for Disaster Risk
UNODRR	United Nations Organization for Disaster Risk Reduction

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1. INTRODUCTION

1.1. Background

Disasters play a significant role in defining household poverty and national economic growth trends through economic losses and shocks to livelihood systems. For instance, from 1979 to 2010, disasters cumulatively affected nearly 21.7 million people and killed about 2, 596 people (GoM, 2015). Disasters also undermine Government efforts towards the achievement of the Millennium Development Goals (MDGs) through the Malawi Growth and Development Strategy (MDGS) (DODMA, 2019). These disasters include floods, droughts, landslides, earthquakes and many others. The water-related extremes such as floods, account for the greatest share of global natural disasters inflicting economic damage and death toll. In the present century, floods are caused by factors like changes of the hydrologic cycle due to climate change, land use changes and increased density of habitation activities in flood-prone areas (Deepak, Rajan, & Jairaj, 2020).

Just like many other countries in the Sub-Saharan region of Africa, there are several disasters that occur in Malawi. However, there are some that are most prominent than others based on the frequency of occurrence and the magnitude of destruction caused. Among the many disasters that occur in the Sub-Saharan region, floods are the most prominent disaster in Malawi. Malawi has for the decades been experiencing this disaster such that some research studies have concluded that Malawi is the most flood-hit country in the Sub-Saharan region (Mzuzu, Zhang, Kapute, & wei, 2019).

In Malawi, floods have had varied impacts on lives of people. For example, according to the 2019 Post Disaster Needs Assessment report, the 2019 floods affected about 975,000 people, with 288,371 houses partially or completely destroyed. Most affected people were accommodated in classrooms and school facilities, with limited access to safe water and sanitation facilities (DODMA, 2019). The situation increased chances of the people suffering from Tuberculosis, malaria and HIV since many people were crammed in one place. At the same time, learning and teaching activities at the school were disrupted which reversed the gains of SDGs

and agenda 2030. However, Deepak, *et al.* (2020) categorized the impacts as either being related to the socio-economic spectrum or the physical environment. The fact that it is unarguably agreed that floods have negative impacts on the economy and the physical environment, it is therefore obvious that there has to be a threshold of vulnerability of these two aspects to the floods (Bigi, Comino, Fontana, Pezzoli, & Rosso, 2021).

Socioeconomic vulnerability is the endogenous inability of the unit to face shocks. This endogenous inability is a function of risk exposure and other socio-economic factors (Triulzi, Tommasoli, & Montalbano, 2003). This study will define it as the capability of individuals and social systems to cope with flood hazards. Exposure and coping mechanisms of the residents in the area will form the scope of the study. Assessing socioeconomic vulnerability will contribute to the enhancement of risk reduction strategies, the reduction of susceptibility and also the development of social and climate change adaptation for exposed socioeconomic groups.

1.2 Problem statement

Chikwawa experiences floods with great damage almost each and every year and T/A Maseya is one of the most affected areas. The socio-economic spectrum is one of the areas that gets affected by floods every time they occur (Rana & Routray, 2017). Mtembenuzeni and Kushe (2018) found out that people's vulnerability in Chikwawa is based on the social economy. The publication also articulates that what was thought as vulnerability and the actual vulnerability in Chikwawa is practically different. This leads to implementation of wrong mitigation measures in these areas hence increasing the impacts of floods on the victims. A gap therefore exists to assess the socioeconomic vulnerability to floods in T/A Maseya in Chikwawa in order to find the right remedies that can be employed in the area to reduce flood impacts. This study therefore aimed to assess socio-economic vulnerability to floods in Chikwawa district.

1.3 OBJECTIVES

1.3.1 Main Objective

The main objective of the study was to assess the socio-economic vulnerability to floods in Chikwawa district.

1.3.2 Specific Objectives

a. Find out how floods affect education and trade in the district.
b. Identify factors that determine the flood vulnerability in the area.
c. Identify the coping strategies that people employ during floods in the area.

1.3.3 Research questions

a. In what ways do floods affect education and trade in the district?
b. What factors determine the flood vulnerability in the area?
c. What coping strategies do people employ during floods in the area?

1.4 Significance of the study

The study will help in identifying relative vulnerabilities of specific people and places. This will help development partners in implementing development projects in the district since the study will point out important areas which are very vulnerable to impact and needs immediate attention. It will also help them in allocation of the scarce resources to areas which are really in need of them depending on the level of vulnerability than a generalized approach.

This research study will also help future researchers interested in assessing socio-economic vulnerability to flooding to have a well-founded starting point. As it may be appreciated from the literature review section, there is few published information that quantitatively describes socio-economic vulnerability to disasters in the Lower Shire region of Malawi.

2. LITERATURE REVIEW

2.1 Floods and vulnerability

Doswell defines floods as an overflow of water that submerges land that is usually dry (Doswell, 2003). Floods usually happen when the volume of water within a water body, say a river or lake, exceeds its total carrying capacity and as a result, some of the water flow outside the normal perimeter of the water body. Floods become disasters when they cause damage or adverse effects to human lives, livelihoods and properties (Glago, 2021). Numerous factors affect streamflow, and therefore the potential for flooding. Most important are the amount and type of precipitation, the nature and condition of the drainage basin, and climate. Climatic conditions include severe thunderstorms, tornadoes, tropical and extratropical cyclones (many of which can be exacerbated by El-Nino phenomena). Although flooding occurs most commonly from heavy rainfall, when natural watercourses do not have the capacity to convey excess water, floods are not always caused by heavy rainfall. Factors which influence whether a flood will occur include volume, spatial distribution, intensity and duration of rainfall over a catchment, the capacity of the water course or stream network to convey runoff; catchment and weather conditions prior to a rainfall event, ground cover; topography and tidal influences (Vilanculos, 2006).

Vulnerability is defined as the conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards (UN-ISDR, 2009). Vulnerability is generated from the impacts of natural events or adaptive capacity which is a crucial indicator for vulnerability (Adger, 2006). This adaptive capacity consists of different types of measures, including prevention, mitigation, preparation, response and recovery measures. These adaptive measures influence the exposure and damage level (Brouwer, Akter, Brander, & Haque, 2007). Vulnerability affects community participation in hazard mitigation, influences emergency response and governs adaptive capacity for the changing environmental and hazards

characteristics. Assessing vulnerability is noted to be an essential step for mitigating hazards and climate change adaptation (Birkman, 2006).

2.2 Socio economic vulnerability

Socio economic vulnerability is the endogenous inability of the unit to face shocks (Triulzi et al., 2003). It is determined by the internal structure of any social system that decides how vulnerable societies and communities are to the occurrence of hazards (Raju, Deshpande, & Satyasiba, 2016). Deepak *et al.* (2020) stipulated that geographical dimension and socio-economic aspects of a society are the two contextual factors that inform risk assessments. For successful and effective performance of vulnerability assessments, it is good if such assessments are categorized into socio-economic vulnerability assessment and physical environment vulnerability assessment. This research study, therefore, agrees with this proposition and in order to come up with concise and well analysed flood vulnerability assessment of Chikwawa district, the study confined the socio-economic vulnerability assessment to the capability of individuals and social systems to cope with flood hazards.

Assessing a region's vulnerability to a hazard only on the basis of its social and economic situation is another aspect of socioeconomic vulnerability assessment. It is believed that a region's socioeconomic condition determines how vulnerable it is to disasters as well as how well and quickly its coping mechanisms work (Malakar & Mishra, 2016). According to the research conducted, there has been a clear increase trend in the economic impact of natural catastrophes over the past few decades. Communities in developing nations, particularly those in the least developed nations, are frequently affected by hazards, increasing their susceptibility and delaying their economic and social development by decades sometimes (Know, 2005). Basing on this, the study intends to come up with practical data on the susceptibility of such socio-economic aspects like education and trade to the harmful effects of floods.

Floods affect different individuals and families due to varying levels of vulnerability (Mtembenuzeni & Kushe, 2018). Cardona (2003) also noted that individuals and communities are differently exposed and are vulnerable to floods because of the socio-economic factors such as wealth, education, race, ethnicity, religion, gender,

age, class, disability and health status. In addition, communities and societies have specific ways of responding to floods, which has resulted in various ways of coping with the flood phenomena. The study of variations in vulnerability is vital to understanding who is vulnerable to what and how differences in vulnerability influence the local response (Brooks, 2003). For instance, a study conducted in Gambela region, Ethiopia showed that single headed families were the most vulnerable to the socio-economic impacts of floods (Haile, Kusters, & Wagesho, 2013). A study in Chadereka Ward in Zimbabwe found out that those who were residing in flood plains were the most vulnerable to the socio-economic impacts of floods (Ruswa, 2017). Furthermore, a study conducted in Nigeria showed that the poor and rural dwellers were the most vulnerable to the impacts of floods while the rich were not vulnerable (Olayinka, 2021).

2.3 Socio economic impacts of floods

Floods impact negatively on infrastructure and have a negative influence on the social, economic, cultural, and psychological values of local communities (Mijoni & Izadkhah, 2009). Those in most disaster-prone developing countries rely substantially on natural resources for their livelihoods, and households that rely entirely on natural resources for their livelihood are more vulnerable to disasters and financial losses caused by floods (De Silver & Kawasaki, 2018). According to a 2019 Post Disaster Needs Assessment analysis, the disaster's devastating torrential rains and floods caused significant damage to infrastructure and physical assets, as well as changes in economic output flows, resulting in losses in both the public and private sectors. Trade, for example, was impacted by 0.90 percent and education by 9.6 percent (DoDMA, 2019)

Although a lot has been published on vulnerability of various items to negative effects of disasters, there has however been deficiency of more detailed research of socio-economic vulnerability to floods in Malawi and some parts of the world. This idea has been amplified by (UNODRR, 2015). The publication indicates that assessment of vulnerability to future and present disasters like floods is still a challenge. This difficulty has been attributed to the fact that contextual characteristics and climate changes influence flood risk with uncertain and unclear impacts. Contextual

characteristics here mentioned includes such factors as geographical dimensions and socio-economic aspects of a society.

2.4 Coping strategies employed during floods

Coping strategies refer to the manner in which people and organizations use existing resources to achieve various beneficial ends during unusual, abnormal and adverse conditions of a disaster phenomenon or process (Gaillard, 2010). According to Huraera et al., (2010), In the case of disasters, there are four different types of coping strategies. One of them is a material or economic coping mechanism that involves diversified sources of income. A family with many income earners can diversify their sources of income or add to the labour force in the home. In some cases, this is keeping kids home from school in order to make money. The second type of coping mechanism is technological, and it entails alterations to the natural and constructed environments. This may involve making changes to the interior of the home or to the structure of the home, such as putting homes on stilts to allow floodwater to pass underneath or on platforms made of mud or concrete to keep them above flood levels. This can also be improvements outside the house or at the neighbourhood scale, such as retaining walls, drainage facilities or sandbags.

In addition, social/organizational is another type of coping mechanism which is associated with the development of social networks. This is the ability to call on the resources of others during difficult times. Networks can be within the household, between extended family members (living nearby or at distance), within neighbourhoods and with larger organizations with a common identity (religious, geographical, commercial, e.t.c). Assistance can take many different forms, either financial help, emotional support, emergency shelter and physical help of any kind.

The last type of coping mechanism is cultural coping strategies which include risk perception and religious views. This classification was also similar to that made by (Douglas, et al., 2008). Abbott (2008) categorized human responses to flood hazards into structural and non-structural measures. Structural measures include building levees along rivers to contain flood water inside taller and larger channels, engineering projects seeking to increase the water carrying capacity of a river channel

via straightening, widening, deepening and removing debris and short-term actions such as sand bagging. Non-structural measures consist of flood forecasting via use of satellites and high-tech equipment, zoning and land use policies, insurance programs, evacuation planning and education.

People's coping strategies can be applied in the mitigation, response, and recovery stages of hazard management. Preventative and impact-minimizing procedures are distinguished based on phases of hazard management (Wisner et al., 2003). Preventative strategies at the individual and community level implies people making choices so that they will not be affected by an event such as avoiding dangerous places at certain times or choosing safe residential locations. By contrast, impact minimizing strategies are those strategies adopted to minimize loss and to facilitate recovery in the event of a loss.

2. METHODOLOGY

3.1 Study design

This research used a Descriptive Survey Research Design (DSRD) to allow for both quantitative and qualitative data analyses. (Mann, 2010) highlights that this research design is suitable for the two data analysis methodologies.

3.2 Study area

The study was conducted in the lower Shire district of Chikwawa. Most of the areas in the district are at the attitude of below 1000 meters above sea level. The district has a total population of 564, 684 and a population density of 116 people with a total area of 4878 km^2. Of the total population, 276, 890 are males, 287, 794 are females and 289, 745 are children of age range 0 to 17 of which 11.87% are orphaned. Traditional authority Maseya has a total population of 37,793. (NSO, 2018).

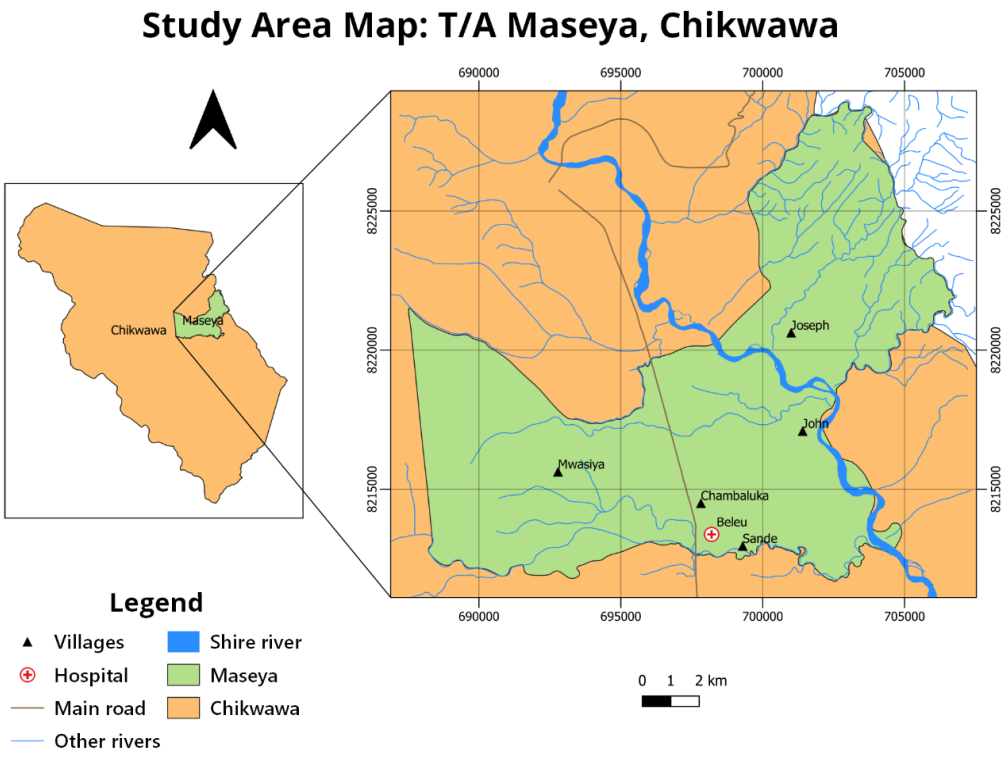


Figure 2.1: Map of study area, T/A Maseya in Chikwawa district

3.3 Site selection

The research study was conducted in Traditional Authority Maseya in Chikwawa district. The area was especially chosen because it is one of the most flood prone areas in the district and floods do occur almost each and every year and cause great damage. Hence, carrying out this study in the area will help in management of the flood-risk in the area. Specifically, the study was conducted in Bereu village of T/A Maseya.

3.4. Sampling and sample size

A sample size of 90 was enrolled in the study. Purposive sampling technique was used to get information from only those residents in the area who have ever been affected by floods.

3.5 Target population

The study targeted the heads of the families who have ever been affected by floods including both men and women. This has been deliberately so as to reflect the general representation of both males and females at district level since they are all affected in one way or another.

3.6 Data collection

Questionnaires and observations were employed to collect data in this study. The questionnaire was made up of both close and open questions on the objectives of this research to assess the socio-economic vulnerability. The questions were translated into a local language (Chichewa) for easy understanding by the respondents.

3.7 Data analysis

Content analysis was used to analyse the words and phrases (qualitative data) that were used in the respondents' responses to generate main themes and sub themes to determine the meaning behind the responses. The quantitative data from questionnaires was loaded in excel spreadsheet and analysed where graphs and pie charts were produced. Correlations were also made in Statistical Package for Social Sciences (SPSS).

3.8 Ethical considerations

The study was approved and granted by the Malawi University of Science and Technology Research Ethics Committee. Consent was sought from the Chikwawa

District Council, Group Village Head and participants were well informed and consented to participate prior to data collection. Participation in the study was voluntary and a code number was used instead of a participant's name for confidentiality.

3. RESULTS AND DISCUSSION

3.1. Introduction

This chapter presented the analysis of the data and interpretation of the findings. Charts, graphs and tables were used to present the data. The main objective of the study was to assess the socio-economic vulnerability to floods in Chikwawa district. This objective was achieved by focusing on specific objectives which included finding out how floods affect education and trade in Bereu village, identifying factors that determine the flood vulnerability in the area and identifying the coping mechanisms that people employ during floods. The results and discussion section presents the findings of the study in the order of specific objectives.

4.2 Results of the study

4.2.1 Socio economic and demographic information

(a) Gender

The demographic characteristics were acquired from Bereu village in T/A Maseya. The respondents to the questionnaire were both men and women though there were slightly more female respondents (58%) than male (42%). This shows an unfair representation of gender as shown in the pie chart below.

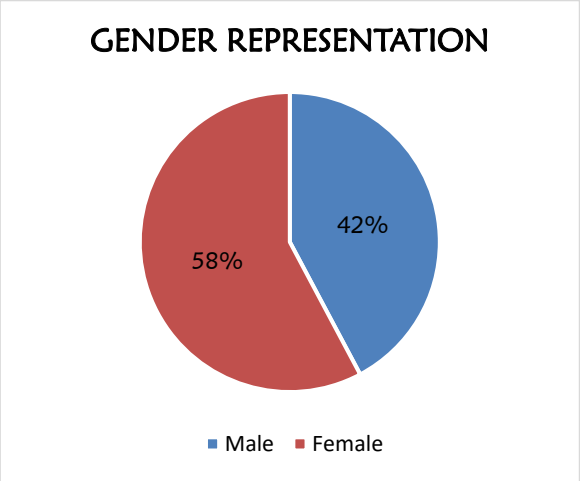


Figure 3.1: Gender representation

(b) Age

In terms of the ages of the household heads, the survey findings show that most of them (41%) were aged between 18-35 years and 26% between 36-49 years old.

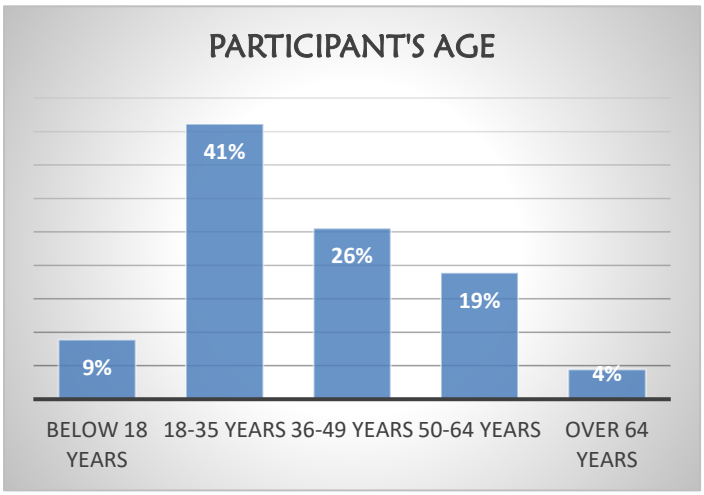


Figure 3.2: Age of participants

(c) Education qualification

A majority of respondents (53%) had attained primary level education. About 19% had not attended any education and a few respondents had attained secondary (23%) and tertiary education (4%).

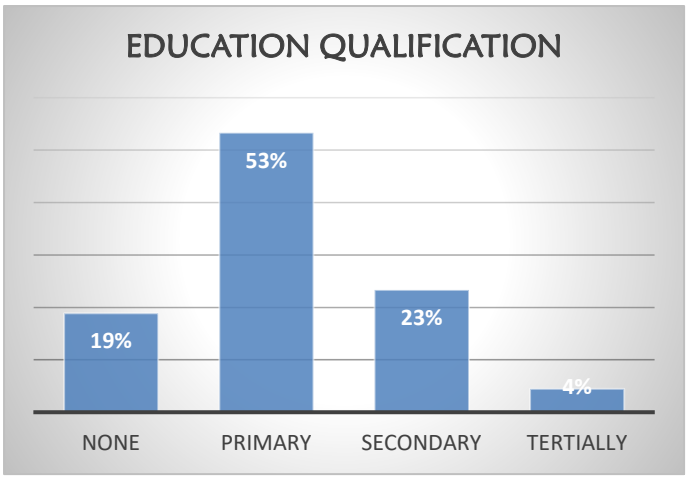


Figure 3.3: Education qualification

(d) Household size

70% of the respondents had 5-7 family members, 29% had 2-4 family members and 1% of the respondents had 8-9 family members.

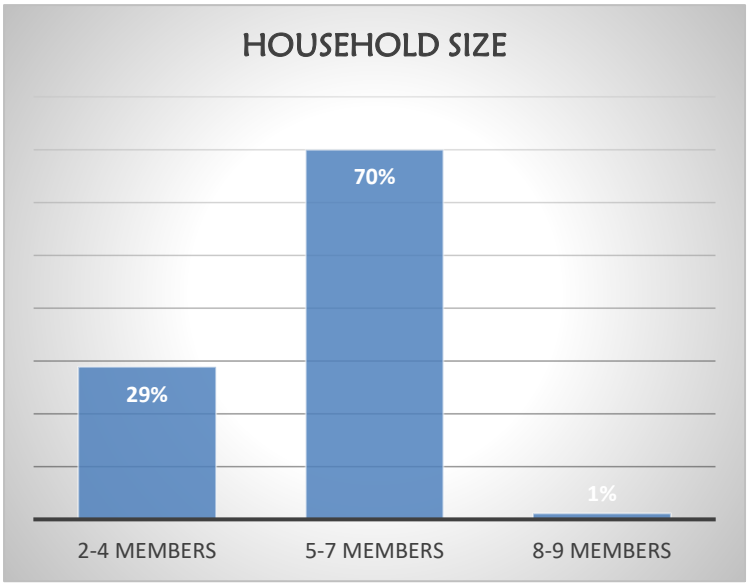


Figure 3.4: Household size

(e) Source of income

The study found out that 38% of the sampled households rely on farming as their source of livelihood and 31% rely on small scale businesses. Only 10% of the sampled population is employed while 21% is into informal labour (ganyu).

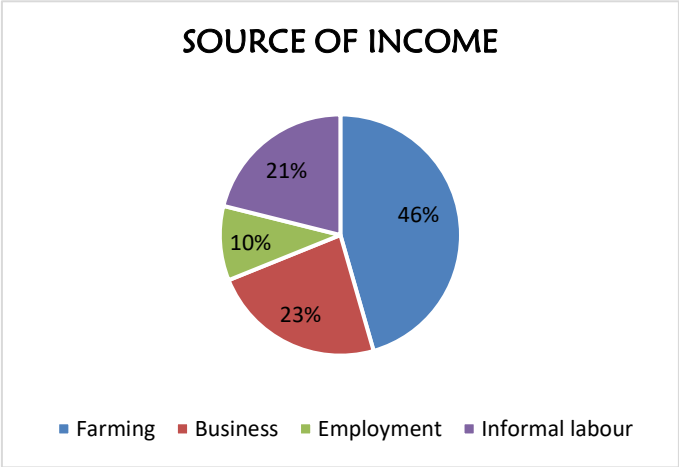


Figure 3.5: Occupation of people

(f) Type of house structure

A majority (77%) of respondents' houses were constructed using mud and a few (23%) were constructed using cement. This contributed to the damage and loss they experienced besides the exposure of these houses to the river.

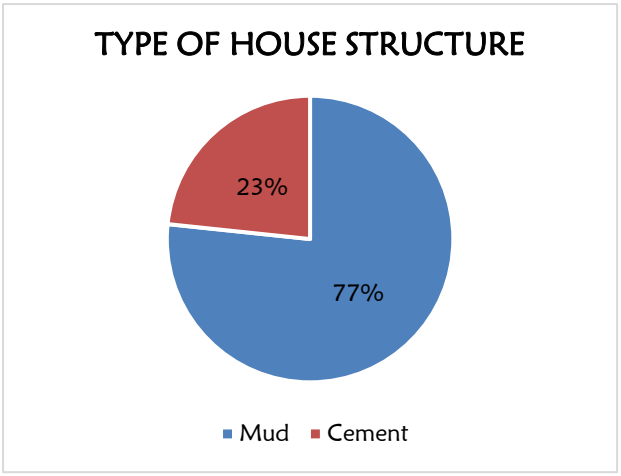


Figure 3.6: Type of house structure

4.2.2 Impacts of floods on socio economic aspects

(a) Education

All sampled households indicated the presence of education facilities in their area (Bereu primary School). Furthermore, 70% of the sampled households indicated that school properties like student notebooks, books, chairs and other school properties were damaged because school infrastructure was filled with mud and most of the school properties were submerged in mud. 30% of the sampled population also indicated that a kitchen at the school partially collapsed. All the respondents indicated that school going children experienced disruption due to floods. The disruption was attribute due to various reasons such as the school blocks being filled with mud and children's clothes and school materials being washed away by floods in their houses.

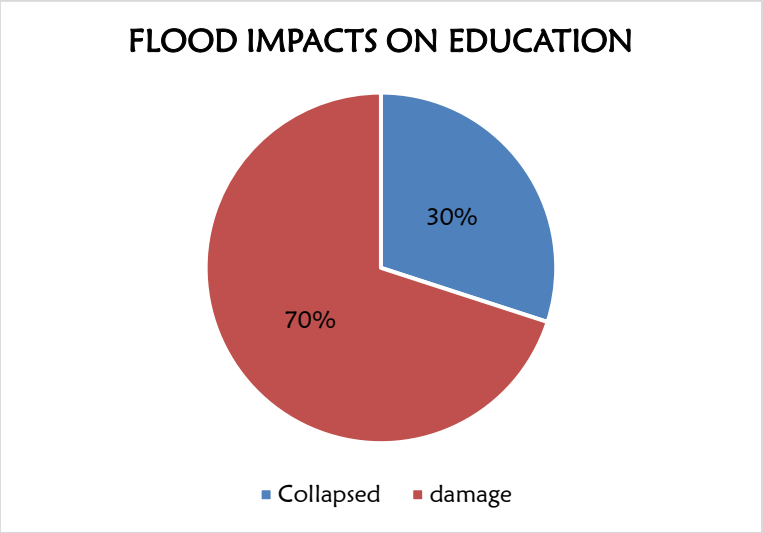


Figure 4.7: Damage on the education sector

(b) Trade

People in the area are involved in both farm and non-farm enterprises. Of the total sampled population, 59% are into farm enterprises while 41% are into non-farm enterprises. Farm activities include livestock rearing, selling rice, dry maize, vegetables, sweet potatoes and other farm produce. Non-farm activities include carpentry, tailoring, teaching, restaurants and retail shops. All these businesses were affected by floods in one way or the other. For instance, most of these goods were washed away by floods and the people had to start all over again after the floods which was so difficult for most of them as they lost almost everything including their household properties.

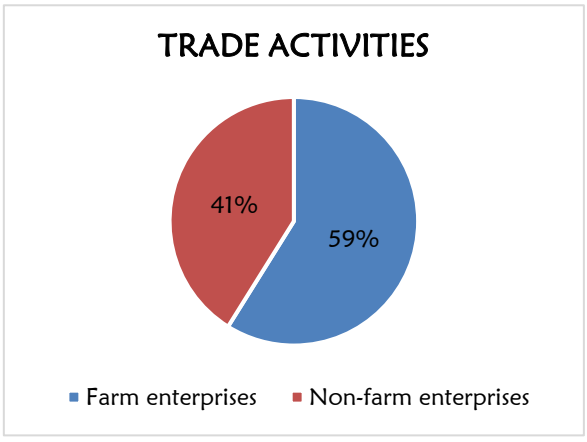


Figure 3.8: Trading activities in Bereu village

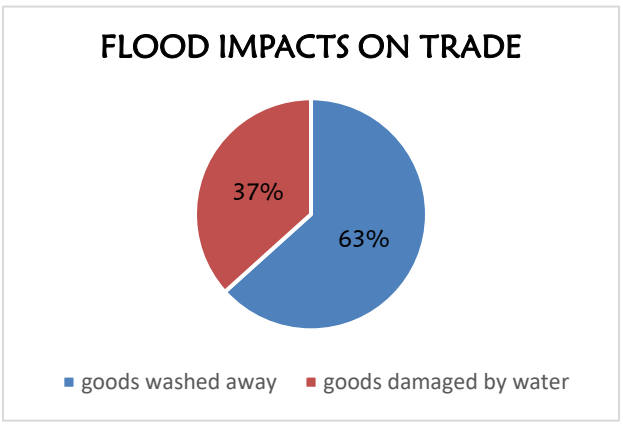


Figure 4.9: Impacts of floods on trade

4.2.3 Factors that determine flood vulnerability in the area.

Four factors that determine flood vulnerability were identified in Bereu village. These include type of house structures, poverty, dyke constructed at Illovo and lack of awareness. All these factors were ranked according to their importance by using a four-point ranking scale, from most important to second, third and least important. Poverty was ranked as the most important factor, followed by type of house structures. Dyke constructed at Illovo was ranked third and lack of awareness about mitigation and preparedness measures being the least factor as shown in the table below.

RANK	FACTOR
1	Poverty
2	Type of house structures
3	Dyke constructed at Illovo
4	Lack of awareness

Table 4.1: Factors that determine flood vulnerability in Bereu village

4.2.4 Coping mechanisms employed by the community during flood

From the study findings, 100% of the sampled population employed temporary migration or relocation during floods as they experienced high level of floods and their houses were all submerged in water. About 27% also had to diversify their income sources in order to deal with the impacts of floods while 13% developed social networks.

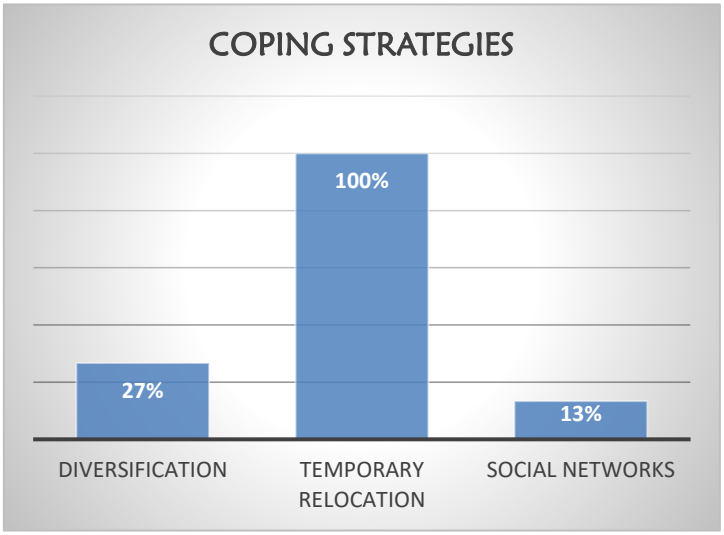


Figure 3.10: Coping strategies employed during floods

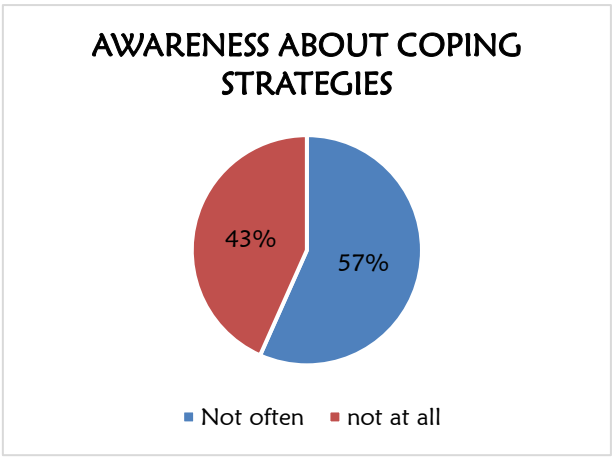


Figure 4.11: How often people receive information about coping strategies

4.3 Discussion of results

The study area is one of the most vulnerable areas to the impacts of floods in Chikwawa district. The area experiences floods almost each and every year and sometimes twice per year as said by most of the respondents and as it has also been the case this year (cyclone Ana and Gombe). Floods cause significant impacts in this area, especially on the livelihoods and other critical sectors like education and trade. A main source of income expresses flood vulnerability at the household level if it is affected by floods. It is worth to note that household income which is reliant on only farming sources of income is a risky livelihood activity in flood situations because farmlands get washed away by floods. Most of the people (46%) from the study

directly depend on the agriculture sector as a source of income. Most of the respondents also depend on livestock production like chickens and goats but most of them are also washed away or die during floods. This clearly indicates that Bereu village is vulnerable to floods.

4.3.1 Impacts of floods on socio economic aspects

(a) Education

Education is also one of the sectors that is mostly affected by floods in this area. From the results, school blocks were filled with mud and this was associated with high cost of removing the mud from the blocks and money to purchase new school properties that were damaged by the mud like books. For instance, according to the 2019 post disaster needs assessment, education was second from the highest affected social sectors and Chikwawa was one of the most affected districts (GOM, 2019). This affects children's attendance and performance in school thereby reducing the gains of SDGs. This also increases number of illiterate people in the society and this makes it difficult for them to obtain formal employment thereby making them mostly derive their income from farming which is also flood sensitive. Rising from the lack of employment and high illiteracy levels, most residents earn very low incomes from small scale businesses and from piece works "ganyu" thereby increasing vulnerability. Tong et al., 2012 also emphasized that education enhances individual's resilience in dealing with disaster risk. Therefore, higher number of uneducated people represents high vulnerability because people with lower level of education are more vulnerable to floods and other disasters as they are likely to be under (or un) employed, marginalized, lack self-confidence and capacity (Rufat et al. 2015).

Correlations

		Participant's highest education qualification	Source of income
Participant's highest education qualification	Pearson Correlation	1	.023
	Sig. (2-tailed)		.828
	N	90	90
Source of income	Pearson Correlation	.023	1
	Sig. (2-tailed)	.828	
	N	90	90

Table 4.2: Correlation between source of income and education qualification

The results show that there is a positive correlation between source of income and highest education of the participants whereby high illiteracy levels make most people derive their income from farming which is also flood sensitive thereby increasing vulnerability of the people.

(b) Trade

People's businesses or trade activities were also disrupted by floods as all their goods that they sell were carried away by flood waters and so, they had to start all over which was difficult for most households as they lost almost everything they had and this was also their source of livelihood. This was most common among households that depend on these small-scale businesses as their source of livelihood and those households whose monthly income is less than or equal to 5,000 MWK (51% of the sampled households) because they feed from hand to mouth. Vulnerability of trading activities is because of low income of most households. From the study, 23% of the respondents depend on small scale businesses as a source of their livelihood. Due to their low income, they cannot diversify their businesses which make them more vulnerable when floods hit and their goods are washed away. Most households have still not fully recovered from these impacts as most of them are still living in the tents

they were given during the floods as shown in pictures at the appendix section. Some victims are still suffering from the flood impacts as a certain tailor lamented:

Since the occurrence of floods in march, my customers have been on my neck and I haven't been able to pay back my customers' clothes that were carried away by floods from my shop. This is putting me from one crime to another because when one customer brings a cloth to my shop, the other customer comes and gets that cloth in compensation of his/ her lost cloth. The situation has been so tough for me and I don't have the money to compensate each one of them.

4.3.2 Factors that determine flood vulnerability

Findings reveal that poverty and type of house structures are the most important factors that determine flood vulnerability. Respondents' ranking was influenced by the level of damage they experienced by the collapse of their houses during the flood event as a majority of them experienced house collapse. Poverty is generally considered an important influencing factor underlying socio economic vulnerability (e.g Few, 2003; Brouwer et al., 2007; Zang, 2009) because it leads to fewer opportunities to take adaptive measures and poor people in developing countries tend to live in areas that are more exposed to risks (e.g floodplains). This results in a lower adaptive capacity and a higher exposure rate. From the demographic information, we can see that only 10% of total respondents are employed and most of them are just into small scale businesses. In addition, 70% of the respondents have their houses constructed using mud and only 30% of the houses were constructed using cement. All this is determining the vulnerability of the people to floods because lower number of good dwelling quality is a function of high vulnerability, same as high percentage of unemployment rate (Munyai et al. 2019). This is because poor quality house structures do no withstand floods and high unemployment rates make people un able to cope with the impacts of floods.

The vulnerability of the area to floods was also caused by the dyke that was constructed at Illovo company so that water should not be entering their farms. This led all the water that was supposed to be diverted to Illovo farms to go to this area that is why they experienced devastating damage. Awareness is also another factor

that determined flood vulnerability in this area. Lack of awareness make people not to be prepared for the disaster. From the study, 63% of the respondents claimed that they don't receive trainings on how they can prepare or mitigate the impacts of floods, hence increasing the vulnerability. A study conducted by Balica (2012) showed that rainfall and education level rankings are among the most important factors that determine flood vulnerability. However, in this study, it is found to be poverty and type of house structures. This proves that vulnerability is rooted within the context of socio-economic characteristics and the physical environment.

4.3.3 Coping strategies employed by people during floods.

Communities and societies have specific ways of responding to floods, which has resulted in various ways of coping with the flood phenomena. In this study, coping strategies were defined as short-term responses to the impacts of sudden events. The findings reveal that 100% of the sampled households revealed taking some coping strategies during floods. Socio economic characteristics of the respondents play a key role in determining their ability and capacity to respond during flood events. For instance, low income and high unemployment rate make people more exposed and vulnerable to floods, and in this area, most people lack resources and this make them take a very long period to recover from the impacts of floods. On a contrast, availability of and adequate resources lead to lower vulnerability.

The coping strategies employed in this area include diversification of income sources, temporary relocation and development of social networks. From the study findings, temporary relocation was adopted by all respondents because of higher levels of flood waters and most of them had low income and unemployed which contributed to the vulnerability. This was more of a short-term coping measure to deal with the immediate impacts of flooding than a longer-term adaptation strategy to reduce impacts of floods because after the floods ceased, people went back to their homes. Actually, the area does not have a built-up camp so people usually use schools and churches as camps, which sometimes also gets damaged by floods.

The other coping strategy used was diversification of income sources. The objective is to make one's livelihood less dependent on increasingly scarce natural resources

and unpredictable occurrence of the weather. However, this was done on small scale because most people are poor and they lost almost everything due to the floods so it was difficult for them to start all over again. Some of the households whose businesses were disrupted started growing vegetables, sweet potatoes in order to provide for their families. Others had to go to Illovo farms to look for temporary jobs.

The last strategy employed by the people was development of social networks. Some households were seeking help from their relatives and friends of both nearby or far. Some went to their relatives' houses to stay there till the flood heights reduced. A majority of the households had nothing to do in this time apart from waiting for donor assistances in the camp either from well-wishers or NGOs and they survived through that. Among the victims themselves, it was found that the social network was weak because everyone was just focusing on their families and not others. Social networks are a crucial attribute that affect the susceptibility of households to the impacts of natural disasters. This is because they play a role in enhancing the capacity of an individual or group to cope with the adverse flood impacts in the short term and to adapt to such effects in the longer term.

4.3.3 Indicators used to assess the socio-economic vulnerability

Socio economic indicators available in the area include employment rate, education level/ literacy level, preparedness and awareness, infrastructure and dwelling quality as shown in the table below. Results above show that the area has high socio-economic vulnerability because there is lack of awareness (46%), higher number of uneducated people (53%), high unemployment rate (90%) and lower percentage of good quality buildings (23%).

Indicators	Components	Factors	Function/relationship with vulnerability
Awareness/ preparedness	Social	Susceptibility	Higher number of people aware, lower vulnerability
Education/ literacy level	Social	Susceptibility	Higher number pf people uneducated, higher vulnerability
Unemployment rate	Economic	Susceptibility	Higher %, high vulnerability
Infrastructure/dwelling quality	Economic	Susceptibility	Higher % of good quality dwelling, lower vulnerability

Table 4.3: Indicators of socio-economic vulnerability

5. CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents conclusion and recommendations that arose from the study. The conclusion and recommendations are based on the primary data collected in the study area.

5.2 Conclusion

The study has assessed the socio-economic vulnerability to floods in chikwawa district, T/A Maseya using questionnaires and observations. The socio-economic indicators found in the area reveal that there exists a high level of socio-economic vulnerability in the area. The study established the level of damage caused by floods on the socio-economic aspects of the people in the area, especially on education and trade activities. Analysis has shown that proximity to the flood prone area, residing in flood prone areas, type of house structures, lack of awareness about mitigation and preparedness measures, dyke constructed at Illovo, poverty which make people not to be prepared and lack of building back better in the recovery phase of the flood disaster leads to the vulnerability of Bereu community.

From the study, it was also clear that households cope differently when affected by floods. The current coping strategies being employed by most households are not very effective because communities use them at a small scale due to their economic status and there was little improvement of the situation after using the strategies. Despite this, local communities coping strategies should not be underestimated but rather bult upon. People should be trained on how they can mitigate and manage flood disasters for example through drills on how they should respond to disasters. Local builders should also be trained on how they can build strong houses during the recovery phase using their available local resources. The focus must also be on improving livelihood conditions of the people in the community. Also, communities should be encouraged to build houses using durable materials and away from the flood prone areas as a way of coping with the floods. The community should also be empowered by giving them reconstruction loans which they can use to build

strong houses there by reducing future flood impacts. Above all, the aim must be to involve all the players to enhance community's resilience to floods.

5.3 Recommendations

(a) The government should clearly assess the implication of the developments they implement in these areas so that they do not increase the flood risk of the communities, as it has been the case with the flood dyke constructed at Illovo company which is one of the main reasons of the high vulnerability of the area to floods. The mitigation measures to be implemented should be community initiated so as to promote community participation and build community resilience.

(b) There is need for capacity building and community empowerment by either giving them mitigation or reconstruction loans so that they can construct strong houses using durable materials that can withstand future floods, and for people to diversify their livelihoods.

(c) Socio economic vulnerability assessments should be carried out every year in these areas as vulnerability changes with time due to the magnitude and severity of the flood events, in order to implement effective DRR measures and reduce impacts of future flood events.

(d) There is also need to construct an evacuation centre in this area because the churches and schools these people currently use as evacuation centres, sometimes gets damaged as well by floods.

(e) The study should also be conducted in some other parts of Chikwawa district at a large scale and the vulnerability should be quantified because vulnerability does not have the same dimension in different areas.

5.4 Study limitation

The study was carried out at a small scale due to time limitations as the researcher was not given special time for data collection and the time employed was also learning time hence data was collected in a small area.

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7. APPENDICES

7.1 HOUSEHOLD QUESTIONNAIRE

BACKGROUND

1. Questionnaire number……
2. Date ……../Month……/Year……..
3. Gender Male ☐ Female ☐
4. Location/Village name ……

SECTION A

SOCIO-ECONOMIC AND DEMOGRAPHIC INFORMATION

1. What is your education qualification

(a) None ☐ (b) Primary ☐ (d) secondary (c) Tertiary ☐

2. What is your marital status

(a) Single ☐ (b) Married ☐ (c) Divorced ☐ (d) Widow ☐ (e) Widower ☐

3. What is your household size

(a) 1 ☐ (b) 2-4 ☐ (c) 5-7 ☐ (d) 8-9 ☐ (e) 10 and above ☐

4. What is the type of the household head

(a) Female headed ☐ (b) Male headed ☐ (c) Child headed ☐

5. What is the type of house structure

(a) Mud house ☐ (b) Cement house ☐

6. What is your occupation

(a) Farming ☐ (b) Business ☐ (c) Employed ☐ (d) others (specify)……

7. What is your monthly income

(a) Less than K5,000 ☐ (b) K6000- K20,000 ☐ (c) K21,000- 50,000 (d) More than k50,000 ☐

SECTION B

FLOODING BACKGROUND

1. How long have you stayed in this area?

(i). Less than one yea ☐ (ii). Two to five years ☐

(iii). Five to ten years ☐ (iv). More than ten years ☐

2. How frequent is the flooding in your area?

(i) Once a year ☐ (ii). Twice a year ☐ (iii). Very frequent ☐

SECTION C

IMPACTS OF FLOODS ON SOCIO ECONOMIC ASPECTS

1. What are the effects of floods on the following:

(i) Housing

(a) Did your house collapse due to floods?

Yes ☐ no ☐

(b) If yes, did the collapsing of the house force you to move to a new area?

Yes ☐ no ☐

(ii) Education

(a) Are there any education facilities in your area?

Yes ☐ no ☐

(b) Was there any damage to school infrastructure (classroom blocks, teacher's houses, toilets) due to floods?

Yes ☐ no ☐

(c) Did any of the school going children in your household experience any disruption in an attendance due to the floods?

Yes ☐ no ☐

(d) If yes, why (indicate main reasons)

Impassable roads ☐

Bridge washed away or submerged ☐

School submerged or surrounded by water ☐

Others (specify)……

(iii) Trade

(a) What kind of trade activities do you do?

……

(b) Were they affected by floods?

Yes ☐ No ☐

(c) If yes, how (specify)

……

SECTION D

FACTORS THAT DETERMINE FLOOD VULNERABILITY

1. What causes floods in this area?

Rainfall ☐

Poverty ☐

Lack of awareness ☐

Proximity to the river ☐

Type of house structures ☐

Education level ☐

Others (specify)……

SECTION E

COPING STRATEGIES EMPLOYED BY THE COMMUNITY

1. What are the coping strategies that you employ during floods?

Diversification ☐

Building codes ☐

Social networks ☐

None ☐

Others (specify)……

2. Which of the above coping strategies are effective?

……

3. How do you get information on flood coping mechanisms?

Radios ☐

Trainings ☐

Tv ☐

Others (specify)……

4. How often do your community get the information about flood coping mechanisms?

(a) Very often ☐ (b)Often ☐ (c) Not often ☐ (d) Not at all ☐

Thank you for your participation

7.2 FLOOD IMPACTS ON HOUSING



Figure 1



Figure 2



Figure 3

Households still live in tents even after recovery (they have not fully recovered).