ASSESSMENT OF VULNERABILITY AND LOCAL CAPACITY TO RESPOND TO FLOOD DISASTERS IN KARONGA DISTRICT, MALAWI

MSc. (WATER RESOURCES AND SUPPLY MANAGEMENT) THESIS

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UNIVERSITY OF MALAWI

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A thesis submitted to the department of Physics and Biochemical Sciences, Faculty of Applied Sciences in partial fulfillment of the requirements of Master of Science Degree in Water Resources and Supply Management

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DECLARATION

This thesis entitled "Assessment of Vulnerability and Local Capacity to respond to Flood Disasters in Karonga District, Malawi" is my own work undertaken as part of a Programme of study in the Department of Physics and Biochemical Sciences, Faculty of Applied Sciences of the University of Malawi; The Polytechnic. It is submitted in partial fulfillment of the requirements of Master of Science Degree in Water Resources and Supply Management. All views and opinions expressed therein remain the sole responsibility of the author, and do not represent those of the Faculty. The use of all materials from other sources has been properly and fully acknowledged. It has not been submitted for any other degree to any University and/or would not be presented to any other institution for any ward.

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CERTIFICATE OF APPROVAL

The undersigned certify that they have read and approve for acceptance by the University of Malawi, the Polytechnic this thesis entitled, *'Assessment of Vulnerability and Local Capacity to Respond to Flood Disasters in Karonga District, Malawi'*.

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DEDICATION

I dedicate this thesis to my mother (Rhoida Mungalwagha- Mwalwimba) and father (Fraction Kadonosha Mwalwimba). Without their support, I would have not been able to carry out this thesis. To my brothers and sisters and all relatives, thank you for your support and moral encouragement during my studies. Importantly, I recognized my brother Petros and my friend Oliver Mtawali for their support when I experienced financial breakdown to finish my studies.

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ABSTRACT

Vulnerability is now a global paradigm. While conceptions of vulnerability principles vary between contexts, it primarily aims to ensure a more understanding of how natural hazards such as floods become disasters. However, vulnerability assessment in relation to disaster risk reduction (DRR) is one of the increasingly significant crosscutting disaster management issues. A review of research into DRR to date suggests that vulnerability assessment is a starting point for the development of DRR programmes. Despite vulnerability being promoted as an attractive approach, a lot of emphasis on the work of disaster management has been placed on post-event humanitarian action and relief activities, with little consideration on vulnerability assessment. Consequently, most developing countries lack a strategy to invest scarce funds to minimize the damage related to disasters. This study assessed vulnerability and local capacity in Traditional Authority Kilupula, in Karonga district of Malawi. The area was chosen because it is dominated by flood plain (flat and low lying areas) along the shores of Lake Malawi which is prone to flooding. The main purpose of the study was to assess the extent of vulnerability and local capacity to respond to flood disasters in relation to disaster risk reduction. The study adopted a cross-sectional survey utilizing both quantitative and qualitative research. Structured questionnaires and GPS receiver were used for the quantitative research while semi-structured interviews, FDGs and observation were employed for the qualitative research. It was revealed that physical (*61%*), social (*55%*), economic (*55%*), environmental (*60%*) were in the category of "very important" factors generating vulnerability while the cultural factors (*37%*) were in the category of "important" factors generating vulnerability. The relationship between the vulnerability factors and flood severity revealed strong, medium and weak correlation (*r)* values. Only the cultural factors (*p*-value*=0.009)* were significant. Several existing gaps between theory and practice in DRR and management were found. Among the gaps identified were poor relocation strategies, ineffective warning systems and weak enforcement of laws. It was also found that local coping strategies were pursued with the infrastructural being pursued most (60%), followed by social organization (34%). However, implementation coping strategies were not effective due to unwillingness of people to relocate to higher grounds. It is recommended that disaster risk reduction programmes should be promoted, but with full knowledge of the vulnerabilities of the affected communities. Further studies on the exploration of emerging needs and priorities on disaster risk reduction as mechanisms of reducing vulnerability of communities should be carried out.

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ACRONYMS AND ABBREVIATIONS

ACPC	Area Civil Protection Committee
ACU	Area Control Unit
AIDS	Acquired Immune Deficiency Syndrome
CPC	Civil Protection Committee
DC	District Commissioner
DCPC	District Civil Protection Committee
DFEP	District Flood Evacuation Plan
DFID	Department for International Development
DISCOVER	Developing Innovative Solutions with Communities to Overcome Vulnerabilities through Enhanced Resilience
DoDMA	Department of Disaster Management Affairs
DPR	Disaster Preparedness and Relief
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
DRRF	Disaster Risk Reduction Framework
EPA	Extension Planning Area
EWS	Early Warning Systems
FDGs	Focus Group Discussions
FEMA	Federal Emergency Management Agency
FOCUS	Foundation for Community Support Services
GVH	Group Village Headman
HDI	Human Development Index
IDRDR	International Decade of Natural Disaster Reduction
IGA	Income Generating Activities
ISDR	International Strategy for Disaster Reduction
JCE	Junior Certificate of Education
KSEP	Karonga Socio-Economic Profile
MSCE	Malawi School Certificate of Education
MVAC	Malawi Vulnerability Assessment Committee
NDPRC	National Disaster Preparedness and Relief Committee

NDRMCS	National Disaster Risk Management and Communication Strategy
NGOs	Non-governmental Organizations
NSO	National Statistics Office
PAR	Pressure and Release
PASSA	Participatory Approach for Self-Shelter Awareness
PSLC	Primary School Leaving Certificate
UNDP	United Nations Development Programme
UNDRO	United Nations Disaster Relief Organizations
UNESCO	United Nations Education and Scientific Organization
UNISDR	United Nations International Strategy for Disaster Reduction
VCPC	Village Civil Protection Committee
WCDR	World Conference on Disaster Reduction

CHAPTER ONE
INTRODUCTION

1.1 Background Information

The magnitude of the impact of disaster is directly related to the vulnerability of individuals and communities and the intensity of a hazard (Concern Strategic Plan, 2005). The types, structures and levels of vulnerability that exist when the event occurs precondition the damage any particular physical event can cause (Blaikie et al., 1994, Hewitt, 1997). The uneven impact of disaster arises from differences in socio-economic characteristics such as age, education, income, culture, gender, behaviour and location (Blaikie et al., 1994). This contrasts research and strategies in the past, which often viewed disaster in a purely naturalistic orientation (Birkmann, 2006).

Initially, the prevailing attitude, which arose from the naturalistic approach, has been that disasters were caused by the "acts of nature" as such were inevitable events that could not be predicted or avoided. This approach, viewed disaster as a natural event that was beyond human control in which accepting death and damage to property was part of the costs (Cannon, 2005). Consequently, a lot of emphasis on the work of disaster management was placed on post-event humanitarian action and relief activities, with little attention paid to disaster reduction strategies that have potential to save thousands of lives (Living with Risk, 2004). Van Niekerk (2005), states that this belief resulted in reactive focus on disasters. The focus was to deal with the post disaster consequences dominated by technical interventions (Cannon, 2005). In other words, when disasters occurred, the response was directed at meeting emergency needs and cleaning up. Now, while there is increasing recognition on humanitarian efforts, much more needs to be done to reduce the severity of hazards and disasters by analyzing vulnerability of communities, which make possible for a hazard to become a disaster (Cannon, 2005). Smith (2002) argues that this is a shift from reactive approach to natural disasters to a proactive planning and preventive approach. Due to this shift, this thesis argues that disasters caused by flood hazards for example, are not only natural in themselves but rather they are also strongly induced by the vulnerability of the community to a particular hazard. According to Canoon (2005), the social system generates unequal exposure to risks which make some groups of people more prone to hazards than others.

1.2 Study Setting

Malawi is a landlocked country in Central Southeastern Africa. It has been ranked 170 out of 188 nations and territories in the category of low human development with HDI value of 0.476 (UNDP, 2016). Over 65% of Malawians live on less than $1 a day (FEMA, 2010). The situation in Malawi illustrates the drastic increase of the frequency and magnitude of disasters caused by natural hazards. For example, since 1946, Malawi has been hit 298 times by hazards of which 89 % have been natural hazards and 11% have been human-generated events (UNDP Malawi, 2009). The Social Vulnerability Index (SVI) has ranked Malawi position 23 out of the 50 African nations, with 0.6 arbitrary units of social vulnerability (Vincent, 2004). This social vulnerability has contributed to the over proportional growth losses and suffering of thousands of Malawians to hazards like floods and droughts.

Weather related events, in particular floods, have exacerbated poverty levels, leaving many Malawians trapped in the cycle of poverty and vulnerability. UNDP- Malawi (2009) indicates that floods have impacted 157 times from 1946 to 2005. The Department of Disaster Management Affairs (DoDMA) has recorded 23 major flood events across the country in the 29 years between 1979 and 2008, affecting 1.9 million and killed 541 people (DoDMA, 2014). Approximately 86% Malawians live in rural areas in poorly constructed houses that are made of mud walls with thatched grass and more than 90% live on subsistence farming (FEMA, 2010). Such types of houses are vulnerable to heavy rains and flash flooding. Other factors such as population growth, environmental degradation and climate change have contributed to increase the magnitudes of floods (NDRMCS, 2014).

For the past 63 years (1946 to 2009), districts such as Karonga, Rumphi and Nkhatabay in the North of Malawi; Salima, and Nkhotakota in the Central region and; Nsanje, Chikwawa and Phalombe in the South have all been heavily affected by floods (FEMA,2010). Flood occurrences in Karonga district are perpetual with compound results. The district is characterized by floods which range from partial to severe that occur primarily during the months of January to April (District Contingency Plan, 2016).

The Flood Evaluation Plan (2016) report, showed that floods have displaced thousands of households in T/A Kilupula of Karonga district. The report further indicated that the primary effect of floods has been loss of basic necessities in form of food, shelter, clothing, water and other social amenities. Schools, churches and hospitals have been closed due to varying degree of destruction and disturbances. Produce markets have been submerged leaving households with no alternative options. Food stores have been damaged resulting in destruction of food stuffs. The available household food stocks have been soaked or completely washed away. Disaster risk reduction (DRR) measures have been slowly adopted to mitigate flood effects. People have been reluctant to relocate their houses to higher grounds. The majority have even considered floods to be part of life. Most of them have beliefs and practices that events from flood hazards are inevitable, acceptable and cannot be disputed. In support of this, Wisner et al. (2004) cited an example of the "Flood Response study" in an article "stopping floods is not the same as reducing vulnerability" conducted in Bangladesh which found that the affected people had their own priorities for flooding and showed very little interest in stopping floods altogether. Also, Tshilunga (2014) in the study of the 2011 Floods on Human Security in Namibia argued that many societies have accepted floods as inevitable natural phenomena to be endured. The crucial point in regard to the nature of this problem and which is the task of this thesis is therefore to assess vulnerability and local capacity to respond to floods disaster in relation to implementation of disaster risk reduction strategies. Studies indicate that appropriate DRR interventions can be implemented only when the vulnerability of people to a particular hazard has been assessed (Bath et al., 2016; Birkmann, 2006; Cannon, 2005; Wisner et al., 2004).

1.3 Problem Statement

In theory, vulnerability can be reduced by adoption of appropriate DRR interventions. In practice, the adoption of DRR interventions in Malawi is limited (Thieme et al., 2012). For instance, people in T/A Kilupula of the Northern part of Malawi have shown very little interest to implement DRR interventions to minimize floods, yet floods keep causing problems to their livelihoods every year. Consequently, to assist flood victims during emergencies, the Government of Malawi absorbs significant amounts of resources, which could have been allocated for development efforts (DoDMA, 2015). Despite this challenge, there has been little research on vulnerability assessment

in Malawi. For example, Mwale et al., (2015) assessed flood risk and vulnerability of rural communities in the Lower Shire Valley districts of Malawi.

Therefore, this thesis assessed the extent of vulnerability and local capacity to respond to flood disasters in T/A Kilupula in order to fill the knowledge gap in vulnerability assessment in order to implement sound disaster risk reduction.

1.3 Objectives

1.3.1 General objective

The general objective of the study was to assess the extent of vulnerability and local capacity to respond to flood disasters in relation to Disaster Risk Reduction (DRR) in Traditional Authority Kilupula in Karonga district.

1.3.2 Specific objectives

The specific objectives of the study were:

i. To explore factors that determines the trends and magnitude of people's vulnerability to floods.
ii. To identify the existing gaps between theory and practice in disaster risk reduction and management.
iii. To evaluate local capacity that can strengthen community resilience in managing the risks of floods and ably reduce vulnerability.

1.4 Significance

The systematic assessment of vulnerability and local capacity to respond to flood disasters in disaster risk reduction and management cannot be oversimplified. As previously stated, vulnerability studies in Malawi are lacking and there is high limitation in the implementation of disaster risk reduction interventions. Therefore, this thesis contributes to fill the gap in vulnerability assessment and to understand why there is limitation in the implementation of DRR interventions, which have potential means of strengthening communities' livelihoods. Furthermore, due to the fact that floods have been persistent in Malawi's history with no indications of diminishing over times, this thesis therefore is a tool to unveil the vulnerabilities

that exist, so that while floods may prevail, people and the government could minimize their negative impact on life, property and the economy. This would create information that would be a useful framework for effective allocation of resources to mitigate flood hazards and improve emergency preparedness practices such as early warning systems. Lastly, this information is significant as a body of reference to further the study on the analysis of vulnerability of people to flood disasters in Karonga and elsewhere in Africa.

1.5 Scope

This thesis assessed vulnerability and local capacity based on the Pressure and Release (PAR) conceptual framework (Blaikie et al., 1994, Wisner et al., 2004). This framework explains that the progression of vulnerability is generated based on three stages classified as the underlying root causes, dynamic pressures and unsafe conditions. Therefore, all the issues of vulnerability, local capacity and disaster risk reduction assessed in this thesis were evaluated based on this framework, and with particular reference to the social sciences vulnerability approach which determines the capacity of individuals to prepare, resist and recover from disastrous events. However, this thesis study opted to leave out the technical science vulnerability approach because it is reactive instead of proactive in dealing with natural hazards' impacts (Ciurean et al., 2013). Furthermore, to reach at an informed conclusion, which determined the vulnerability of people in relation to PAR model and the dynamics of social vulnerability, other theoretical approaches like the Participatory Approach for Safe-Shelter Awareness (International Red cross and Red Crescent, 2014) and Sustainable livelihood model (Birkmann, 2006) were used as part of disaster risk reduction and local capacities. It is important to note that the variables of measurement in all the issues assessed were only from flood hazards perspective and not any other kind of hazards.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

The frequency and impact of floods are increasing causing huge loss of life, damage and destruction of the environment, property, agricultural and livestock systems (DoDMA, 2015). The shocks arising from flood disasters are felt by the poor. Poor households are less able to cope than the non-poor households (Vakis et al., 2004). The poor own fewer productive assets, are more likely to reside in hazardous locations and in substandard housing, and are primarily dependent on their own labour to meet their livelihood needs (Mwape, 2009). Such risk profiles give them fewer options to cope with and recover from the loss of assets in the event of a disaster. In this light, the need to assess the extent of vulnerability and local capacity to respond to flood disasters in order to implement disaster risk reduction and management interventions that can reduce vulnerability and strengthen disaster-resilient societies, is a crucial task if science is to promote sustainable livelihood world.

2.2 The Evolution of the Concept of Vulnerability

As of late, 1970s and early 1980s, the new approach to disasters entitled the "vulnerability approach" entered into the disaster discourse (Baumwoll, 2008). This was an alternative paradigm shift from naturalness of disaster events (naturalistic approach) to "un-natural disaster" events (Cardona, 2004a). In other words, it was a simple rejection of the past academic and policy works, which were hazard oriented. Literature reveals that before the emergence of the concept "vulnerability", there was a range of views, none of which dealt with the issue of how society creates the conditions in which people face hazards differently (Blaikie et al., 1994).Now, the use of the term vulnerability to explain disasters has dominated in most academic work and policy documents (Chambers, 1989; Bohle, 2001; ISDR, 2004; Watts, 1993). In a vulnerability viewpoint, disasters are not "natural", neither in the sense of being from nature or in the sense of being normal and acceptable. Baumwoll (2008) stipulates that hazards become disasters only when the likelihood of a hazard and the vulnerability of the community increase the risk of being affected. Annan (2003), states that hazards only become disasters when peoples' lives and livelihoods are swept away, mainly from human activities. Wisner et al. (2004) argues that in a disaster risk the social production of vulnerability needs consideration with at least the same degree

of importance that is devoted to understanding and addressing natural hazards. Canoon (2005), states that the condition, extent and types of people's vulnerability can turn a hazard into a disaster. Wisner et al. (2004) further stipulates that there cannot be disasters if there are hazards but without vulnerability or if there is vulnerable population but without hazardous event. Worth noting is that any hazard for example, flood, earthquake or drought which is a triggering event along with greater vulnerability (inadequate access to resources, sick and old people, lack of awareness, condition of settlement and infrastructure, etc.) would lead to disaster causing greater loss to life and property. Thus, a natural disaster is only a disaster because people are in wrong place at the wrong time, had no choice but to be in the way of a disaster or were caught unawares when it struck (Living with Risk, 2004).

2.2.1 Definition of Vulnerability

Vulnerability is a single term but with extensive literature on its definition. Views on vulnerability stem from research groups and professionals in academia, disaster management agencies, the climate change community and development agencies. Each of these groups has used the term in different contexts with the purpose of addressing particular issues of the potential impacts of disasters. Thywissen (2006), for example lists 35 definitions of vulnerability from the perspective of different researchers. Leon (2006), states that the many perspectives of the term demonstrate that the field is still unsettled. For this fact, Ciurean et al. (2013) argues that the definition of vulnerability for the purpose of scientific assessment should depend on the purpose of the study. Hinkel (2011), states that the diversity in definition is accompanied by similar diversity of methodologies for assessing vulnerability. This study adopted one of the authoritative definitions of vulnerability given by United Nations International Strategy for Disaster Reduction (UNISDR) as: "*a set of conditions determined by physical, social, economic and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards*' (UNISDR, 2009).

2.2.2 Conceptual Framework of Vulnerability

The use of vulnerability assessment is significant framework to develop an effective disaster risk management plan. Birkmann (2006) argues that measuring vulnerability can help to develop indicators that can reduce vulnerability of societies at risk. Many vulnerability frameworks have

been developed in the context of disaster resilience in order to develop methods of measuring vulnerability. However, for assessing vulnerability in this study, the Pressure and Release (PAR) model was adopted. The PAR model emphasizes the underlying driving forces of vulnerability and conditions existent in a system that contribute to disaster situation when a hazard occurs.

2.2.2.1 The Pressure and Release (PAR) Model

The PAR model is a compound of two models; the Pressure (Crunch) model and the Release model. On the one hand, the Pressure model is based on the idea that a number of factors influence vulnerability to disaster. On the other hand, the Release model arises from the realization that to release the pressure that causes disaster, the entire chain of causations needs to be addressed right back to the root causes and not just the proximate causes or triggers of the hazard itself, or the unsafe condition of vulnerability. The PAR model views disaster as the intersection of the processes generating vulnerability and natural hazard event. The model underlines how disasters occur when natural hazards affect vulnerable people (Blaikie et al., 1994; Wisner et al., 2004). The framework stresses that the cause of vulnerability can be traced back from the unsafe condition through economic and social (dynamic) pressures to underlying root causes. It is a framework that outlines a hierarchy of causal factors that together constitute the pre-conditions for a disaster. The PAR approach is based on the commonly used equation: Disaster Risk= Hazard x vulnerability**.**

The upper part of the framework defines vulnerability within three progressive levels: root causes, dynamic pressures and unsafe conditions while the lower section illustrates that to release the pressures that cause vulnerability, there is a need to address the root causes, dynamic pressures and unsafe conditions (Figure 1). Root causes can be, for example, economic, demographic and political processes, which determine the access to and distribution of power and various resources. The category of dynamic pressure encompasses all processes and activities that transform and channel the effects of root causes into unsafe conditions, such as epidemic diseases, rapid urbanization and violent conflicts (Wisner et al., 2004). Unsafe conditions are specific forms in which human vulnerability is revealed and expressed in a temporal and spatial dimension. These conditions include living in hazardous locations and entitlements that are prone to rapid and severe disruption (Wisner et al., 2004).

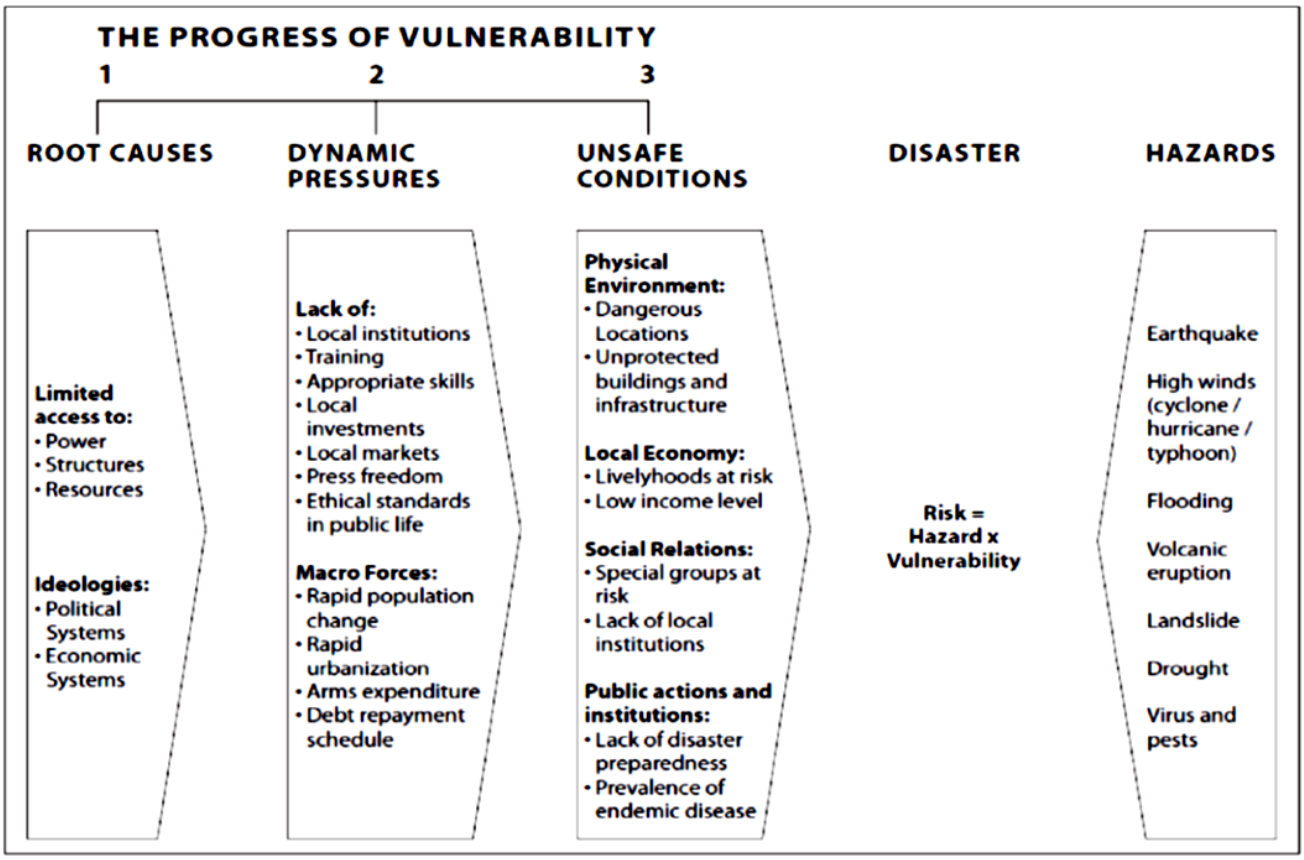
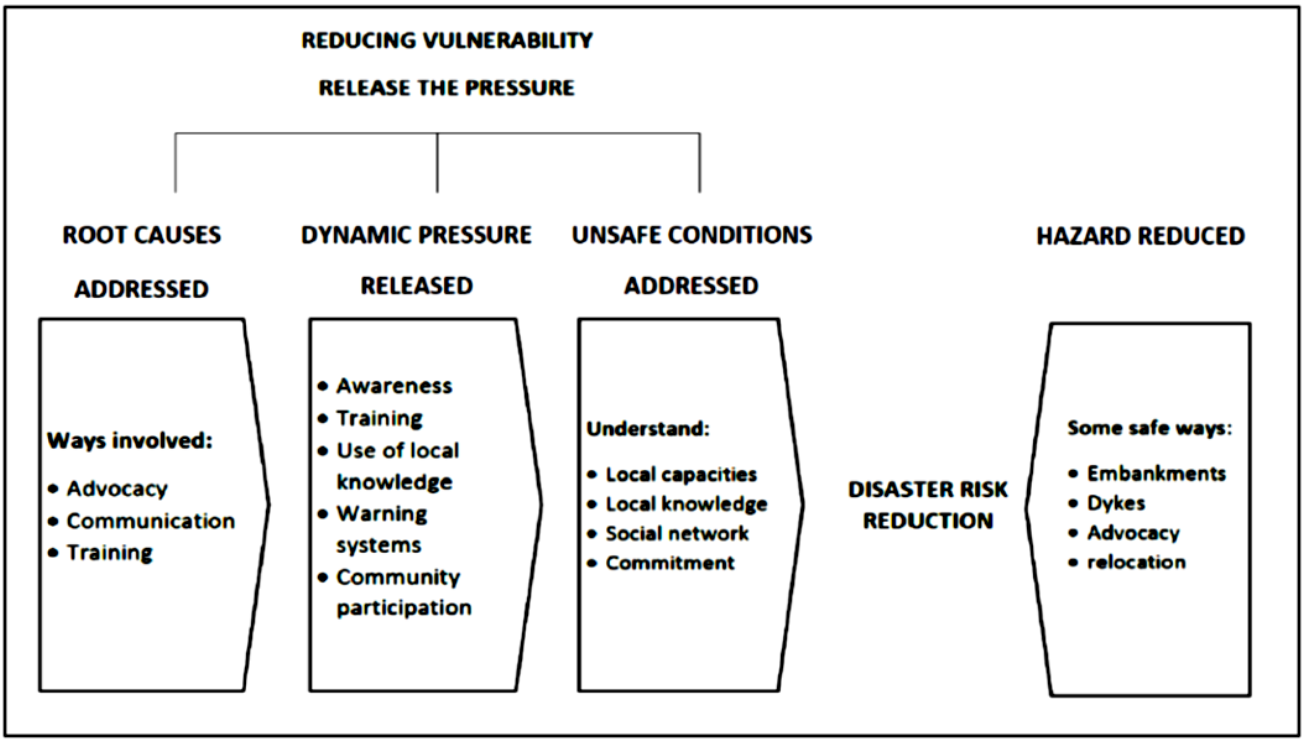


Figure 1: The Pressure and Release model proposed by Blaikie at al. (1996). Root causes lead to dynamic pressures, which lead to unsafe conditions. Risk is the combination of hazard and vulnerability (Wisner et al, 2004).



Incorporation of DRR in the Pressure and Release model to address Root causes, dynamic pressures and unsafe conditions. Risk is reduced by releasing the pressure that lead to vulnerability (source author knowledge)

2.2.2.2 Rationale for the PAR model

The PAR model is one of the best-known conceptual frameworks worldwide that focuses on vulnerability and its underlying driving forces. It is useful in addressing the release phase and the root causes that contribute to disaster situations. However, critics argue that the model puts much emphasis on the national and global levels although many dynamic pressures and unsafe conditions might also be determined by local conditions. Other studies further state that the framework exaggerates the separation of hazard from social processes in order to emphasize the social causation of disasters. Nevertheless, for the purpose of this thesis study, this model was adopted because unlike other models, the PAR model clearly defines and separates the underlying conditions that generate vulnerability from those that can release the pressure in order to reduce vulnerability. In this way it has incorporated disaster risk reduction to address a comprehensive mix of factors contributing to communities' vulnerabilities. Moreover, this model gives a real situation as to why people are affected differently by the impact of flood hazards occurring in the same place with the same magnitude and intensity and in the same location. Likewise, based on Birkmann (2006) opinion, this model was adopted because it is an important approach, which goes beyond identification of vulnerability towards addressing its root causes and driving forces embedded in the human-environment system.

2.3 Approaches to the Study of Vulnerability

Vulnerability in the context of disaster risk can be viewed in two perspectives. The first as technical or engineering sciences oriented perspective. The technical perspective of vulnerability focuses on the physical vulnerability aspects (Ciurean et al., 2013). It neglects the role of human systems in mediating the outcomes of hazard events. The second view is the social sciences perspective. This uses the social vulnerability as a starting point for risk reduction. This takes into account various factors and parameters that influence vulnerability, such as physical, economic, social, environmental, and institutional characteristics (Ciurean et al., 2013). Therefore the concentration of this thesis study is on the social sciences perspective (social vulnerability). This is because it correlates with the argument of this thesis that disasters caused by flood hazards for example, are not only natural in themselves but rather they are also strongly induced by the social production of vulnerability which operate to generate disasters. This also is supported by the Yokohama Conference (1994) where the social aspects of vulnerability were given any serious consideration.

2.4 Vulnerability Assessment Methods

In the face of increasing frequency of flood disasters and continued environmental degradation, assessing vulnerability is a crucial task. According to a United Nations (UN) (2014) report, many countries across the world have implemented vulnerability assessment at community level with support from NGOs. However, it is argued that very little has been done in Malawi to assess vulnerability from the same support. Leon (2006), states that in relation to the number of different definitions about vulnerability, the number of methods to assess vulnerability is very low. The UN (2014) report, also stresses that the assessments are often sporadic, isolated and that they lack standardized methodologies. The literature has been even contradictory to some extent. For example, Leon, (2006) has argued that some social scientists and professionals have stated that vulnerability cannot be measured at all and only proxies can be used to present it. But, Hinkel (2011) argues that the diversity in definitions of vulnerability is accompanied by a similar diversity of methodologies for assessing vulnerability. This indicates that no one has a clear idea as to what exactly this concept means in operational terms. Birkmann (2006) noted that 'we are still dealing with a paradox: we aim to measure vulnerability, yet we cannot define it precisely'. Researchers around the world have just developed vulnerability methods deemed fit for some kind of format that allows for its assessment using data available, or data that can be acquired by different means. According to the UN (2014) report, rigorous and scientific inputs on vulnerability assessment may be lacking but their assessments are largely based on anecdotal evidence and the opinions of sector officials. The report emphasizes that the anecdotal and sector officials are useful because local knowledge has become an important factor in understanding risks (UN, 2014).

Banda (2015) stipulates that a methodology of measuring vulnerability involves critical infrastructure and sectors assessment. The emphasis of this method is based on the ground survey of the exposure and susceptibility of a basic infrastructure services and facilities such as hospitals and schools (Birkmann, Fernando & Hettige, 2006). This measurement method is based on quantitative approaches and set along three dimensions- geographical level, sector and components (Banda, 2015). In order to assess vulnerability, this method focuses on the dimension of the components. It employs vulnerability indicators, which make use of arbitrary set weights to combine different elements. Though expert judgments tend to be employed, some still question the selection of numerical weights (Leon, 2006).

The other approach to measure vulnerability involves the use of census data. This method is used when assessing the vulnerability of social groups and local communities (Banda, 2015). General indicators available in census and local statistics are used to estimate the vulnerability of different social groups and economic sectors of social communities to hazards.

Furthermore, Banda (2015) in the study of contextual framework of vulnerability to floods in Blantyre city, Malawi, used questionnaire-based interviews with households in selected locations to identify and assess the different vulnerability of various social groups to hazards. According to Birkmann et al. (2006), this method requires the most attention to explore the various vulnerabilities of different social groups. It is observed that the in-depth questionnaire survey allows better understanding and estimation of current vulnerability and address spatially specific features of vulnerabilities to flood disasters.

Similarly, other studies use both qualitative and quantitative methods to assess vulnerability. In this case, the vulnerability assessment involves conducting risk assessment. According to Blaikie et al. (1994), risk assessment considers potential hazards, estimating the likelihood or probability of those impacts actually occurring and the consequences or potential harm that would result. The process involves both the science of measurement and the art of judgment in order to determine the acceptability of a particular risk. The vulnerability risk matrix is used to express the qualitative and quantitative values in which word and numerical values are assigned to qualitative and quantitative data respectively.

2.5 Factors Generating Vulnerability

Wisner et al. (2004), indicates that vulnerability involves a combination of factors that determine the degree to which life, livelihoods, property and other assets are put at risk by a discrete identifiable event in nature and in society. Based on this opinion, this thesis indicates that the social, economic, cultural, physical, political and environmental conditions in which an individual, a household or a community live can increase (or decrease) the degree to which life, livelihoods, property and assets are put at risk. Therefore, the characteristics within the factors that lead to the progression of vulnerability are discussed below.

2.5.1 Social Factors

Baumwoll (2008) states that social vulnerability refers to the impact of disasters on the social structure of a society and vice versa. The most common social factors that increase people's vulnerability include limited access to health, education and housing. Most people residing in flood prone areas face health, education and housing problems. They lack access to knowledge and information on health, have low levels of education and inadequate access to shelter and safety. Moreover, vulnerability among these people increases because they stay in very remote and risk-prone areas. Often these areas are difficult for emergency services to access them easily. It is also noted that the remoteness of the location of people results in challenges for the delivery of relief and recovery assistance during disaster (Kelman, 2008).

2.5.2 Cultural Factors

Maskrey (1998) as cited in Maferetlhane (2012) defines cultural vulnerability as systems of beliefs regarding hazards and disasters. There are various cultural factors contributing to vulnerability (Maferetlhane, 2012). McEntire (2005) identifies "public apathy towards disasters, defiance of safety precautions and regulations and dependency and absence of personal responsibility" as such factors. People have beliefs and practices that events from natural hazards are inevitable and humanity should accept the fate without dispute (Murelfelhane, 2012). For example, local people may believe that a mountain is their savior or shrine and they are not permitted to live anywhere near it. This may increase their vulnerability if the area is susceptible to a disaster. Maferetlhane (2012) further states that due to certain religious and cultural beliefs people may not attempt to prevent, reduce or deal with hazards causing disaster.

2.5.3 Environmental Factors

Environmental vulnerability refers to the natural environment in which a society is located and the impact of environmental degradation (Baumwoll, 2008). It is a fact that environmental change affects everyone; however, this phenomenon has adverse impact on people whose lives remain entirely tied to the land and who depend largely on the environment for food. Environmental damage affects well-being of the local peoples in that the availability of traditional foods and medicines is diminished as a result of environmental degradation (Maferetlhane, 2012).

2.5.4 Economic Factors

Economic vulnerability is related to the number of economic resources in the country, the ability of the country to support itself in the face of a disaster and the susceptibility of a country's economy to disasters (Baumwoll, 2008). A country's economic stability and the amount of money allocated to disaster management determine economic vulnerability. People are regarded to be more vulnerable to economic challenges due to their standing in the society. In most cases local, people are marginalized from the economic mainstream and they live in poverty. Poverty is generally recognized as one of the most important causes of economic vulnerability, because the poor tend to have much lower coping capacities, and thus they bear a disproportionate burden of the impact of disasters, conflict, drought, desertification and pollution (ISDR, 2004).

2.5.5 Political Factors

Aysan (1993) defines political vulnerability as limited access to political power and representation. Politics also has a serious influence on the vulnerability of local people or communities at large. This vulnerability occurs when people lack political voice. According to McEntire (2005) identified political factors such as "minimal support for disaster programs among elected officials, over centralization of decision making and uncoordinated disaster related institutions". When resources are allocated politicians and governments may give priority to the influential sector of society who has the power to vote for them.

2.5.6 Physical Factors

According to Baumwoll (2008) physical vulnerability refers to the physical characteristics of a country which can be classified according to three components: geography, infrastructure and population. Kelman (2008), states that an individual's physical characteristics also influence the individual's vulnerability to death or injury from natural hazards. The characteristics include age, gender, linguistic ability and background, ethnicity, race, and state of physical and mental health. An individual's state of health includes physical mobility, speed of reaction, intelligence and medical history.

Elderly people are more susceptible to diseases. This puts them to be more vulnerable to injuries during the occurrence of natural hazards such as floods, storms and earthquakes. Additionally,

elderly people are more vulnerable to some biological hazards than younger people, because they also have decreased mobility which increases vulnerability to rapid onset hazards. As a person's state of health declines due to old age, physical mobility is impaired, linguistic ability may regress, and the ability to respond appropriately to warnings or situations may be compromised (Maferetlhane, 2012). These therefore increase the vulnerability of old people in situation of rapid response due to decreased mobility. Furthermore, individuals who do not understand warnings and safety instructions due to their educational background, youth or age, hearing impediments, intelligence, or linguistic background different from the language of the community are more vulnerable to rapid-onset hazards such as storms and flash floods. Individuals who do not understand a language in which a warning about an impending disaster is issued may be more vulnerable to that hazard due to their lack of understanding and comprehension of the hazard.

2.6 Vulnerability Theoretical Factors

The other factors that can either increase or decrease vulnerability are development initiatives, environmental degradation, poverty, relief and recovery programmes and climate change herein referred to as vulnerability theoretical factors. Ciurean et al, (2013) noted that the need to account for these factors further broadens vulnerability assessment in scope but also the more interdisciplinary it becomes.

2.6.1 Vulnerability and Development

Vulnerability is a dependable variable that is influenced negatively or positively by development (Lavell, 1999). For instance, flood disasters can both destroy development initiatives and create development opportunities and that development schemes can both increase and decrease vulnerability. According to Lavell (1999), decision-makers who ignore these relationships do a disservice to their people, who place their trust in them. Anderson and Woodrow (1989) states, however, that vulnerability in this scenario should not be considered as part of development and/or underdevelopment but an integral component in the definition of development. Therefore increasingly, projects need to be designed to include flood disaster recovery programmes and with long term development needs in mind.

Development requires institutional and structural transformations of societies to speed up economic growth, reduce levels of inequality, and eradicate absolute poverty (Lavell, 1999). Over time, the effects of flood disasters can seriously degrade a country's long-term potential for sustained development and cause governments to substantially modify their economic development priorities and programmes. For example, the total loss due to damage caused by the January 2015 flooding in Malawi was estimated at MK748 million (about $ 5.2 million) (GOM, 2015) resulting in the government spending lot of money on humanitarian support.

On the other hand, flood disasters may often provide opportunities for development. They can improve the atmosphere in favour of change and create a rationale to establish development programmes such as job training, housing construction and land reform. However, poor management of the relief and rehabilitation responses may have severe negative implications for development for years to come, and may even increase vulnerability to future hazards (Lavell, 1999).

2.6.2 Vulnerability and Environmental Degradation

The intensification of environmental degradation increases the frequency and magnitude of flood disasters (Draper et al., 1989), it is a factor that transforms a flood hazard into disaster. According to UNDP (2008) explains that river and lake floods are aggravated or even caused by deforestation, which causes erosion and siltation of river channel. It is also argued that environmental degradation is caused by poverty (Lavell, 2002). The poor are compiled to exploit environmental resources as a result their risk and exposure to flood disasters increases. Simbeye and Phiri (2012), stress that environmental degradation in the recent time has increased due to rapid population growth. As a result of increasing human population, there is scramble for land resources which force people to cut down trees and cultivate in marginal areas. Draper et al., (1989) argues that deforestation is a primary consequence of human population growth. The author maintains that deforestation lead to environmental degradation and loss of tree cover in the higher elevations and increases the intensity of flooding and erosion downstream. The higher rates of flooding and siltation reduce the useful lives of reservoirs, hydroelectric facilities, and investments in irrigation.

2.6.3 Vulnerability and Poverty

Poverty and other socioeconomic pressures, such as migration, unemployment, AIDS, illegal land tenure practices make people more vulnerable by forcing them to live in dangerous locations, often on unsafe land and in unsafe shelters on low-cost dwellings because there is no other land available at reasonable cost (Maferetlhane, 2012). According to ISDR (2004), poverty is a key issue in the analysis of vulnerability. Poverty does not equal vulnerability but being poor makes people more vulnerable to disasters because poor people lack resources such as physical, social and knowledge based to prepare for and respond to such threats and shocks of natural hazards. Mwape (2014) argues that poor people often get locked in a cycle of vulnerability. Because the poor are vulnerable, they are at great risk in the face of natural hazard, leading to disasters. Moreover, economically marginalized people have less social power and lack adequate resources to survive and recover from the massive floods. Furthermore, Morrow (2000) underscore the close link between poverty and community vulnerability. The Author states: *"the association between poverty and vulnerability is easy to make*". Poverty affects an individual to respond to hazards because of lack of resources that can assist to procure materials for response and recovery.

2.6.4 Vulnerability and Disaster Response and Early Recovery

Disaster response refers to the provision of assistance of intervention during or immediately after a disaster to meet the needs of those affected (UN/ISDR, 2004). The primary objective of this humanitarian assistance is to save lives, alleviate suffering and maintain human dignity. It includes immediate rescue and relief activities such as the provision of food, water and sanitation, shelter, health services and other assistance. It also includes the protection of vulnerable people such as those involuntarily displaced from their homes or whose access to relief assistance may be affected by factors such as a disability.

Actions taken after flood disasters have a major impact on the recovery process to follow. Article eight of the code of conduct of international Red Cross and Red Crescent states that: "*Relief aid must strive to reduce future vulnerabilities to disasters as well as meeting basic needs*" (Concern Strategic Plan, 2005). The World Bank (2006) explains that disaster response programmes need to be planned and implemented accordingly. Since they can often increase vulnerability and turn a hazard into disaster. For example, by constructing homes using the same building techniques that

caused them to collapse will increase vulnerability to flood in future. Moreover, poor households may resort to sell off their scarce productive assets such as livestock to meet basic needs and thus become even more vulnerable to future shocks.

The rapid onset of flood disasters may result in taking shortcuts in consultative process that may sideline local decision- making structures. People and institutions that might help rebuild communities may be left out. Too little may be done to ensure that the social and livelihood needs of the affected population are considered. Poor and vulnerable groups may become even more disadvantaged than were before the disaster (World Bank, 2006). For these reasons, early work to restore essential services, livelihoods opportunities and governance capacity needs to take place in tandem with emergency assistance.

2.6.5 Vulnerability and Climate Change

The world today is at risk of facing development gridlock. The fact is almost all countries of the world are overwhelmed with the problem of the climate change. Most people who are adversely affected by climate change are the poor who already struggle with existing variability. They find it very difficult to protect their families, livelihoods and food supply from the negative shocks of climate change such as floods. Climate change impacts disproportionately increase vulnerability of the poor households because their ability to withstand and recover from disasters is eroded and limited.

2.7 Disaster Risk Reduction and the International Mandates

The need to include disaster risk reduction is growing. Various mandates exist, as the outcome of pledges made by the international community, in an effort to achieve a paradigm shift away from natural hazards and their quantification towards the promotion of disaster risk reduction, which are significant to reduce vulnerability of societies to hazards. Below are some of the mandates:

2.7.1 The International Decade of Natural Disaster Reduction

On 1 January 1990, the United Nations launched an international Decade for Natural Disaster Reduction (IDNDR, 1990-1999), following the adoption of Resolution 44/236 (22 December 1980). The Decade was intended to reduce, through concerted international action, especially in

developing countries, loss of life, poverty, damage and social and economic disruption caused by natural disasters. To support the activities of the Decade, a Secretariat was established at the United Nations Office in Geneva, in close association with the United Nations Disaster Relief Organization (UNDRO). The aim of this decade was to ensure a shift in the reactive approach to natural disasters to a pro-active planning and prevention approach (Smith, 2002). The IDNDR envisaged that all countries would have conducted national risk assessments, developed national and/or local prevention preparedness plans, and implemented global, regional and national warning systems (UNESCO, 2000). The declaration of the decade assisted insuring that there was a shift in how people viewed disasters- from reactive to a proactive approach.

2.7.2 The Yokohama Strategy and Plan of Action for a Safer World

This was the first international conference where the issues of disaster risk reduction were given consideration. This fact is supported by Tau (2007), who states that Yokohama was the first conference where the social aspects of vulnerability were given any serious consideration. This led to the adoption of the Yokohama Strategy and Plan of Action for a Safer World (1994). The strategy stressed that every country has a sovereign and primary responsibility to protect its people, the infrastructure and the national, social and economic assets from the impact of disasters. It further emphasized that community involvement and active participation should be encouraged in order to gain greater insight into individual and collective perception of development and risk, and a clear understanding of the cultural characteristics of each society as well as its behaviour and interactions with the physical and natural environment (ISDR, 1994). The document further stipulates that knowledge is of the utmost important to determine those things, which favour or hinder prevention and mitigation or encourage or limit the preservation of the environment for the development of future generations, and in order to find effective and efficient means to reduce the impact of disasters. In point H of the strategy it is stated that there is a strong need to strengthen the resilience and self-confidence of local communities to cope with natural disasters through recognition and propagation of their traditional knowledge, practices and values as part of development activities (ISDR, 1994). Specifically, point R indicates that all countries are called upon to aim at the application of traditional knowledge, practices and values of local communities for disaster risk reduction, thereby recognizing these traditional coping mechanisms as valuable

contribution to empowerment of local communities and enabling of their spontaneous cooperation in all disaster reduction programmes (ISDR, 1994).

2.7.3 The Second World Conference on Disaster Reduction (WCDR)

In December 2003, the UN General Assembly adopted resolution 58/124, in which it was decided to convene a Second World Conference on Disaster Reduction (United Nations, 2003). The resolution resulted in the Second World Conference on Disaster reduction to increase the commitment to the implementation of disaster risk reduction at all levels, and in particular, its integration into development planning processes. This Conference which was held in Kobe, Hyogo, Japan, on 18-22 January 2005, further focused on building the resilience of nations and communities to disasters. During, the Conference, the progress made was recognized, but it was also admitted that much remained to be done. In response, Governments and agencies agreed to the Hyogo framework for Action 2005-2015, which aimed at promoting the strategic and systematic approach of reducing vulnerability and risks to hazards and emphasizing that education, sharing of experiences and building of capacities are primary elements to create and support the community to reduce disaster risk. In 2015, the Hyogo Framework was replaced by Sendai Framework. This was adopted at the third United Nations World Conference on Disaster Risk Reduction held from 14 to 18 March 2015 in Sendai, Japan. The States present expressed their commitment to address disaster risk reduction and build resilience to disasters but this time with a renewed sense of urgency within the context of sustainable development and poverty reduction.

2.8 Disaster Risk Reduction and the Government of Malawi Mandates

Malawi became a signatory of the United Nations World Conference on Disaster Reduction in 2005. As the outcome of the Conference, Malawi and its development partners have been equally involved in reducing the risk posed by disasters. Enabling structures have been established to assist the implementation of disaster risk reduction programmes from village level to national level. The structures are guided by the Disaster preparedness and Relief Act of 1991 (DPR Act 1991) which is the main legal reference document related to DRM implementation. This DPR Act of 1991 was developed as a result of the Phalombe flashfloods on March 11,1991.Prior to that, the disaster management in Malawi was “ad hoc” (Mwamlima, 2008), thus very reactive. Currently, the DPR Act has been considered outdated by many stakeholders who have appealed for review and

amendments. Before 2015, Malawi did not have a DRM policy. However, in 2009 pending to development of DRM policy, the country designed a National Disaster Risk Reduction Framework (DRRF-2010-2015) and Operation Guideline (OG) for DRM. Then in 2015, the Government published its Disaster Risk Management policy (DRM Policy 2015-2018), which aims at sustainably reducing disaster losses in lives and social, economic and environmental assets of individuals, communities and nation. The Government of Malawi hopes that this will increase resilience of communities to the impact of hazards. Interestingly, the DRM policy has spelt out the term vulnerability on page 1 of the policy document "Environmental degradation, poverty, rapid urbanization, lack of access to information and knowledge, cultural beliefs and customs, limited food diversity, weak buildings/infrastructure, and lack of effective disaster risk reduction efforts have all compounded the vulnerability of the population to hazards". This supports the notion that before implementation of disaster risk reduction interventions, vulnerability of communities to a particular hazard must be assessed so as to bring effective DRR interventions.

The Disaster Preparedness and Relief Act, 1991 created the legal and institutional framework for addressing disaster in Malawi. The established institutional mechanisms include the National Preparedness and Relief Committee (NDPRC) attached to the office of the President. This is the highest-level decision-making for policy directions in the implementation of DRM programmes. The Office of the Secretary and Commission for Department of Disaster Management Affairs (DoDMA), is responsible for ensuring, among other things, that all stakeholders adhere to DRR principles and coordinate and direct DRM programmes in the country. Other technical committees such as Village Civil Protection Committee (VCPC), Area Civil Protection Committee (ACPC) and District Civil Protection Committee (DCPC) were established to provide coordinate DRM activities at district, area and village level. The District Commissioner (DC) coordinates implementation of DRM activities through the Civil Protection Committees (CPCs).

Nevertheless, with all these efforts undertaken to foster DRR into various programmes, it has been noted that the capacity of the Government of Malawi is limited to achieve adequate inclusion of DRR. Among other factors included are resources, commitment and poor coordination of government and civil society. Thieme et al, (2012) in the study titled "Risk Mapping Malawi", found various challenges limiting the Government of Malawi to fully implement DRR. The

challenges include lack of resources, no real institutional commitment and unavailability of multilevel platforms between civil society, national planning institutions and development organizations to come together. The study further established that though early warning systems are available in form of periodical weather forecast and outlooks, there is no community reach in the form of communication.

2.9 Strategies to Reduce Vulnerability

Vulnerability can be reduced by the adoption of appropriate disaster risk reduction interventions. More importantly, the interventions need to be implemented with full awareness that they do not further increase vulnerability but rather reduce such vulnerability. Broadly they include mitigation, preparedness and advocacy. These are not exclusive such that some of the measures can be included under a different or more than one heading (Concern Strategic Plan, 2005).

2.9.1 Mitigation

The Concern Strategic Plan (2005) states that mitigation means "to make less severe" this measures undertaken to reduce the frequency, scale, intensity and impact of hazards. They include structural and non-structural measures. As part of non-structural measures, the Department of Economic and Social Affairs (2002) states various mitigations that can reduce vulnerability; gender sensitive regulatory and legal measures, institutional reforms, improved analytical and methodological capabilities, education awareness, financial planning and potential commitment. Other non-structural measures highlighted in literature include introducing new agricultural practices, promoting dialogue between communities in conflict and relocation of settlements. It is also argued that mitigation should typically consider physical/structural measures, which should include infrastructures such as the construction of earth bunds, gabion cages, contour planting, strengthened dwellings and public buildings, raise riverbanks and re-forestation (Concern Strategic Plan, 2005).

2.9.2 Preparedness

It involves strengthening the capacity of communities to withstand, respond to and recover from hazards. This implies that government and implementing partners must establish speedy and appropriate interventions when the communities' capacities are overwhelmed. Preparedness in this

scenario entails establishing contingency plans and evacuation plans to ensure that a speedy and effective response to be made in-country to emergencies. According to Concern Strategic Plan (2005) preparedness plans can be established at a number of different levels including village or community, local authority and central government. It also states that preparedness should be community-led responses because they assist where there is a requirement for search and rescue interventions (Concern Strategic Plan, 2005).

Preparedness also involves having strong and adequate early warning systems (EWS) to predict the occurrence and intensity of hazards. Early warning systems provide information on an emerging hazardous situation to allow communities and institutions to prepare themselves. In this way EWS are used to reduce the possibility of injury, loss of life, or damage to property and natural environment. Concern Strategic Plan (2005) states three elements to be found within any early warning systems (EWS). Firstly, it must be able to forecast when a hazard is going to occur, and predict its scale and intensity. Secondly, the forecasts must be communicated within, and to communities that are at risk from hazards' impact. Thirdly, there must be sensible response to the warning by communities and other players including local authorities, central government, and international organizations.

2.9.3 Advocacy

These are considered as a means of favourably influencing the wider political, economic, social and environmental context where these factors contribute to the vulnerability of a community, or are one of the underlying causes of hazards (Concern Strategic Plan, 2005). McEntire (2005) as cited in Maferetlhane (2012) suggests that advocacy measures to reduce and manage vulnerability should involve firstly, establishing a knowledge base. The aim should be to gain an understanding of vulnerability. It should also involve conducting a regular assessment of the liabilities and capabilities in the physical and social environments. Secondly, it should involve education of policy makers and citizens on disasters and strengthening of disaster prevention and preparedness institutions. Thirdly, measures should include harnessing technology, protecting the environment, and reducing poverty to reduce vulnerability by addressing contextual factors. Fourthly, other measures should be taken to implement vulnerability management by promoting individual and community empowerment and responsibility. Lastly, "activities should be integrated and

coordinated through public, private and non-profit partnerships and collaboration as a way of reducing liabilities and raise capabilities" (McEntire, 2005).

2.10 Local Capacities

Local capacities are very important assets of reducing communities' vulnerability. They can be part of disaster risk reduction interventions if carefully understood. Therefore this thesis finds it very necessary to understand the Participatory Approach for Safe Shelter Awareness and Sustainable livelihood framework as among best theoretical approaches that underscores the significance of local capacities in reducing vulnerability.

2.10.1 Participatory Approach for Safe-Shelter Awareness (PASSA)

The Participatory Approach for Safe Shelter Awareness (PASSA) is a participatory method of disaster risk reduction (DRR) related to shelter safety. The overall aim of PASSA is to develop local capacity to reduce shelter related risk by raising awareness and developing skills in joint analysis learning and decision-making at community level (International Red Cross, 2014). Basically, PASSA is a bottom up approach which emphasizes much on people to identify the risks and their own capacities to overcome the risks and their shortfalls or problems that need attention from other appropriate authorities either government, non-governmental organizations and other partners. The international Red Cross and Red Crescent (2011) indicates that this is a win-win situation between communities and government because communities understand their own risks related to shelter and government prioritizes choices based on real needs.

2.10.2 Sustainable Livelihood Approach

The basis of this approach lies on the inclusion of local capacities in disaster risk reduction interventions to reduce vulnerability. Concern Strategic Plan (2005) states that it is an approach which is holistic and people centred. The aim of the approach is empowerment of the local marginalized group to effectively reduce vulnerability (Department for International Development [DFID], 1999). Similarly, Birkmann (2006) underline the fact that the sustainable livelihood approach consider the capabilities and capacities that poor people offer to reduce their own vulnerability. Concern Strategic Plan (2005) further states that at the centre of it are the various strengths and capacities of an individual or community which has been divided into six categories

that embraces assets and resources. Further, it is noted that assets should include all financial, physical and natural as well as health, education, social organization and political influence.
It is stated in the approach that an individual or community that has a wide distribution of assets throughout the six categories will be less vulnerable, as they are in stronger position to withstand and recover from the impact of hazards due to diversity of their capitals.

Furthermore, development interventions include activities that increase the capital assets of individuals and communities. These activities cover the whole spectrum of development sectors and can include programmes such as education, HIV awareness, micro-credit, agricultural diversity or re-forestation. The sustainability of these programmes will not diminish other categories of the capital assets and vice versa.

Therefore looking at the arguments of these two theoretical approaches, this thesis highlights that local capacities are indeed very important assets to reduce vulnerability. This means that if they can be effective, they can reduce communities' risks and then strengthen community resilience. Moreover, the views of the two approaches discussed above, can be stated that they have a significant explanation on how vulnerability can be reduced by addressing root causes, dynamic pressures and minimizing unsafe conditions as highlighted in the three progressive levels of the PAR model.

2.11 Summary

This section, in discussing the concept of vulnerability, focused on vulnerability conceptual framework, the approach of vulnerability, underlying and theoretical factors of vulnerability, vulnerability assessment methods, and approaches to reduce vulnerability (disaster risk reduction measures and local capacities). The literature review covered these aspects because they were very relevant to the objectives of the study. It is vital to note that these areas were selected with adequate understanding of the topic. More significantly, the understanding of these categories of analysis provides a basis of the vulnerability and capacity assessment thereby a full picture emerges of how to reduce disaster risk to individual and communities.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study Design

The study adopted a cross sectional survey utilizing both quantitative and qualitative research methods. The quantitative method was used to evaluate the main factors that determine trends and magnitudes of people's vulnerability to floods. The qualitative method was used to obtain in-depth perceptions of participants on the nature of the problem(s) that keep causing vulnerability of people to floods. The rationale for mixing both quantitative and qualitative approaches was for the purpose of triangulation. Mwape (2009) argues that triangulation helps to neutralize the bias that can be inherent in a particular data collection, investigator and method because it is used in conjunction with other data sources, investigator and methods.

3.2 Selection of Study Area

The study area was GVH Matani Mwakasangila and Mujulu Gweleweta in Traditional Authority Kilupula, in the northern part of Karonga district.

3.2.1 Profile of Study Area at District Level

Karonga lies between latitudes 09º E and 10º S along 33º longitude (District Environmental Outlook, 2015). The district covers an area of 3,355 Km^2, which is about 3.5% of national total land area (94,274Km^2) (Socio-economic profile (SEP), 2013-2018). Its main topographic features are the flat rift valley plain along the lakeshores 500meters to 600metres, the rift valley escarpment zone 601metres to 1400metres and the high hills and plateau zone 1401metres to 2000metres above sea level (SEP, 2009-2012). The district has an estimated population of 307,216 (NSO, 2012) now estimated at 348,000 people which represent 2.07% of the total population of Malawi (SEP, 2013-2018).

The district town is situated 220km and 585km north of Mzuzu City and Lilongwe, the capital city of Malawi respectively. The district boundary with Tanzania is zero kilometers from Songwe River because Songwe is a boundary. It also shares district boundaries with Chitipa to the West and Rumphi to the South. The district has been characterized by occurrence of high magnitude and

increased frequency of flood disasters. Though flooding is not limited to a particular geographic area, but the areas hardest hit include those of T/A Kilupula and Paramount Chief Kyungu.

Figure 2: Map of Karonga district showing location of Traditional Authority Kilupula (Department of Physical Planning, Karonga District Council)

3.2.2 Flooding Profile at District Level

The documented evidence of vulnerability to floods in Karonga district dates back to the early 1960s. However, by 1981 records about floods started to be seriously documented following a major flooding disaster destroyed most of the old town along the lakeshore in 1980s. Macheyeki et al. (2016) indicates that in 1979/80, floods occurred because the water level in Lake Malawi rose from 471 m above Karonga reference level in 1915 to 477m in 1980. Kushe et al., (2016) noted that the rise of the lake induced flooding damage of the old town and led to relocation of the commercial centre to the current site in 1987. As a response to the Gitec Consult feasibility study

which showed that Karonga town was at risk mainly due to out bank of North Rukuru River, dykes had to be constructed to control any recurring flood occurrences. Despite the development of dykes, the recorded data on floods since 1974 (Table1) indicates that the north (in T/A Kilupula) and north west (in Paramount Kyungu) are affected by various types of floods which are common along rivers Rukuru, Lufilya, Songwe, Kyungu and Lake Malawi. The wide range of river networks means that the swelling of rivers due to heavy rains has devastating effects to the livelihoods living close. The trend of floods from 1974 to 1992 shows that Karonga South and Central did not experience much flooding because the environment was not much degraded (DFEP, 2016).

Table 1: Trends of floods and affected areas in Karonga district (1974-2016)

Year	Rivers/ Lake	Areas Affected
1974	Rukuru and lake Malawi	North, North West
1978	Rukuru, Lufilya and Songwe	North, North West
1983	Rukuru, Lufilya and Songwe	North, North West
1988	Rukuru, Lufilya and Songwe	North, North West
1992	Rukuru, Lufilya and Songwe	North, North West
2006	Songwe and Kyungu	North and Central
2011	Rukuru	North and Central
2016	Various rivers	North, Central and South

Source (District Flood Evacuation Plan, 2016)

3.3 Profile of the Study Areas

3.3.1 GVH Matani Mwakasangila

The area of GVH Matani Mwakasangila is found in T/A Kilupula located about 16 km north of Karonga town. GVH Matani Mwakasangila has five Village headmen (VH) namely Eliya Mwakasangila, Matani Mwakasangila, Chipamila, Shalisoni Mwakasangila and Fundi Hamisi. The greater part of the area - Eliya Mwakasangila, Chipamila and Matani Mwakasangila, are bounded by Lake Malawi to the eastern side and M1 road-Songwe-Tanzania border to the Western side. The other two villages Shalisoni Mwakasangila and Fundi Hamisi are to the Western side of the M1 road. The area has numerous networks of rivers such as Lufilya, Kasisi, Fwira, Ntchowo, and Kasoba. The area has two primary schools (Maro and Ntchowo) and one health post at Miyombo in VH Fundi Hamisi. The main hospital for the area is Kaporo Rural Hospital located at latitude (0595943) and longitude (8920187) in GVH Gweleweta. Serious cases are referred from

Kaporo Rural Hospital (KRH) to Karonga District Hospital (KDH) which is the referral hospital in the district. The area has no Flood Evacuation Centre such that during floods, victims are forced to camp in classroom blocks and sometimes others temporarily stay on the main road and churches.

1:50,000

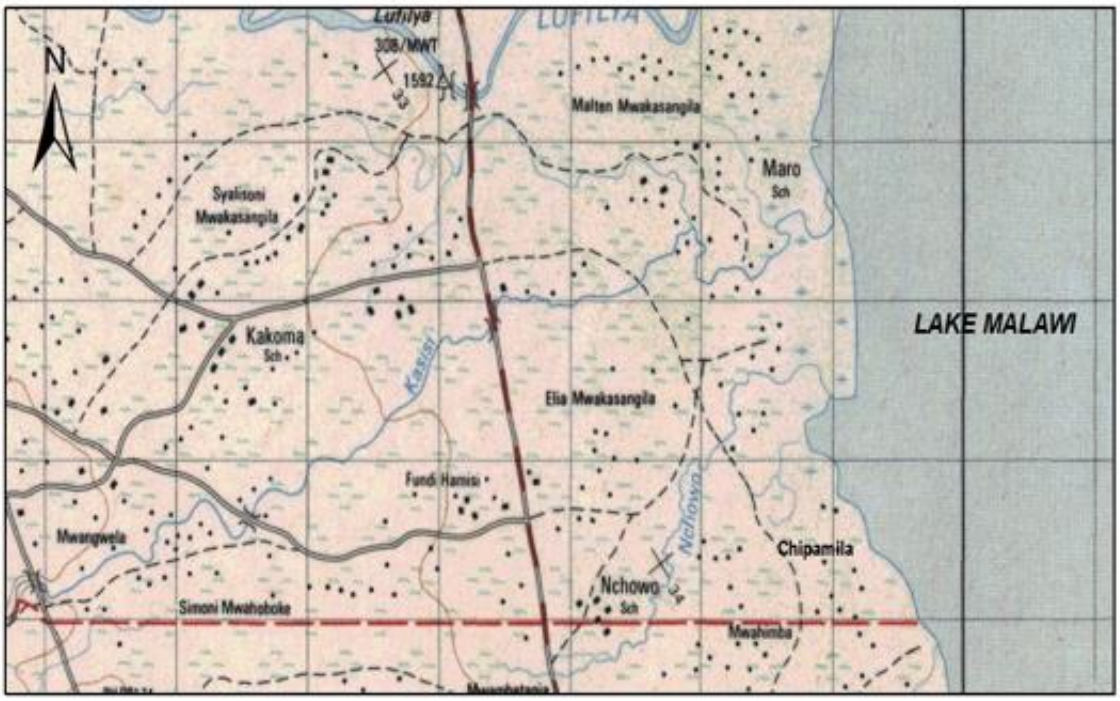


Figure 3: Location of GVH Matani Mwakasangila in Traditional Authority Kilupula

Source (Department of Physical Planning, Karonga District Council)

3.3.2 GVH Mujulu Gweleweta

The area of GVH Mujulu Gweleweta is found in T/A Kilupula located about 22 km north of Karonga town. GVH Mujulu Gweleweta has seven Village headmen (VH) namely James, Gweleweta, Chakwera, Chimalabanthu, Mangulu, Yarero and Phaniso. Five villages (Phaniso, Chimalabanthu, Chakwera, Mangulu and Gweleweta) were chosen because these are the most vulnerable villages to floods. Two villages within the GVH (Chakwera and Gweleweta) are bounded by Lake Malawi to the eastern side and M1 road –Songwe- Tanzania boarder to the Western side. The other three villages; Chimalabanthu, Phaniso and Mangulu are to the Western side of the M1 road. The area has numerous networks of rivers such as Kiwe/Kabundi, Mayofya, Wiloye, and Ngalamu. The area has two primary schools (Kiwe and Kaporo) and one hospital

which is Kaporo Rural Hospital. During floods, victims are camped at a Church which is used as rescue center located in VH Chimalabanthu at latitudes (0594345) and longitudes (8920197) with height above sea level as 496 metres.

1:50,000

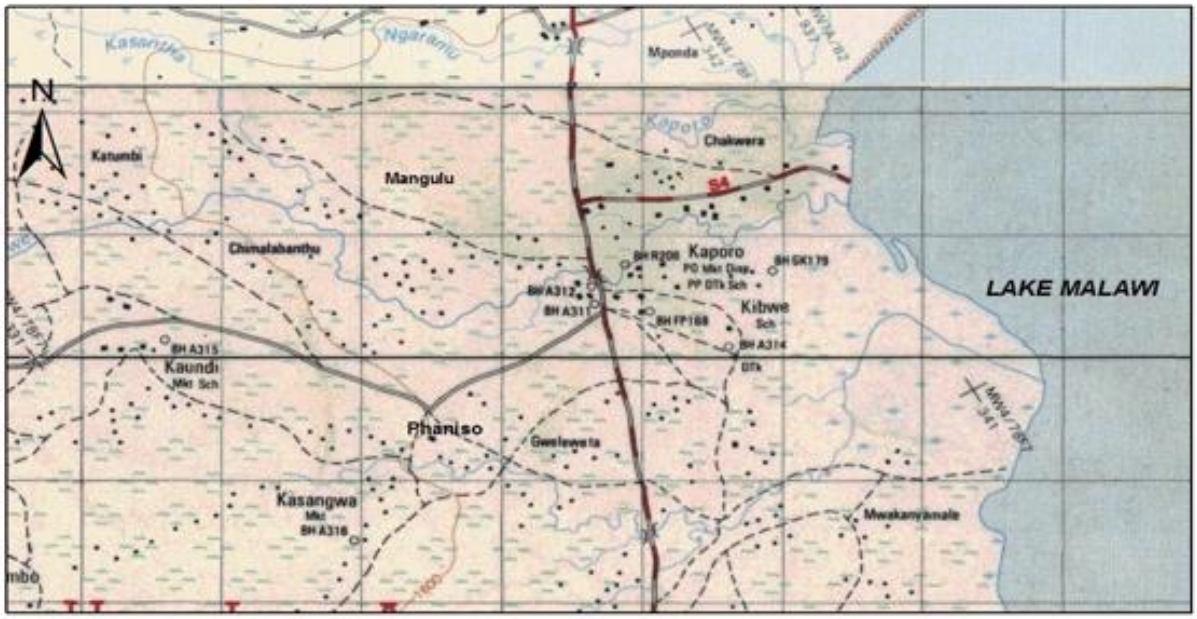


Figure 4: Location of GVH Mujulu Gweleweta in Traditional Authority Kilupula Source (Department of Physical Planning, Karonga District Council)

3.3.3 Justification for the Study Area

The two areas were chosen because the nature of their locations is prone to flooding. This makes the residents vulnerable to flood hazards that cause disaster every year. Secondly, the areas are dominated by flood plain along the shores of Lake Malawi. These areas are flat and low lying areas as such this becomes the pre-requisite to flooding in the event of heavy downpour. Thirdly, the choice of these two areas is due to high population growth rate and issues of culture which have forced the people to occupy dangerous areas and even occupy the protected areas rendering them vulnerable to the effects of flooding. Lastly, the last flood in these two areas occurred recently in 2016 which was easy to be verified from officials responsible for flood management. Moreover, the fact that flooding in these areas occurred more recently implies that respondents could easily remember their flood experiences.

3.4 Methods

The causes that give rise to vulnerability and those that can replicate vulnerability over time are economic, demographic, cultural, social, political and environmental processes (Leon, 2006). Blaikie et al. (1994) argues that what constitutes an increase in people's vulnerability is that people have insecure livelihoods and resources, receive little attention from government interventions, have no trust in their own methods of self- protection and lose confidence on their own local knowledge. Due to these factors, both quantitative and qualitative tools were employed to assess the stated issues. Below is a separate description of quantitative and qualitative techniques that were employed to assess the issues.

3.4.1 Quantitative

Cross sectional survey targeting household participants in the selected villages of GVH Matani Mwakasangila and Mujulu Gweleweta was conducted. The process in which the survey was done quantitatively especially the way data was collected, the sampling procedures, the research tools and variables assessed as well as the data analysis procedures is described below.

3.4.1.1 Sampling Procedures

Population

The target population was in villages of GVH Matani Mwakasangila and Mujulu Gweleweta in T/A Kilupula. This study used a total of 10 village headmen (VH), five from each GVH. The choice of five VH in each GVH was based on the fact that each GVH in T/A Kilupula has minimum number of five Village Headmen (Karonga Chief Classification, 2016). GVH Matani Mwakasangila and Mujulu Gweleweta have 4035 and 5139 total number of households respectively from which the sample of this study was derived.

Sampling method

Household participants were selected through simple random sampling. Participants were determined according to the number of the households of the village to the total households of Group Village Headman (GVH). From each village, households were randomly selected to give a representation of all affected households in that village. This most vulnerable households were targeted based on distance from rivers and elevation thresholds.

Sample Size

The sample size was calculated using a formula developed by Fisher et al. (1983).

$n = \frac{z^2pq}{d^2}$, where:

n = Minimum sample size

z = Constant, standard normal deviation (1.96 for 95% confidence interval)

p = Proportion of the target population (The targeted adoption rate is at least 20%)

q = Alternate proportion (1 – p), which is 1 – 0.2= 0.8

d = Acceptable margin error, which is 0.05 at 95% confidence interval

$$n = \frac{(1.96)^2(0.8)(1-0.8)}{0.05^2} = 246$$

The total sample size calculated at 20% targeted population was 246 household participants. However, during the survey 200 participants were interviewed face-to face. From the sample size of 200, the number of household participants in the villages was calculated based on the population of households of each village to the total population of the GVH and also the households' location relative to river position and elevation thresholds.

3.4.2 Research Tool and/or Instrument

A questionnaire was developed based on the Pressure and Release (PAR) Model. The PAR model is a tool for showing how disaster occurs when natural hazards such as floods affect vulnerable people. Below is a description of each data collection tool and the issues that were assessed. The data collection tools were pretested.

Household Surveys

Quantitative data was collected using structured close-ended questionnaire to capture household information relating to flooding, vulnerability, local capacities and disaster risk reduction policies and measures. The questionnaires were developed in English and translated in local language Ngonde. Face-to-face interviews were conducted with household participants who were above 18 years old and were available during the time of recent floods 2015/16. This means that the interviewers were not free to contact whomsoever they wanted.

GPS Receiver

GPS coordinates were recorded for each village headman after administering household questionnaire .They helped to gather information pertaining to household location points and depth (height above sea level). The coordinates were recorded in order to map location of households from which data was collected.

3.4.3.2 Quantitative Analysis

Data collected from households using structured-close ended questionnaire was entered and analyzed using SPSS version 20. Descriptive statistics such as mean, percentage and tables were used in determining various vulnerability issues that were assessed i.e. physical, social, economic, environmental and cultural factors. The statistical analysis such as chi-square tests and probability value (p-value) were used to determine the associations between demographic characteristics and vulnerability factors. The analysis was at 95% confidence level i.e. p- value 0.05. Correlation was also used to establish relationship that depicted the trends between factors generating vulnerability and severity of past and recent floods. This helped to determine the factor that increases the trends and magnitudes of vulnerability in relation to the occurrence of floods.

Coordinates collected using the GPS receiver were entered into Quantum Geographic Information System (QGIS) to produce a polygon. The polygon was over layered on top of the topographic map of T/A Kilupula. Then the map was produced to show the location of villages in which the households were sampled.

3.4.3.3 Data Variables and Measurements

The variables were categorized based on the PAR framework (Figure 1). Hypothetically, within the phenomenon of the framework, there cannot be a disaster if there are hazards but without vulnerability or if there is vulnerable population but without a hazardous event (Blaikie et al, 1994). The vulnerability of a group of elements at risk characterizes the capacity of the elements to withstand the effects of a hazard or the degree to which damage will be sustained (Blaikie et al, 1994). For example, a house that has been reinforced may withstand a flash flood. This implies that vulnerability and capacity manifest themselves once a community is exposed to hazardous event.

The intersection of a disaster, vulnerability and hazard is quantified as disaster risk (R) = hazard (H) x vulnerability (V) simply R = V x H. From this tabulated equation, the occurrence of disaster is determined by the dependent variable vulnerability.

In this thesis, vulnerability was constructed by a set of variables from the five underlying vulnerability factors i.e. physical (quality of building materials), social (lack of knowledge in DRR and lack of local institutions support), economic (income levels, income generation activities, diverse sources of livelihoods, poverty and damage to staple crop and food stocks), environmental (pressure on cultivated land and geographical location) and cultural factors (traditional beliefs, conflicts, defiance of safety precautions and regulations and absence of personal responsibility). These variables considered all the three stages that lead to the generation of vulnerability **(**Figure 1).

To measure vulnerability based on the highlighted variables, two sets of categories were used. The first category was used when assessing characteristics generating vulnerability. This category used measurement scale of 1- 3, in which 1 meant less important, 2 important and 3 very important. The second category measured the level of the vulnerability of the elements at risk. Elements at risk are those assets that people's lives rely upon. They include (but not limited to) houses, water supply, crops, livestock, infrastructures, social services (schools, health posts, & electricity), natural environment. The vulnerability of people increases if these elements do not withstand the impact of a hazard (Blaikie et al, 2005). This category used a measurement scale of 1= not vulnerable, (0-25%), 3 = severely vulnerable (76-100%), 5= vulnerable (51-75%) and 7= slightly vulnerable (26-50%). In Table 2, characteristics generating vulnerability (A) and elements at risks (B) have been combined with its measurements in all outcomes of underlying vulnerability factors.

Table 2: Vulnerability Variables and Measurement Scores

VULNERABILITY VARIABLES		
OUTCOME	**MEASUREMENT RATE**	**MEASUREMENT RATE (%)**
	CONDITIONS GENERATING VULNERABILITY (A) 1= Less important 2= Important 3= Very important	**ELEMENTS AT RISK (B)** 1= Not vulnerable (0-25) 3= Severely vulnerable (76-100) 5= Vulnerable (51-75) 7= Slightly vulnerable (26-50)
PHYSICAL	• Poor construction standards • Safe shelter awareness • Lack of building materials	• Houses • Toilets • Wells and boreholes • Roads and bridges
SOCIAL	• Lack of Knowledge in DRR • Lack of Skills to cope with urgent needs • Lack of local institutions support	• Health posts • Schools • warehouses
ECONOMIC	• No credit unions • Lack of income generating activities • Poverty • Lack of alternative livelihoods	• Staple crops (cassava & maize) • Cash crops (rice) • Livestock (cattle) • Trading & fishing
ENVIRONMENTAL	• Pressure on arable land • Residing in prone areas • Scarcity of water & energy	• River channels • Forest cover • Land and soil quality
CULTURAL	• Traditional beliefs • Cultural conflicts • Defiance to safety measures • Absence of ownership	• Broken social networks

Source (own compilation, 2017)

The explanatory variables included household demographic characteristics such as age, sex, marital status, education level and source of income of household heads (Table 3, below). This is supported by Buckle et al. (2000) who argues that the widely used vulnerability indicators are age, education, gender, income, employment, ethnicity, household composition and type of dwellings.

Table 3: Explanatory variables and their measurements

VARIABLES	MEASUREMENT RATES
AGE	• 21- 30 years = 1 • 31- 40 years = 2 • 41- 50 years = 3 • 51- 60 years = 4 • > 61 years = 5
SEX	• Male = 0 • Female = 1
MARITAL STATUS	• Single/divorced = 1 • Married = 2 • Widowed = 3
OCCUPATION	• Crop production = 1 • Livestock production= 2 • Fishing = 3 • Agricultural trading = 4 • Charcoal burning = 5
EDUCATION LEVEL	• No formal education = 1 • Primary level = 2 • Junior secondary level = 3 • Tertiary level = 4

Source (own compilation, 2017)

This study considered the disaster risk reduction policies and strategies of mitigation and preparedness measures under the category of local capacity/ institutional set up. Key variables were demarcated as local capacities and disaster risk reduction measures. Local capacity included actions taken by the household to mitigate flood damage and loss. On disaster risk reduction, a set of variables included mitigation (relocation and use of knowledge sharing), emergency preparedness (early warning systems, public commitment and participation).

3.4.4 Qualitative Methods

For triangulation purposes, the qualitative methods were used to gain a wider understanding of vulnerabilities and capacities of local people. In addition, it was employed to obtain in-depth understanding of the perspectives of participants on the nature and underlying factors that keep increasing the trends and magnitudes of people's vulnerability to floods. Finally, it was conducted to ascertain the perspectives of participants on the practice of disaster risk reduction policies and strategies necessary to reduce vulnerability.

3.4.4.1 Population

The target population was officials from Government Departments and Non-governmental organizations (NGOs), indigenous leaders (Chiefs and elders), Area Civil Protection Committee (ACPC) and Village Civil Protection Committee (VCPC) and the District Civil Protection Committee (DCPC).

3.4.4.2 Sampling

Purposive sampling was employed for selecting 15 key informants comprising seven (7) officials from Government Departments and Non-governmental organizations (NGOs) and eight (8) chiefs and elders. Area Civil Protection Committee (ACPC) and Village Civil Protection Committee (VCPC) were also sampled using the purposive technique. The sampling technique is commonly used for a qualitative research and especially small-scale projects. Purposive sampling is non-probability sampling as such it entails that respondents are not randomly selected but rather handpicked.

3.4.4.3 Data Collection

Qualitative data was collected through semi-structured interviews with key informants and focus group discussions with members of Area Civil Protection Committee (ACPC) and Village Civil Protection Committee (VCPC). Interview guides and focus group discussion guides contained open-ended questions which allowed participants to express their feelings and thoughts.

3.4.4.4 Semi-structured Interviews

This was carried with key informants to gain a wider understanding of vulnerabilities and capacities by talking to those who have influence to local people. This was also to ensure that local government officials are interviewed because they control many resources that could lead to the success of disaster risk reduction activities in the area. Moreover, communication with key informants' increases chances of gaining appropriate information on the local activities (capacities) to reduce vulnerability. Activities to reduce vulnerability tend to be effective if supported and not challenged by those in authority/power.

3.4.4.5 Focus Group Discussion

Two Focus Group Discussions (FDGs) were carried in every GVH. The FGDs for each GVH had 10 members, 3 officials from VCPC, 2 officials from the ACPC,2 local leaders (Chiefs), 1 official from education (head teacher), 1 official from health (Health Surveillance) and 1 extension worker. The objective was to solicit their views on the vulnerability of local communities and on their capacity to respond to and recover from flood events. Additionally, this was carried as a necessary tool to talk to individuals who have a different perspective, level of knowledge and understanding from the majority in order to establish variation of vulnerabilities, capacities and disaster risk reduction measures in the area. Lastly, it provided an opportunity for the VCPC members to share their experiences with Chiefs, health personnel, teachers, community members and thereby contributing to refine information from the semi-structured interviews.

3.4.5 Qualitative Data Analysis

The qualitative data from key informants and focus group discussions was analyzed descriptively. The data was read and examined carefully to provide a detailed understanding of the nature of the problem that keeps causing vulnerability of people in GVH Matani Mwakasangila and Mujulu Gweleweta in T/A Kilupula. The themes which were analyzed for both key informants and focus group discussions included; historical account of frequencies and magnitudes of flooding, nature of the factors increasing vulnerability and local institutional measures and strategies. From these themes, a meaningful pattern/conclusion was established between quantitative and qualitative results in the discussions of the major findings. Tshilunga (2014), stresses that qualitative data analysis is a deductive process of organizing the data into categories and identifying patterns among the categories.

3.5 Quantitative and Qualitative Relationships

Caracell et al. (1989) stipulates five reasons for connecting/merging quantitative and qualitative methods in a single study. These reasons are for triangulation, complementary, development, initiation and expansion. Bryman (2006) highlighted that when utilizing these approaches in a single study, researchers need to at least give one clear reason for combining the methods.

Therefore, the connection of quantitative and qualitative methods in this study was for the purpose of triangulation. It was important that the methods be combined to triangulate findings of the first quantitative phase with the subsequent qualitative phase so that findings would be mutually corroborated. This was sought in order to overcome the deficiency of using one method in vulnerability and capacity assessment (VCA).

3.6 Ethical Consideration

Permission to conduct the study was sought from District Commission (DC), Karonga district Council and Traditional Authority Kilupula for approval to conduct this study in GVH Matani Mwakasangila and Mujulu Gweleweta. The T/A endorsed the stamp, and then the T/A's consent was forwarded to GVH Matani Mwakasangila and Mujulu Gweleweta who later acknowledged the VH plus households. Before the data collection was resumed, the aim, purpose and importance of the research were explained to the participants. As obligation for ethical consideration, the participants were assured of anonymity and confidentiality. They were also informed that they could either accept (or decline) to take part in interviews in case the questions were not meeting their interest.

3.7 Data Management

Quantitative data collected using structured questionnaires were coded with numbers (1-100) those from GVH Matani Mwakasangila and (101-200) from GVH Mujulu Gweleweta. The questionnaires were checked if they were assigned with exact number corresponding to the village they were administered. Information in every questionnaire was checked to see if questions were responded correctly especially those administered by the research assistants. Households coordinates, height above sea level and village codes were also checked. The questionnaires were later packed in a sealed envelope ready for data analysis and interpretation of the results.

Qualitative data collected from semi-structured interviews were documented and audio recorded. These audios where stored in a folder and CD disk clearly labelled "Semi-Structured interviews Audios". These audios where transcribed during data analysis process. Information from semi-structured interviews was also documented on (4) Note books 5"x 8" with 50 sheets each. Later

these note books were packed in a sealed envelope ready for data entry into SPSS for analysis, presentation and discussion of the results.

3.8 Limitations

During data collection there were certain issues that made the process challenging. Travelling to different places was a problem due to poor conditions of the roads. Most roads were not in good condition to the extent that bicycle taxi operators were reluctant to cycle to those areas. To overcome this problem, a special arrangement with some community members was made whereby four bicycles were hired at an agreed cost. The other challenge was the people's mindset about humanitarian relief on disaster response. Many households were very eager to be interviewed and even those not selected during random sampling were demanding to be interviewed hoping for disaster relief handouts. This challenge was elucidated by explaining to the participants that the purpose of the study was purely academic which would be used for policy interventions by stakeholders in disaster risk reduction and management. Also, due to financial constraints, it was difficult to visit some areas like Kaporo North Escarpment which is a catchment for some rivers like Lufilya which cause a lot of flooding to appreciate the extent of deforestation at the protected encroached area. However, information regarding the area was collected from the Karonga Forestry offices.

3.9 Summary

This section has described the study design, study area, sampling methods, data collection procedures, and data collection tools and/or instruments as well as data analysis procedures based on the study conducted in T/A Kilupula. The area was chosen because of its geographical position. Therefore, the research used various method of data collection to ensure construct validity and reliability. It is hoped that by using all these methods and instruments recapitulated in this section, all the study objectives were achieved.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Results

This section focuses on how the quantitative and qualitative data unfolded; and it presents the analysis of the results and findings that were derived from the study.

4.1.1 Demographics Characteristics of Participants

Table 4: Demographic Characteristics of Households' Participants

VARIABLES	MEASUREMENTS	FREQUENCY DISTRIBUTION	
		n=200	%= 100
AGE	21-30 years	48	24
	31- 40 years	52	26
	41 – 50 years	44	22
	51 – 60 years	31	15
	> 61 years	25	13
SEX	Male	92	46
	Female	108	54
MARITAL STATUS	Single/divorced	12	6
	Married	166	84
	Widow/widower	22	11
OCCUPATION	Arable farming (subsistence)	140	70
	Livestock production	12	6
	Fishing	8	4
	Agricultural trading	40	20
EDUCATION	No formal education	44	20
	Primary education	124	62
	Junior secondary level	24	12
	Senior secondary level	8	4

Source (own compilation, 2017)

The demographics characteristics of households show that more participants interviewed (62%) attained primary level, (70%) were subsistence farmers and (84%) were married. More females than males were interviewed (Table 4). The results further show that participants in all age ranges were interviewed, with decreasing number in the ages above 50 years.

4.1.2 Factors that Determine the Trends and Magnitudes of Vulnerability

Table 5: Underlying Vulnerability Factors

n= 200	Measurement rates: 1=less important; 2= important; 3= Very important			
Outcome variables of underlying vulnerability factors	Average % in category of less important	Average % in category of important	Average % in category of very important	Total average % in each vulnerability factor
Physical	12	27	61	100
Social	16	29	55	100
Economic	17	28	55	100
Environmental	19	21	60	100
Cultural/human	30	37	33	100

The results show that the physical factors (61%), environmental factors (60%) and the social and economic factors (55%) are above the average (50%) on the category of very important factors generating vulnerability while the cultural factors (33%) are below the average and greater on the category of less important (30%) than all the factors, (Table 5).

Key informants also reported that all the factors contribute to generate vulnerability. In their views they expressed that vulnerability is mainly generated by cultural beliefs. One participant reported that "*the main challenge is on the Ngonde culture of respecting the graveyards of their forefathers*". Their views showed variation with the result in Table 5.

Table 6: Elements at Risk in Vulnerability Factors

n=200	Scale Range: 1= Not vulnerable (0-25%); 7= Slightly vulnerable (26-50%); 5= Vulnerable (51-75%); 3= Severely vulnerable (76-100%)				
Outcome variables of the Elements at Risk in vulnerability factor	Average % in category on not vulnerable	Average % in category of slightly vulnerable	Average % in category of vulnerable	Average % in category of severely vulnerable	Total average percentage in each element
Physical	4	4	8	84	100
Social	15	39	16	30	100
Economic	9	4	63	24	100
Environmental	8	47	6	39	100

The analysis of the results shows that the physical elements are severely vulnerable (84%); the economic elements are vulnerable (63%) while the environmental and social elements are slightly vulnerable (47%) and (39%) respectively (Table 6).

Participants in semi-structured interviews and FGDs also reported that the elements at risk to floods are houses and livestock and agricultural crops such rice, maize, cassava. One key informant reported that "*653 hectares of crops such as maize, cassava and rice were either washed away or silted by the floods occurred on 31st march and 15th April, 2016".*

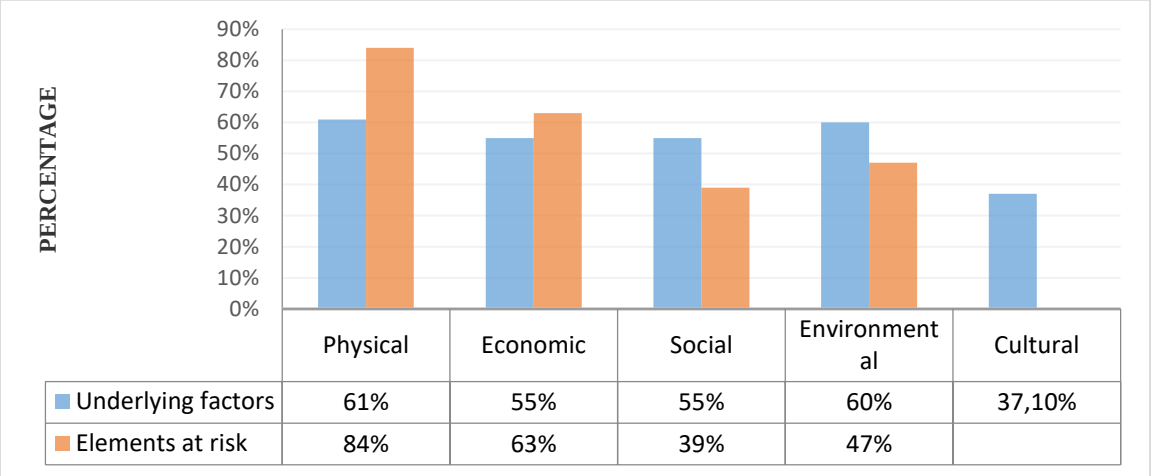


Figure 5: Percentages in Underlying Factors and Elements at Risk for Each Factor

Except for the cultural factors, the results show that the elements are at risk in all vulnerability sector/factor. The percentage in underlying factors generating vulnerability and the elements at risk is high for physical factors followed by economic factors (Figure 5).

Table 7: Relationship of Vulnerability Factors and Demographic characteristics

Variables	**Physical**		**Social**		**Economic**		**environmental**		**cultural**	
	p-value	chi²	*p*-value	chi²	*p*-value	chi²	*p*-value	chi²	*p*-value	chi²
Age	0.322	14.453	0.095	20.335	0.085	33.285	0.147	38.011	0.0764	35.306
Sex	**0.006**	8.547	0.164	5.745	0.164	18.507	**0.026**	5.223	**0.004**	10.997
Marital status	**0.010**	26.305	0.179	21.977	**0.003**	6.106	**0.026**	14.203	**0.043**	28.543
Occupation	0.121	28.063	0.397	47.868	**0.038**	30.436	0.288	56.842	0.121	40.756
Education	0.281	37.529	0.084	24.609	0.203	47.814	**0.003**	22.664	**0.030**	27.230

(The association is significant at $p \leq 0.05$)

The results of the associations between vulnerability factors and demographic characteristics show that there is no relationship between age and all other vulnerability factors (Table 7).

The views gathered from participants in semi-structured interviews and FGDs also indicated variation of the vulnerability of people in relation to demographic characteristics. One community leader said: "the *patriarchal system has affected women to plant their crops very late such that their crops either get washed by floods or dry up due to abrupt cut off of rain".* In the FGDs, it was reported that children are the most vulnerable group because they are taken as baby-sitters during cultivation of rice as parents take advantage of floods.

Table 8: Relationships between Vulnerability Factors and Flood Severity

Flood severity	Vulnerability factors				
	Physical	**Social**	**Economic**	**Environmental**	**Cultural**
	(r)	***(r)***	***(r)***	***(r)***	***(r)***
Recent floods	0.509	0.734	0.477	0.578	0.897
Past floods	0.162	0.271	0.262	0.123	0.009

The relationship between the factors and flood severity revealed a strong, medium and weak correlation coefficient (*r*) value for all the factors, that is, they determines the trends and magnitudes of vulnerability. However, the result showed that only the cultural factor was significant to the past floods (Table 8).

Participants in semi-structured interviews and FGDs also expressed that the recent floods are quite worrisome due to their increased occurrences. One key informant said: "*recent floods remain historic in my life time due to its increased frequency and magnitude as compared to when I was a young man as I never saw water in our homes like this time".*

Furthermore, the results of the mapped location points of the villages in which the households' coordinates were recorded showed the elevation threshold between the ranges of 483 to 502 metres above sea level (Figure 6,below). Key informants during semi-structured interviews expressed that most people are vulnerable to floods due to geographical position of the area. One key informant said: "*vulnerability depends on soil seepage and this area is very flat with open fields associated with clay soil which has high water retention and that there is high deforestation due to bad farming practices which all together have increased overflowing of rivers".* During Focus Group Discussion, one VCPC member highlighted that most parts of the area to north and west shores of Lake Malawi are dominated by flood plain causing flooding in the event of heavy downpours.

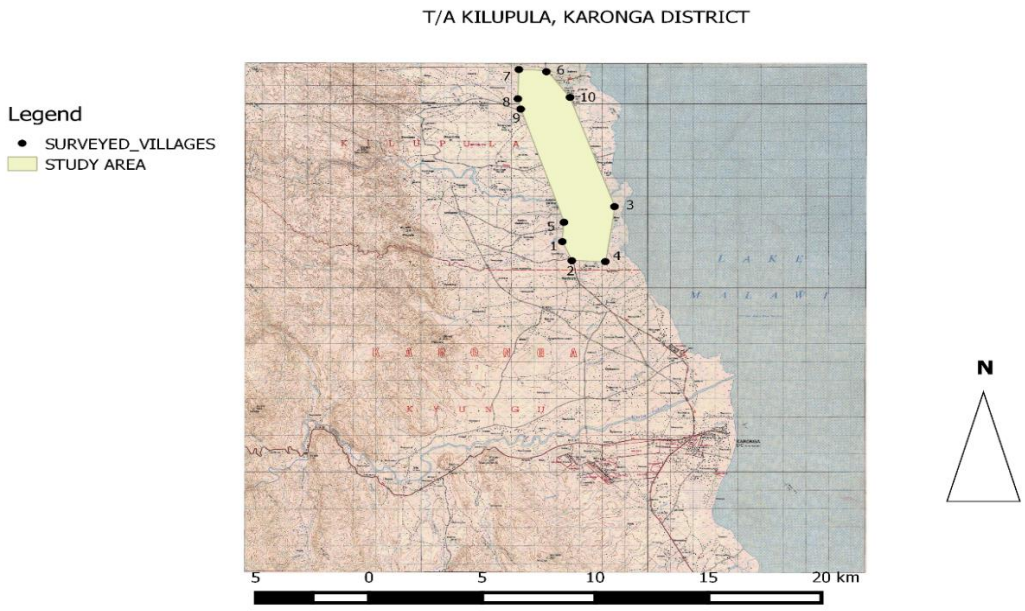


Figure 6: Spatial Distribution of Villages in GVH Mwakasangila and Gweleweta of Traditional Authority Kilupula

ATTRIBUTE TABLE

ID	NAME OF VILLAGE	X COORDINATE	Y COORDINATE	ELAVATION (m ASL)
1	SHALISONI MWAKASANGILA	596243	8912519	490
2	FUNDI HAMIS	596661	8911482	493
3	MATANI MWAKASANGILA	598548	8914426	480
4	CHIPAMILA	598146	8911433	486
5	ELIYA MWAKASANGILA	596316	8913570	483
6	CHAKWERA	595541	8921760	486
7	MANGULU	594320	8921878	502
8	CHIMALABANTHU	594279	8920284	496
9	PHANISO	594403	8919728	489
10	GWELEWETA	596584	8920365	485

4.1.3 Existing Gaps between Theory and Practice in Disaster Risk Reduction and Management

4.1.3.1 Relocation

The results show that 84% participants showed unwillingness to relocate, 12% of the participants indicated they can relocate and 4% participants were uncertain (Figure 7).

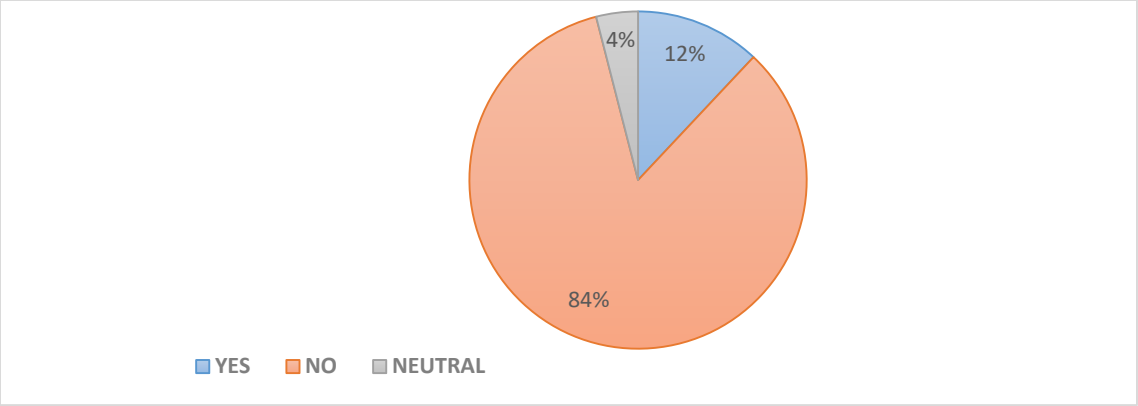


Figure 7: Willingness for Relocation of Households

The results also revealed that among the major reasons that contribute to high unwillingness of the people to relocate to upland areas despite being at risk to floods every year are benefits from agricultural activities (rice cultivation and alluvial soils-49%) and custom of taking care of the forefathers' graveyard (25%).

In semi-structured interviews and FDGs it was expressed that relocation for those people in flood prone areas could be very difficult due cultural beliefs and personal interest on floods. One participant said that "*people believe in their ancestral spirits and they have a cultural feeling that crocodiles never live in upland areas*". That is to say they cannot relocate because they are used to living in water and eating rice and fish. Other reasons reported were reliance on relief items, land governance and chieftaincy issues. One key informant said: "*Traditional Authority Kilupula's area has registered the highest incidences of chieftainship wrangles in Karonga district in the past and present forms which have tremendously contributed to impeding implementation of disaster risk reduction and management strategies*". Some key informants reported that the conflict of the Kilupula succession dispute from the period of 2010-2015, just after the 6th to 20th December, 2009 earthquakes, followed by the March-April 2010 floods affected the provision of emergency preparedness, recovery and rehabilitation process.

4.1.3.2 Early Warning System (EWS)

The results of household survey revealed that early warning systems on magnitudes (75%) and time occurrence (71%) of floods are not available. Views of community leaders also showed that

information with which to alert people about magnitudes and occurrence is lacking. One community leader said "*we have no communication about the magnitudes and occurrence of floods than relying on our human mechanisms like observing hill flowers to indicate high rainfall with likelihood of heavy flooding*". Another key local official highlighted the district authorities and general public depend on warnings originating from the Department of Meteorological Services, Ministry of Agriculture and Water Development and Department of Disaster Management Affairs. This official further said: *communication facilities in the district are inadequate with only one radio at the DC's office so we need 6 more messages for each ACPC.*

The analysis further revealed that 52% of the household participants recommended indigenous/traditional knowledge systems, 18% recommended scientific/modern knowledge systems and 30% recommended the combination of both systems to provide weather forecast and predict the impending flooding. This finding is different from the views gathered from key informants from government departments and NGOs that the scientific system (through radio, published newspaper and telephone) provide wide range of weather related information to people to prepare for and respond to floods.

4.1.3.3 Flood Evacuation Plan

The results revealed that all the participants during household survey appeared to lack knowledge on the availability of flood evacuation plan. Also, chiefs, community leaders, and some members of VCPC expressed ignorance of the evacuation plan. One VCPC member said "*I don't know even what an evacuation plan means"*. Views of participants from government departments and non-governmental organizations revealed the availability of the district flood evacuation plan. "*We have evacuation plan which is reviewed every year said one local official*.

In the FGDs it was also reported that victims of floods are accommodated in schools and churches. One community leader said: "*We don't have rescue shelters rather we use schools, churches and the main road as our temporary shelters"*. Key informants reported that most schools in the district are used as evacuation shelters, a situation which often disturbs teaching and learning process of pupils for a period of two to three months. One key informant said: "*currently, very little effort is made to build evacuation centers where large numbers of people can find safety and shelter because of lack of sufficient funds*". It was also reported that the political system is just quick to

respond to emergency needs than to implement interventions necessary to promote long term solutions for the general public. One Key informant said: "*look of 1836 households whose home were completely damaged, 768 households were evacuated to the three camps of Zindi, Kakoma and Chimalabanthu which are schools and churches".*

4.1.3.4 Flood Emergency Preparedness

Different views were revealed on this topic. Key informants from government departments explained that the district has emergency measures stipulated in the district contingency plan. Views of community leaders and chiefs revealed that there are no emergency plans. Community leaders further acknowledged that when local authorities respond to the emergency they bring materials that are not helpful to their problems and needs. One community leader said "*they provide plastic papers which are not durable only last one week, plastic papers are not what we need"*. One key informant from government department also said "*we fail to reach some places up until hazards subside because of inadequate resources to comprehensively sustain an emergency management programme*".

4.1.3.5 Training and Advocacy

The survey revealed that 60% participants have no access to training and advocacy. During semi-structured interviews and FGDs participants also indicated that people have limited access to advocacy as part of disaster risk reduction measures. One participant said "we *lack human capacity and financial resources to conduct advocacy activities"*. It was expressed that some people shun away advocacy because of their personal interests. One participant said: "*it becomes difficult to tailor disaster risk reduction measures due to lack of commitment, cooperation and responsibility of some individuals".* Some participants indicated that it becomes difficult to promote advocacy because the district Councils are poorly funded and that there is lack of coordination of local authority and civil society.

4.1.4 Local Capacities, Resilience and Vulnerability Reduction

Table 9: Frequency distribution of coping strategies

Coping strategy	Frequency
Economic	12(6%)
Social organization	68(34%)
Infrastructural/Technological	120(60%)

The frequency distribution of household coping capacities undertaken to strengthen resilience and reduce vulnerability of houses shows that most households undertake infrastructural/technological (60%) strategies followed by social strategies (34%) and economic strategies (6%), (Table 9). Participants in the semi-structure interviews and FGDs reported that flooding issues in the district are managed as a cluster approach, involving different stakeholders according to responsibility and expertise. They reported that this provide a platform where different stakeholders has a role to play in the event of flooding. It was further reported that it provides much interaction and shared experiences. Within this approach, some key informants indicated that Karonga has established an Emergency Operation Centre (EOC). This center assists all stakeholders to access disaster information and promote communication as part of EWS. Key informants further reported that DoDMA coordinate all the disaster activities at district level. They said that DoDMA take proactive approach to mobilize and preposition resources such as relief items and provision of helicopter and Malawi Defence Forces personnel.

Furthermore, most key informants also reported that several organizations operate in the district assisting to undertake various coping strategies. They indicated that major activities undertaken by the organizations are procuring equipment such as raingauge, phones, megaphones, first aid kits. Others include training of upstream VCPCs on EWS data collection, interpretation and effective communication. It was observed that most of the coping strategies undertaken by local government and organizations together with local communities are within the phenomena of early warning systems, economic, social organization and infrastructural strategies. A summary of the coping strategies and activities is presented in Table 10.

Table 10: Local Strategies to Reduce Vulnerability

TYPE OF COPING STRATEGY	HOUSEHOLD COPING ACTIVITIES	LOCAL INSTITUTIONAL ACTIVITIES
Early warning systems	• Use local knowledge (flying birds, frogs, hill flowers) • Vacate house to avoid loss of life	• Installation of rain and river gauges • Strengthening capacity of APCs, VCPCs, communities & individuals to mitigate flood impacts • Increasing the capacity of communities & individuals to adapt their livelihoods to climate variability. • Provision of first aid kit • Disseminate weather forecast information
Social organization	• Repair houses with household members to avoid the cost of labour • Keep the household items to neighbours house	• Develop EWS for each area together with CPC members.
Economic livelihood	• Work on piece work to earn money	• Provision of IGA • Provision of maize and rice seeds • Assisting community savings and loans (VSL)
Infrastructural/technological	• Elevate part of the house • Plant trees/bananas along the rivers to create buffers • Digging and cleaning drains	• Construction of dykes • Construction of water pumps • Planting bananas along rivers • Construction of irrigation schemes • Encourage conservation agriculture • Afforestation and re-afforestation • Provision of life jackets, whistlers and gum buts for emergency rescue • River dragging • Provision of note books to learners

Source (own compilation, 2017)

4.1.4.1 Challenges of local capacities

The results of household survey show that the main challenges affecting the implementation of household coping strategies are lack of income (51%), poor cooperation of community members (43%) and laziness of people (6%).

Furthermore, the results of the relationship between household coping strategies undertaken to mitigate flood impacts on housing and livelihoods show that the infrastructural/technological strategies are commonly undertaken followed by the social organization strategies (Figure 8).

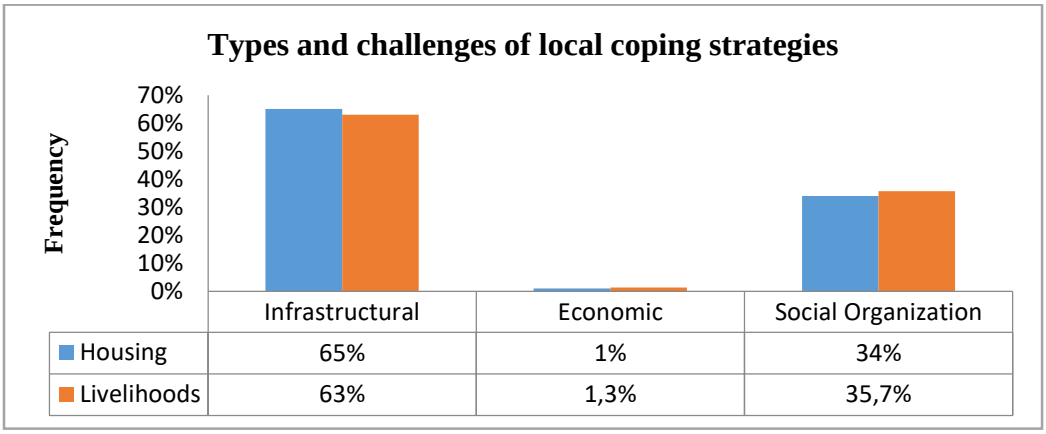


Figure 8: Frequency Distribution of Coping Strategies and Their Challenges

Participants in the semi- structured and FGDs, also reported several challenges hindering the implementation of local capacities. Among them were lack of knowledge in disaster risk reduction, financial resources, human capacity, cooperation and commitment, weak enforcement of regulations, unwillingness of people to relocate and external influence.

4.1.5 Summary

This part focused on the factors that determine trends and magnitudes of people's vulnerability in relation to physical, social, economic, environmental and cultural factors. Further, it focused on disaster risk reduction and management theory and practice as well as local coping capacities. The results revealed that all the factors contributed to generate vulnerability of people to floods. The results found that disaster risk reduction measures are not viable. Finally, the results revealed

various local capacities, though their implementation was revealed to meet several challenges some being lack of commitment and cooperation.

4.2 Discussion

This section provides a discussion of the analysis of the results. It begins by presenting the general overview of this thesis.

4.2.1 General Overview

This thesis focused on vulnerability and local capacity to respond to flood disasters in relation to disaster risk reduction. The idea behind is that hazards are natural, but that in general disasters are not, and should not be seen as the inevitable outcome of hazard's impact. Therefore this thesis argues that disasters caused by flood hazards for example, are not only natural by themselves but rather they are strongly induced by the vulnerability of a community to a particular hazard.

It started with the Pressure and Release (PAR) model to understand the generation of vulnerability. The PAR model is based on the idea that vulnerability is generated by structures and processes stemmed in the underlying root causes (1), dynamic pressures (2) and unsafe conditions (3), (Figure1). The implication is that the extent of vulnerability depends on how the society deals (or does not deal) with the hazard in terms of addressing structures and processes that generate vulnerability.

In the review of the factors generating vulnerability, several characteristics were found with respect to physical, economic, social, environmental and cultural factors. Other vulnerability theoretical perspectives such as development, environmental degradation, poverty, disaster response and early recovery as well as climate change were reviewed. One main result from this review is the notion that vulnerability needs to be understood in a wide context, which spans many sectors, components and levels.

This thesis also reviewed the methodologies of assessing vulnerability. Despite, most countries having implemented vulnerability assessment with the support from NGOs, little has been done in

Malawi to implement vulnerability assessment. The result is that the methodology is very low, sporadic, isolated and lacks standardized principles.

This thesis also analyzed ways of reducing vulnerability through coping capacities and disaster risk reduction interventions. From the review, it has been noted that the availability (or unavailability) of these interventions has a bearing in the way people respond to hazards and disasters.

4.2.2 Factors that Determines the Trends and Magnitudes of Vulnerability

The analysis of the results has revealed five underlying factors that determine the trends and magnitudes of people's vulnerability to respond to flood disasters. These factors are outlined below:

4.2.2.1 Physical Factors

The relationship between physical factors and flood severity showed that there is weak (but positive) correlation value, (r=0.162) for the past floods and medium correlation (r= 0.509) for the recent floods (Table 8). This result suggests that the physical factors determine the trends and magnitudes of vulnerability. The cause of this could be attributed to lack of knowledge and skills related to shelter and safety. For example, the results of the quantitative analysis revealed the average of the physical conditions generating vulnerability to be 61% in the category of "very important" (Table 5). The physical conditions found were lack of permanent buildings (68%), lack of safe shelter awareness (66%) and poor construction standards of infrastructures (49%), (Appendix 5.1). Some key informants during the semi-structured interviews acknowledged that most land (79%) in the district is held under customary tenure which leads to unplanned settlement and non-compliance of people to council and country planning systems that govern the building of resilient structures.

It was also noted that most infrastructures such as houses are traditional and substandard, predominantly made up of grass thatch and mud floors, prone to leaking and thereby becoming more vulnerable to floods. For, example the physical elements that were found to be "severely vulnerable" with an average of 84% (Table 6) included houses (92%), toilets (89%), wells (85%)

and infrastructures (roads and bridges-82%), (Appendix 6.1). Even in the semi-structured interviews and FGDs, several physical elements such as houses, toilets, bridges, ploughs and plates, were reported as severely vulnerable. For example, it was reported that 1836 of the 4477 affected households during the 2016 floods had their houses completely damaged. It was also noted that most people have substandard houses due to high dependency on subsistence farming (70%), (Table 4) which gives them limited source of income. With this low level of income, it is very difficult for them to build strong houses that can withstand flooding impacts.

The results of the association between demographic characteristics and physical factors (Table 7), suggests that the physical factors influence the vulnerability of an individual to respond to floods based on sex and marital status. This is because the results revealed a significant association between sex, marital status and physical factors (Table 7). It was revealed that due to the patriarchal system, widowed and divorced women without male children are more vulnerable to floods. It was noted that they have poor houses made up of mud floors and thatched with grass. They also find it difficult to rebuild their homes once their houses get damaged by floods. It was further reported that they even receive little attention from the community leaders in times of humanitarian actions and relief activities because of their limited access to power in the communities. One key informant reported that it becomes very difficult to identify needy beneficiaries due to external influences by the people charged with responsibility. It was further reported that when resources are allocated leaders give priority to influential families who have power to voice out their concerns than the widowed and divorced women.

Although, most literature indicates that the age of a person influences vulnerability of individual to a particular hazard, the results of this study revealed that age is not associated with any vulnerability factors. The reason for this could be due to the fact that this study considered the minimum age standard of participants to be 18 years and above. As such, during household surveys most participants interviewed were in the age category of 21-30 years, 31-40 years and 41-50 years and very few participants in the age of 61 years and above (Table 4). The result suggests therefore that the middle active group is not affected by floods due to their age. However, during semi-structured interviews and FDGs, children below the age of 18 years and the elderly were reported

to be highly vulnerable because of their physical mobility, speed of reaction and intelligence ability.

4.2.2.2 Social Factors

The results of the relationship between social factors and flood severity showed there is weak (but positive) correlation, (r=0.27) for the past floods and strong correlation (r=0.734) for the recent floods (Table 8). This result points out that the social factors accelerate the trends and magnitudes of people vulnerability to floods. The cause of this increase could be that people lack access to knowledge and information on disaster risk reduction and management measures. For example, the results of the quantitative analysis revealed the average social conditions generating vulnerability to be 55% in the category of "very important" (Table 5). The social factors identified were lack of preparedness and early warning systems (59%), lack of knowledge and skills to cope up with urgent needs (52%) and lack of local support institutions (53%), (Appendix,5.2). It was also spelt out during semi-structure interviews that it is difficulties to provide education and awareness to people on flood preparedness measures such as early warning systems because of their ignorance. This indicates that low levels of education of people increase vulnerability. The survey established that the highest level of education one could attain was PSLC (62%), (Table 4). With this level of education, it was observed that many people have little knowledge on risk reduction and early warning systems. For example, it was reported during semi-structure interviews and FGDs that early warning system such as rain gauges and river gauges have been installed to provide data on rainfall and water levels to predict flooding but due to ignorance people do not understand them. Furthermore, some key informants reported that inability to incorporate disaster risk reduction in development plans for the past years has contributed to increased vulnerability of people. One example of such development is a culvert at Kibwe River along the M1 road. The culvert is too small to allow water to pass through hence in any event of flooding it increases the volume of water to the communities of Chimalabanthu village affecting even Kaporo Police Station.

The results further revealed that the social elements at risk were "slightly vulnerable" with an average of 39% (Table 6). The elements at risk that were found slightly vulnerable include the health posts (36%) and school infrastructures (42%), (Appendix 6.2). Despite the quantitative

analysis revealing this, participants in semi-structured interviews and FGDs maintained that the social elements have been severely vulnerable. They reported for example, that there is damage of classrooms, teacher's houses and toilets during time of floods. It was also observed that schools are used as evacuation centres. Worst still, some of the district documents (Contingency and DRM plan) have earmarked school structures and places as evacuation shelters and sites respectively. This has posed a major concern of increasing vulnerability of learners to health hazards because the evacuees either share or build toilets close to school premises. This is also an indication that learners in the district are not honored and protected by the law. Some Key informants further reported that primary schools like Maro, Ntchowo and Kaporo experience high overcrowding of learners during floods. One participant said: "*we teach learners under a tree when floods are not there but when floods take place all learners are forced to learn in the same classrooms*". It was reported that sometimes classes are suspended in the same schools to allow water to recede. However, the difference between quantitative results and views of participant in semi-structured interviews and FGDs with regard to the level of vulnerability of social elements could be argued in two ways. The first is that most local people do not value the social elements as their immediate needs in their lives than either the physical or economic elements. The second difference suggests that local people lack ownership of such resources as they have a mindset that institutions like schools and health centres are government owned as such they have little influence on them. Despite this mindset, the same people shift their homes to classrooms during the onset of classes or even during the time of examination preparation at the time of emergencies.

The results revealed that the associations between demographic characteristics and social factors were not significant (Table 7). This result is different from the study conducted by Maferetlhane (2012) who stated that demographic variables such as age, sex and marital status influence people's vulnerability. However, this difference could be due to the nature of social factors that were used to associate the demographic variables. For example, Maferetlhane (2012) states that the social factors that increase people's vulnerability include limited access to health, education and housing while this study used the more technical social factors such as lack of preparedness and early warning systems, lack of knowledge and skills to cope up with urgent needs and lack of local support institutions. Nevertheless, in the semi-structured interviews and FDGs participants indicated that high illiteracy levels have made people to become adamant to adhere to early

warnings, a situation which render them more vulnerable and unable to withstand to floods. This result therefore suggests that education influence the way an individual respond to flood disasters.

4.2.2.3 Economic Factors

The economic factors showed a weak (but positive) correlation between economic factors and flood severity of the past floods (r=0.262) and for the recent floods (r=0.477) (Table 8). This result points out that the economic factors determine the trends and magnitudes of people vulnerability to floods. However, on the economic conditions generating vulnerability the findings of the quantitative and qualitative analysis were different. For example, the results of the quantitative analysis revealed that the economic conditions generating vulnerability with an average of 55% in the category of "very important" (Table 5), were poverty (75%), lack of alternative likelihoods (66%) and low income (52%), (Appendix 5.3). On the other hand, it was spelt out in the semi-structured interviews that the interest that people have on floods such as using flooded water to plant their rice, plant their winter maize and benefit from alluvial soils for bumper rice yields were among economic factors generating vulnerability. The variation of the results was observed to be limited capacity of the households to support themselves as a result of low levels of income generating activities. The majority of people are poor and they cannot raise extra-income to establish and support their families as well as to access another land in safer ground for settlement relocation. Consequently, they have developed high interest to reside in the flood risk areas, a condition that contributes to generating their vulnerability. Some key informants explained that the district economy is not well developed owing to its narrow resource base. It was further observed that a very low income and rampant poverty among the people prevent many people from living a decent life and thereby becoming vulnerable to floods.

The analysis further revealed that the economic elements are vulnerable with a high average of 63% in the scale category of "vulnerable" (Table 6). Though the analysis of the average of economic elements was revealed to be vulnerable, some elements like maize and cassava (92%), rice (95%) and livestock (82%) fall on the category of severely vulnerable (Appendix 6.3). Furthermore, the findings of the results indicate that trading was found slightly vulnerable on both scale category of severely vulnerable and slightly vulnerable while fishing was found to be vulnerable (58%) and not vulnerable on the scale of slightly vulnerable and severely vulnerable

respectively (Appendix 6.3). The views of participants during semi-structured interviews and FGDs also revealed huge economic loss from the impact of floods. For example, it was reported that unspecified number of livestock have been reported missing or dead and 653 hectares agricultural crops have been either washed away or silted. The strategic crops, maize and rice, in the field have been flattened with little room for recovery.

Except occupation (p=0.0375, Chi square=30.436), all the demographic characteristics were not associated with the economic factors (Table 7). It can be argued that the economic factors associated with occupation because most households were found to depend on farming as a source of occupation. Similarly, the survey established that women are the most economically vulnerable to floods due to their marital status. It was reported during semi-structured interviews and FDGs that widowed and divorced women fail to plant their crops at the right time. This was observed as a condition that gives them limited access to economic resources. It was noted that they become even more vulnerable to future hazards because they reach the other rainy season without food. Moreover, it was observed that women-gender specific roles of not doing land tillage or ploughing and leveling with draught animals give them limited time to do land preparation and early planting. This renders them vulnerable to floods or drought.

4.2.2.4 Environmental Factors

The results showed a weak (but positive) correlation between environmental factors and flood severity of the past floods (r=0.125) and a medium correlation of the recent floods (r=0.578) (Table 8). This result points out that the environmental factors accelerate the trends and magnitudes of people vulnerability to floods. The cause of this acceleration can be argued to be habitation in low-lying areas (Figure 7). For example, the results of the household survey revealed that the environmental conditions generating vulnerability with average of 60% in the category of "very important" (Table 5), are residing in flood prone areas (78%), pressure on land (63%) and lack of energy sources (39%), (Appendix 5.4). Similarly, during semi-structured interviews and FGDs, participants reported that the environmental conditions generating vulnerability are residing in flood prone areas, deforestation and bad farming practices. Some participants reported that deforestation in the protected forest reserve (Kaporo North Escarpment Forest Reserve) has increased due to pressure exerted on land, poverty and availability of charcoal market in Tanzania.

It was also observed there are a lot of bad farming practices such as cultivation in marginal land in the area. This scenario has led to increased siltation in the river channels thereby rendering rivers unable to contain large volumes of water. Further, some participants highlighted that high population growth has created pressure on land which has forced people to occupy or reclaim land which is not suitable for habitation rendering them vulnerable to the effects of flooding.

Though, the quantitative analysis revealed environmental factors as the second from the physical factors to generate vulnerability (Table 6), the analysis of the vulnerability of the elements at risk revealed that environmental elements tend to be "slightly vulnerable" to floods. The elements found in this case category included forest (50%) and natural pasture (50%) while rivers (68%) and soil and land (59%). However, based on individual element, the results showed variation of vulnerability, for example river channels (68%) fell on vulnerable category (Appendix 6.4).

The results showed a significant association between sex, marital status, education and environmental factors. This suggests that the environmental factors influence the vulnerability of people to respond to floods based on sex, marital status and education. The relationship between sex and environmental factors showed that both men and women face numerous challenges during floods. For example, it was revealed that men find it difficult to graze their livestock because all the pasture gets submerged in water. Therefore, men are forced to travel long distances to search pasture for their livestock. Sometimes they are forced to identify other people in the hilly areas of Chipake, and Malili to keep their livestock until the flood subside. One participant reported that this also increases their vulnerability because their livestock sometimes get lost or die under the control of another person who lacks ownership of the livestock. On the other hand, it was revealed that women find difficulties where to get firewood. It was reported that the majority use maize cobs during time of floods and animal dung after floods for cooking due to lack of firewood. It was further revealed that women walk long distances to fetch water because all the water sources especially shallow wells get contaminated with flooded water.

4.2.2.5 Cultural Factors

The results of quantitative and qualitative analysis portrayed huge differences in terms of cultural factors. The results (Table 5) showed that cultural factors are not very important in generating

vulnerability. The analysis revealed a less average percentage on the category of "very important" (33%) than on the category of "important" (37%) and less than the benchmark 50% altogether (Table 5). The cultural factors found to generate vulnerability include absence of ownership (51%), cultural conflicts (34%), defiance to safety measures (39%) and traditional beliefs (36%). Nevertheless, the results of the qualitative analysis revealed that cultural issues such as beliefs in forefather's graveyards and land governance are the main factors generating vulnerability of people. For example, key informants during semi-structured interviews maintained that the Ngonde people strongly believe in the existence of their ancestral spirits, believed to have been guiding their daily lives .As such, abandoning any home containing graveyard is a great insult to their ancestors and inevitably calls for a calamity upon the offenders' entire family as a result of this negligence. It was reported that people are adamant and reluctant to vacate their flood prone homeland because they want to protect their cultural beliefs of conserving their forefathers' graveyards. It was therefore observed that because of this, many people have maintained their forefathers' land as part of respect to their ancestral spirits and even one way of avoiding the calamity (in most cases death) of the offenders.

The discrepancy of results of quantitative and qualitative analysis is due to people's mindset towards cultural beliefs and customs. It was observed that most people value their beliefs such that they refuse relocating their homes in favour of the cultural philosophies of taking care of forefathers' graveyards. One participant said: "I *would rather die with floods and be buried together with my parents, grandparents all relatives than to move out of this land*". This still emphasizes that it could be difficult to convince people to move out the place unless more advocacy and awareness are carried out. Moreover, it was noted that chiefs are also reluctant to move out with their subjects for fear of losing chieftainship and powers.

The results revealed a strong correlation of the recent floods (r=0.897) with the cultural factors. Furthermore, the results showed that the relationship of the cultural factors and past floods were significant (Table 8). This result showed that culture is the most important factor contributing to determining the trends and magnitudes of vulnerability to floods. Views of participants during semi-structured interviews and FDGS also spelt out that past floods (1960s-1970s) were not dangerous compared to the recent floods. Participants stated the major cause of increased

vulnerability to the floods is rooted in cultural beliefs. It was reported that "*people have a cultural belief that crocodiles never stay in upland areas*" implying to say that like crocodiles the people in the area are used to staying in water so it could be very difficult for them to move out and relocate to high areas eating "millet Nsima" when rice is in their blood.

4.2.2.6 Land Governance and Chieftaincy Disputes

It was noted that land governance and chieftaincy succession disputes contribute to generating vulnerability. Participants argued that in the Ngonde patrilineal culture, abandoning the ancestors land may result in the future generation of the family becoming landless. It was also reported that in case someone decides to evacuate and search for new land, the evacuated home is automatically pronounced vacant by the chief himself and immediately the chief confiscates the land and distributes it to another person to occupy. The participants acknowledged that when the evacuee, for instance, has not been successful in the new land and eventually request to a return to his ancestors land, chiefs rebuff the request. Participants indicated that for fear of losing land, people still occupy areas that are not habitable and thereby increasing their vulnerability. It was further noted that due to frequent chieftainship wrangles in the area, the lives of women, children and the elderly have been at high risk. Their vulnerability is generated because they become traumatized when houses are burnt due to conflicts. It was observed that the conflicts have made chiefs to lose their powers to maintain peace, unity, law and order to their subjects. The result has been little implementation of development projects in the area. For example, in 2013, a local NGO commonly known as Foundation for Community Support Services (FOCUS) shifted its maternal mortality project in Traditional Authority Kilupula to Traditional Authority Wasambo due to lack of safety and increased insecurity as a result of Kilupula chieftainship succession dispute between Ponsiano George Mwantende and William Kalongolera Mwamkamba, which led the Ministry of Local Government and Rural Development to suspend Ponsiano George Mwantende as Traditional Authority Kilupula on 25th December, 2012, after being installed on 17th November,2012 by the same Ministry.

The results showed a significant association between demographic characteristics, sex (p=0.0043; chi square =10.977), marital status (p=0.00427; chi square=28.543), education (p= 0.0301; chi square 27.230) and cultural factors (Table 7). This result suggests that cultural factors influence

vulnerability of people to respond to floods based on sex, marital status and education characteristics. This association revealed that widowed and divorced women face disproportionate burden of the impact of floods. The survey revealed that the Ngonde culture is gender specific. For example, the involvement of women on the land is tied on planting, weeding, harvesting, transplanting seedlings, and not on the use of draught animals. Consequently, women without husbands or male child are limited to plough their fields because culturally it is uncommon to find women using draught animals. This makes them vulnerable because they always plant late and in the event of floods or drought their crops get damaged. Moreover, low education influences their vulnerability because uneducated people lack cooperation and they fail to anticipate the challenges that may come out of their behaviour. Some key informants reported that low education of people make them adamant to adopt measures that could control the flood hazards. It was further reported that some people are rude, defiant and arrogant to accept issues of relocation to safe places due to lack of awareness. The main observation made was that most households have beliefs and practices that flooding events are beyond humanity and no person can control them.

4.2.3 Existing Gaps between Theory and Practice in Disaster Risk Reduction and Management

Disaster risk reduction and management aims to address a comprehensive mix of factors contributing to communities vulnerabilities. There are numerous theoretical strategies, tools and methodologies that have been developed to put this approach into practice. Among other theoretical strategies include strengthening early warning systems, relocation of settlements, use of knowledge sharing and training, strengthening preparedness and response through public commitment and community participation. This thesis analyzed these strategies in terms of the way they are being practiced to reduce communities' vulnerabilities to flood disasters. One major result from this analysis is the fact that the practice of these theoretical tools is very limited. Below is a discussion of the gaps identified in each theoretical strategy.

4.2.3.2 Early Warning System (EWS)

The effectiveness of EWS depends on the ability to forecast when a hazard is going to occur and predict the scale on intensity (Concern Strategic Plan, 2005). This study however, identified that early warning systems are not effective. For example, the results of quantitative analysis revealed

deficiency of early warnings on the magnitudes (75%) and occurrence time (71%) of floods. Even in semi-structured interviews, chiefs and community leaders reported that early warning systems on the impeding flooding are limited. However, officials from government departments indicated that EWSs are provided to people through the support of NGOs. It was reported that the rain gauge systems have been installed to provide rainfall data that can be used to predict flooding. Further, it was acknowledged that river gauge systems were installed in some rivers to provide data on water levels so as to predict flooding. Moreover, it was found that communities have been provided with loudhailers as part of early warning systems. It was also noted that other local initiatives such as drumming and whistles are used with the same purpose as loudhailers. However, the results of the quantitative analysis revealed that people have no trust on the aforementioned modern systems. The results revealed a greater part of the population prefer the use of human mechanism (52%) and a combination of both (30%) to prepare for and predict about flooding. It was observed that the causes of lack of trust to modern systems were cultural beliefs, low education and information is less focused on their locality and it disseminated in broader manner. The cultural beliefs have made people to be adamant and accept that floods are part of life. Even if people hear (or do not hear) warnings, it was observed that due to lack of resources and low education, their capacity is still limited. Participants indicated that use of radio and television has widened the scope of information because they do not specifically inform the community the risk of flood disaster in their locality.

Though the results revealed that people prefer the use of indigenous knowledge systems, it can be argued that very little has been done to integrate indigenous knowledge with scientific/ modern systems in the area and Malawi in general. The role of indigenous knowledge systems has not been fully analyzed and documented. During semi-structured interviews and FGDs, the role of indigenous knowledge was also emphasized, but some key informants indicated that they have not yet combined with modern knowledge systems. It was even reported that indigenous knowledge systems have not been documented either. Therefore this study argues that the slow integration of indigenous knowledge systems combined with inadequate documentation of the same presents a gap in the work of disaster risk reduction and management because for many times they have assisted communities to prepare for and respond to natural hazards like floods.

4.2.3.1 Relocation

The results revealed high unwillingness for relocation of settlements 84% (Figure 7). Some reasons impeding relocation includes, cultural beliefs, land governance and benefits from agricultural activities. Furthermore, it was noted that relocation is impeded due to the following five reasons. The first reason is weak enforcement of policies to curb settlement located in marginal and hazardous areas. The second is that there is high over reliance on relief items to support flood victims by government and stakeholders. This has created a mindset of people to depend on short term handouts than to relocate. These handouts are unpredictable and give people minimum ability to cope with future flood shocks. Thirdly, the economic status of most people is very low. This economic level restricts them from procuring materials to support their response and recovery. Most of the people 70% depend on subsistence farming. However, some argued that they cannot relocate because it could be very difficult for them to live in higher areas since they are used to lowland areas. Fourthly, there is lack of capacity of local authorities to establish evacuation shelters and social services such as schools and health facilities in areas where people are told to relocate. It was reported that some floods victims attempted to relocate to the nearby hilly areas of Mwabulambo, but due to lack of shelters and poor conditions they returned to their original homelands. Lastly, there is lack of clearly defined policies aimed at addressing issues of the evacuated land. This is due to the fact that most participants reported that when they attempt to relocate chiefs threaten to confiscate their land and give it to other persons.

4.2.3.3 Community Participation

The success of DRR activities depends to larger extent on the participation of community members. However, this study identified that there is lack of community consultative efforts to fully strengthen emergency management of floods. This presents a challenge to local authority to identify and implement plans and mechanisms to respond effectively during emergencies including early warning. For example, the analysis of quantitative results revealed a lack of local institutional support to provide important activities that could strengthen disaster resilient community. Even during semi-structured interviews, participants reported that most community sensitization activities aimed at empowering local structures are not viable and effective due to lack of funds. The results revealed that people are not consulted about their needs and wishes on the type of relief items that could help them to respond positively to floods. One participant reported that "*relief*

items do not match our problems". Most participants argued that those in the authority bring materials that do not match with their local problems created by floods. During semi-structured interviews, one local official indicated that "*lack of resources affect to comprehensively sustain the emergency programmes"*. Another observed factor militating to this gap could be persistent occurrence of conflicts due chief's disputes in the area. The effect has been that chiefs lack the capacity to effectively mobilize their subjects to take part in development activities. This was also observed that it forces authorities to take shortcuts in case of any assistance because they fear to involve the disgruntled chiefs to refrain from the scenario of being considered as favouring certain faction of chieftainship.

4.2.3.4 Education and Advocacy

The ISDR (1994) stressed that knowledge is of utmost important to determine those things which favour or hinder prevention and mitigation. Furthermore, the Hyogo Framework of Action (2005-2015) on part B, priority 3 (ii) point K stressed the need to "develop training and learning programmes in disaster risk reduction targeted at specific sectors (development planners, emergency managers, local government officials etc.)". Furthermore, advocacy seeks to ensure that vulnerable people in the society achieve change empowerment and knowledge. However, this study established that training and advocacy are lacking. As such people lack knowledge in disaster risk reduction. The quantitative results revealed that lack of knowledge and access to information contributes to generating vulnerability. Even key informant reported that people are more vulnerable because they lack knowledge in DRR. It was observed that lack of training and advocacy is due to limited number of staff at the local council with risk reduction knowledge, lack of funds to engage advocacy and lack of higher learning institutions to offer DRM disciplines in Malawi. The district council (and which is the case for every district in Malawi) has one desk officer employed by DoDMA. It was observed that this officer finds it difficult to conduct DRR activities for the whole district. Even, some people who are delegated the responsibility in case the responsible officer is away to discharge other duties lack risk reduction knowledge. Furthermore, in Malawi until the introduction of a degree programme at the Malawi University of Science and Technology (MUST) recently 2016, under the Ndata School of Climate Change and Earth Sciences, there was no higher learning institution offering a pure degree programme in DRM, a situation which has contributed to lack of knowledge in DRR.

4.2.3.5 Responsibility and Commitment

Preparing for evacuation is an important part of disaster risk reduction planning, and requires responsibilities and commitments by government, communities, and individual households. It includes among other things informing people of evacuation routes, identifying and/or building evacuation centres (Hartog, 2014). However, this study identified that there is little effort to establish proper evacuation shelters. The results showed that there are no evacuation centers in strategic areas. Though it was found that construction of evacuation centers is underway in some areas, the process is very slow. Instead, schools and churches are used as evacuation centres. This was observed that it disturbs the operations of schools because at times classes are suspended and/or there is scramble for social amenities like water and the issue of sanitation is affected as well. The results further revealed that communities and some individual households lack obligation and commitment to manage resources restored to them. During interviews and FGDs, it was reported that some individuals destroy dykes to have access to flooded water for their rice cultivation. This study observed that lack of government commitment to enforce policies with strict penalties coupled with insufficient resources to fully develop the infrastructure to meet the emergency management needs of the general public remains a major challenge to Malawi as a nation and is contributory to vulnerability.

4.2.3.6 Flood Relief and Recovery Schemes

Article eight of the code of conduct of international Red Cross and Red Crescent states that "Relief aid must strive to reduce future vulnerabilities to disasters as well as meeting basic needs" (Concern Strategic Plan, 2005). This study identified that recovery schemes are not planned well to reduce future vulnerability because it was observed that people still construct their homes with same building techniques and materials that caused them to collapse. Moreover, the results revealed that people sell off their scarce productive resources such as livestock to meet basic needs and thus become even more vulnerable to future shocks. The study noted that there is a shortcut in consultative process due to rapid onset of flood hence sidelining decision-making of local communities in development planning and relief distribution. The situation triggers local authorities and stakeholders to provide materials that are not suitable to the local needs and problems to reduce their vulnerabilities.

4.2.3.7 Gender Mainstreaming

The results of Table 7 show that except for social factors, all the factors are associated with gender. This finding revealed that women are more vulnerable than male. The cause was observed to be the patriarchal system dominated by the Ngonde culture. There are cultural beliefs that are still prevailing in the communities. Some community members, including some traditional leaders, still harbour the perception that women empowerment and gender equality is alien and a threat to their culture that always places men as leaders in all spheres of life. In this respect, there are pockets of resistance to accept the fact that women can also contribute to family and community development. For example, it is uncommon to find women using draught animals to farm their land. Therefore, widowhood and divorced women without male children face problems to farm their land because of the patriarchal systems which discriminates women and prevents them becoming active participants in development projects.

4.2.3.8 Vulnerability Assessment

Research is utmost important to enhance sound disaster risk reduction policies. However, this study identified that little has been done to assess vulnerability in the study area and with particular reference to Malawi as a nation. It was observed that most NGOs which assist people in disaster risk reduction had no vulnerability officers and at the same time had no defined methodologies of assessing vulnerability. The Malawi DRM policy has also spelt the term vulnerability once in a 21 paged document. Instead, the policy has focused much on interventions and response after disaster. This is again a strong indication that the field of vulnerability in Malawi is yet to be tapped with strong effort.

4.2.4 Local Capacity, Resilience and Vulnerability Reduction

The survey found that households and local institutions such as NGOs and some government departments take various coping strategies. The strategies are not mutually exclusive because they are often taken as a combination at the same time.

4.2.4.1 Economic/Livelihood Aspect

The principal element of this strategy was economic diversification. The frequency distribution of households taking certain form of economic strategy both on housing and livelihoods showed that

very few households undertake economic coping strategies (Table 9). This was observed to be due to lack of diverse source of income activities since most household were revealed to depend on subsistence farming. Those taking certain form of economic strategies indicated that they borrow money from money lenders on "katapila" arrangement where the borrower is required to pay the double (100% interest) of the borrowed money not in form of cash again but rather the borrower is told to pay specified number of 200 kilograms bags of rice. One participant stated "*I paid the whole rice I harvested to cover the debt of the money I borrowed to rebuild my house damaged by the 2015 floods*". This was observed as one of the situation which renders them more vulnerable because those households tend to be forced to enter into serious debts. With such debts they reach the other rainy season without anything in their households having paid the debts to the money lenders at a double interest. Though key informants reported that NGOs assist households with income generating activities (IGA) such as provision of short maturation rice, and cassava and maize seeds for diversification and training community members in village savings and loans (VSL), (Table 10), they also acknowledged that not much has been achieved to support people due to lack of funds. The result has been high dependency on short term interventions which give them minimum ability to cope with future shocks.

4.2.4.2 Social/Organizational Strategies

The principal element on this strategy was community partnerships. The frequency distribution of households taking a certain form of social organization strategy on both housing and livelihoods showed that 34% of households take certain form of strategies on housing and livelihoods (Table 9). Those taking certain form of social organization strategies indicated that they vacate their houses to seek for refuge at neighbours or relatives to avoid loss of life and property. It was also found that some stay in camps waiting for relief items from government, whereas others indicated that they repair their houses with members of the family to mitigate labour costs. However, it was reported that community associations are difficult to be achieved due to poor cooperation among the people. Even in semi-structured interviews with key informants, it was expressed that lack of cooperation and commitment of communities contributes to affect the implementation of coping strategies.

4.2.4.3 Infrastructural/Technological Coping Strategies

The principal elements on this strategy were land management, building materials, and constructions methods. The frequency distribution of households taking a certain form of social organization strategy on both housing and livelihoods, showed that 60% of households take certain form of infrastructural/technological strategies (Table 9). Several initiatives were revealed during household surveys, semi-structured interviews and FDGs under these three principal elements. Land management coping strategies for example included managing the surrounding land in a way that slows down rain water runoff, creating outlets to manage water overflow when it is in excess, planting trees, grass or sugarcane along streams, rivers or drainage channels to stabilize the river banks and encouraging conservation agriculture. Building and construction coping strategies included, ,planting bananas along the river banks to shield houses from flood water, elevate part of the house, constructing dykes and water pumps. Despite these efforts, it was reported that some people destroy the dykes and river banks during the night to have access to water for their rice fields.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

This thesis focused on vulnerability and local capacity to respond to flood disasters in relation to disaster risk reduction based on three specific objectives from which the following conclusions were made:

By exploring the factors that determine the trends and magnitudes of people's vulnerability to floods, several conditions in all vulnerability factors were established. The first condition found was substandard infrastructures caused by lack of knowledge in disaster resilient shelters. The second condition was Ngonde governance systems characterized by conflicts and violence. The third condition established was the demographic characteristics caused by differences in gender, marital status, education and occupation of people. The other condition found was limited access to resources due to power differences between men and women. Last but not least, vulnerability was found to be generated by habitation in flood prone areas and bad farming practices like deforestation. These conditions fit the root causes, the first stage of the PAR model. The relationship between the factors and flood severity revealed a strong, medium and weak correlation (*r)* value for all the factors, depicting that they determine the trends and magnitudes of vulnerability. Only the cultural factors (*p*-value=*0.009)* were significant.

The study found that disaster risk reduction and management measures in practice are not sustainable and viable. Several gaps exist between theory and practice in disaster risk reduction and management. These gaps basically characterize the dynamic pressures, the second stage of the PAR model. Several dynamic pressures were identified as existing gaps between theory and practice in disaster risk reduction and management. The first being lack of emergencies evacuation shelters influenced by the problem in which the district documents (contingency and DRM plan) spot school and church structures as evacuation shelters. The second gap observed was lack of knowledge in disaster risk reduction due to insufficient funds to carryout training and advocacy in flood risk zones. Thirdly, it was found that poor relocation strategies as result of weak enforcement of policies and land governance issues contribute to ineffective implementation of disaster risk reduction. Furthermore, ineffective early warning systems combined with poor communication

networks to aid timely response to the victims affect disaster risk reduction and management in practice. Similarly, external influences by the people charged with responsibility and, imbalances between men and women created by the Ngonde patriarchal systems affects disaster risk reduction and management in practice. Lastly, lack of community participation, absence of commitment and responsibility and slow integration of indigenous knowledge systems to speed up emergency preparedness of early warning were found to be gaps in disaster risk reduction practice.

In evaluating local capacity, it was established that various coping activities were pursued with the infrastructural/technological strategies being pursued most (60%), followed by social organization strategies (34%) and economic strategies (6%). However, It was noted that the implementation of local strategies were not effective. This was observed as a result of poor cooperation of people to manage resources and unwillingness of people to relocate due to cultural issues. These factors therefore characterize the unsafe conditions, the third stage of the PAR model.

In summary, the extent of vulnerability in the study area is very high. Variation of issues influences the vulnerability of men, women, children and the elderly to respond to flood disasters. Some of these include:

- Lack of disaster risk knowledge among communities and individuals including those charged with responsibility such as VCPCs and ACPCs due low education levels.
- Communities lack risk reduction strategies in all aspects of shelter safety.
- Lack of access to diversified livelihoods due to dependency on subsistence farming.
- Gender disparity caused by the Ngonde patriarchal system.
- Habitation in prone areas due to personal interest, cultural and land governance issues.
- Weak enforcement of policies due to chieftaincy wrangles and government commitment.
- Inadequate human resource coupled with lack of funds to support disaster risk reduction activities such as construction of dykes and evacuation shelters.

Similarly, local capacity and disaster risk reduction strategies are weak and unsustainable to deal with such mix of factors contributing to vulnerabilities of men, women, children and the elderly.

Generally, there is inadequate financial support from government to fully promote local capacity and disaster risk reduction strategies to meet the needs of the general public to reduce their risks.

5.2 Recommendations

The following recommendations were made:

- Stakeholders should commit to design and implement effective disaster risk reduction projects in order to deal with the unveiled mix of factors contributing to communities' vulnerabilities.
- Policy makers should strengthen disaster risk reduction and management strategies in order to reduce vulnerabilities of people. Among other things, policy makers must strengthen the disaster risk management by:
    - ❖ Increasing community awareness through strengthened early warning systems which should integrate both indigenous knowledge and scientific/modern systems regarding disaster risk reduction measures.
    - ❖ Increasing the effectiveness of local institution led advocacy initiatives through provision of human and financial resources.
    - ❖ Establishing proper evacuation centres through development of MoU between the district council and communities in disaster prone areas.
- Stakeholders should equip people with long term interventions to build their capacities and resilience to reduce vulnerability. Stakeholders can achieve this by:
    - ❖ Strengthening community resilience to future shocks and crises by improving people's ability to protect themselves from disasters through diversified livelihoods
    - ❖ Intensifying enforcement of policies on human settlement planning and relocation. Also, those destroying dykes to meet their personal interest should be charged with stiff penalties.
    - ❖ Assisting people with development of infrastructures such as construction of dykes and provision of excavators to remove sand to increase the depth of rivers.

REFERENCES

Anderson, M. & Woodrow, P. (1989). *Raising from the ashes: Development strategies at times of disaster*. Colorado: Westview Press Boulder.

Annan, K. (2003). *Message for the International Day for Disaster Reduction*. Retrieved from: http://www.unisdr.org/eng/public_aware/world _camp/2003/pacamp03-sg-eng.htm.

Ariyabandu, M. M. & Wickramasighe, W. M. (2005). *Gender dimension in disaster management: A guide for South Asia*. Sri Lanka, Practical Action Publishing Ltd.

Aysan, Y. F. (1993). *Keynote paper: Vulnerability assessment*. In Merriman and Browitt, (Eds). *Natural Disasters Protecting Vulnerable communities*. London, United Kingdom: Ice Publishing pp. 1-14.

Banda, F. K. Z. (2015). *The role of contextual factors in flood impact vulnerability in the context of climate change: Case study of Ndilande and South Lunzu, Blantyre City* (Master's thesis), The University of Twenties, Enschede, Netherlands.

Banda, S. S. & Nyirenda K. (2000). Karonga District state of Environment Report, Department of Environmental Affairs. (Unpublished)

Bath, J. R. & Chris, D. (2016). *Vulnerability of coastal community from storm surge and flood disasters.* Lynch: Jackson State University.

Baumwoll, J., (2008). *The value of indigenous knowledge for disaster risk reduction: A unique assessment tool for reducing community vulnerability to natural disasters* (Master's thesis). Webster University, Vienna, Austria.

Birkmann, J. & Winner, B. (2006). *Measuring the un-measurable: The challenge of vulnerability*. Bonn, Germany: UNU-IEH.

Birkmann, J. (2006). *Measuring vulnerability to promote disaster-resilient societies: Conceptual frameworks and definitions*. Bonn, Germany: UNU-IEH.

Birkmann, J., Fernando, N. & Hettige. (2006). *Measuring vulnerability in Sri Lanka at the local level*. In J. Birkmann (Ed). *Measuring vulnerability to natural hazards: Towards disaster resilient societies* (pp. 329-356). Tokyo: United Nations University.

Blaikie P., Wesner B. & Cannon, T. (2003). *At risk: Natural hazards, people's vulnerability and disasters* (2nd ed.). Latin America: La Red.

Blaikie, P., Wesner, B., Cannon, T. & Ian, D. (1994). *At risk: Natural hazards, people's vulnerability and disasters*. London & New York: Routledge.

Bohle, H. G. (2001). Vulnerability and criticality: Perspectives from social geography. *Newsletter of the International Human Dimensions Programme on Global Environmental Change*: *IHDP Update*, 2/2001, 1–7.

Brown, D. (2011). Making the linkages between climate change adaptation and spatial planning in Malawi. *Environmental Science Policy*, *14*(8), 940-949.

Bryman, A. (2006). Integrating quantitative and qualitative research. How it done? *Qualitative Research*, *1*(1), 8-22.

Canon, T. (2005). *Vulnerability analysis and the explanation of natural disaster*. London: University of Greenwich. pp. 15-21.

Caracelli, V.J. & Greene J.C. (1993). Data analysis strategies for mixed method evaluation designs. *Education Evaluation and Policy Analysis*, *15*(2), 195-207.

Cardona, O. D. (2004). The need for rethinking the concepts of vulnerability and risk from a holistic perspective: A necessary review and criticism for effective risk management. In G. Bankoff, G. Frerks & D. Hilhorst (Eds.). *Mapping vulnerability: Disasters, development and people* (Chapter 3). London: Earth Scan.

Chambers, R. (1989). Vulnerability, coping and policy. *IDS Bulletin, 20*(2), 1–7.

Ciurean, D.S. & Glade, T. (2013). Conceptual *Frameworks of Vulnerability Assessments for Natural Disasters Reduction*. Retrieved from http://dx.doi.org/10.5772/55538

Concern Strategic Plan. (2005). Approaches to Disaster Risk Reduction. Bangladesh, Emergencies Unit Press: p 1-13.

Creswell, J. W. (2010). *Designing and conducting mixed methods research* (2nd ed.). Lincoln, USA: University of Nebraska.

Dekens, J. (2007). Local knowledge for disaster preparedness: A literature review. Kathmandu: International Centre for Integrated Mountain Development (ICIM). p. 97.

Department of Economic and Social Affairs (2002). Disasters reduction and sustainable development: Understanding the links between vulnerability and risk to disasters related to development and environment, World Summit on Sustainable Development. Retrieved from http://www.unisdr.org/2006/ppew/whats-ew/pdf/wssdisdrdoc.pdf

DFID (Department for International Development). (1999). *Sustainable livelihood guidance sheets.* London: Author. Retrieved from http://www.livelihood.org/info/info-guidancesheet.html.

DoDMA. (2014). National Disaster Risk Management Communication Strategy (2014- 2018). Lilongwe, Malawi: Department of Disaster Management Affairs.

FEMA. (2010). *Emergency management in Malawi: A work in progress with a strong foundation.* Florida: Department of Emergency Management and Homeland Security.

Fisher, A., Laing, J. & Stoeckel, J. (1983). *Handbook for family planning operation research design*. New York: Population Council.

GOM. (1986). *Karonga Flood Control Project*. Lilongwe: Author.

GOM. (2006). *Malawi National Programmes of Action (NAPA): Under the United Nations Framework Convention on Climate Change (UNFCCC)* (1st ed.). Lilongwe: Author.

GOM. (2010). *Guidelines for safe house construction technical manual*. Lilongwe: Department of Housing and Urban Development/ UN-Habitat.

GOM. (2013). *Disaster risk management handbook.* Lilongwe, Malawi: Author.

GOM. (2014). *Karonga District Contingency Plan 2014-2015*. Karonga: Author.

GOM. (2014). *National Disaster Risk Management and Communication Strategy (2014-2018).* Lilongwe: Author.

GOM. (2015). *Malawi 2015 floods post disaster needs assessment report*. Lilongwe Author.

GOM. (2015). *Malawi 2015 floods post disaster needs assessment report*. Lilongwe: Author.

GOM. (2015). *National Disaster Risk Management Policy*. Lilongwe: Author.

Hartog, J. (2014). *Disaster resilience in an ageing world: How to make policies and programmes inclusive of older people*. London: HelpAge International, pp. 17-22.

Hewitt, K. (1997). *Regions of risk: A geographical introduction to disasters*. Harlow, Essex: Longman. .

Hinkel, J. (2011). Indicators of Vulnerability and adaptive capacity: Towards a clarification of the science-policy interface. *Global Environmental Change, 21*(1), 198-208.

International Federation of Red Cross and Red Crescent Societies. (2011). *PASSA: Participatory Approaches for Safe Shelter Awareness.* Geneva, Switzerland: Author.

International Federation of Red Cross and Red Crescent Societies. (2014). *World disaster report*. Geneva, Switzerland: Author.

IPCC. (2007). *Climate Change 2007: Fourth assessment report of the Intergovernmental panel on climate change*. Vol 4. Cambridge and New York: Cambridge University Press.

ISDR (International Strategy for Disaster Reduction) (2002). *Living with risk. A global review of disaster reduction initiatives* (Preliminary version). Geneva: ISDR Secretariat.

ISDR (International Strategy for Disaster Reduction). (2001). Framework for action for the implementation of the international strategy for disaster reduction (ISDR) June. Retrieved from http://www.unisdr.org/eng/about/isdr-framework-eng.html

ISDR (International Strategy for Disaster Reduction). (2004). *Living with risk: a global review of disaster reduction initiatives.* Kobe: UN/ISDR

ISDR (International Strategy for Disaster Reduction). (2006). *Disaster reduction in Africa*. Geneva: ISDR.

ISDR (International Strategy for Disaster Reduction). (2009). *Status report on disaster risk reduction in sub-Saharan Africa* (Preliminary Version).Washington DC: World Bank and Global Facility for Disaster Reduction and Recovery (GFDRR).

Karonga District Council (2015). Karonga District Contingency Plan (2016). Karonga: Author.

Karonga District Council (2015). Karonga District Flood Evacuation Plan (2016). Karonga: Author.

Karonga District Council (2016). Karonga District Chief Classification Summary (2016). Karonga: Author.

Karonga District Council (2016). Karonga District Disaster Management Plan (2013-2018). Karonga: Author.

Karonga District Council. (2000). Karonga District state of the environment report: Karonga: Environmental Affairs Department.

Karonga District Council. (2009). Karonga District socio-economic profile, 2003-2018. Karonga: Author.

Karonga District Council. (2009). Karonga District Socio-economic Profile, 2009-2011. Karonga: Author.

Karonga District Council. (2013). Karonga District Environmental Outlook Report (2013-2018). Karonga: Author.

Kelman, I. (2008). Relocating disaster risk reduction for urban resilience. *Urban Design and Planning, 161*(DP4), 197-204.

Kushe, J., Manda, M., Kamlomo, D., Mphande, C., Wanda, E., Msiska, O., & Kaunda J. (2016). Karonga Town, Growth and Risk Profile: Mzuzu University, Mzuzu, Malawi, p12.

Lavell, A. (1999). The impact of disaster on development gains: Clarity and controversy. *Paper presented at the IDNDR Programme Forum*, Geneva, Latin America (5^{th}-9^{th} July).

Leon, J. C. (2006). Vulnerability Assessment: The sectoral approach. In J. Birkmann (Ed.). *Measuring vulnerability to natural hazard: Towards disaster resilient societies* (pp. 300-315). Tokyo: United Nations University.

Lewis, J. (1999). *Development in disaster-prone places: Studies of vulnerability*. London: Intermediate Technology Publications.

Lunduka R.W., Phiri, M.A., Kambani, C. & Boyer, C.(2010). *Malawi disaster risk reduction and climate adaptation*. Lilongwe: Research for Cord Aid.

Maferetlhane, O. I. (2012). *The role of indigenous knowledge in disaster risk reduction: a critical analysis* (Master's thesis), Potchefstroom: North-west University, South Africa.

Malawi Department of Poverty and Disaster Preparedness. (2009). *The refugee programme.* Retrieved from http://www.gov.mw/poverty/Home%20Poverty.htm

Marrow, B. (2000). *Identification and mapping community vulnerability, disasters*. Florida, USA: Department of Global and Sociocultural Studies, Florida International University.

Maskrey, A. (1993). Vulnerability accumulation in peripheral regions in Latin America: The challenge for disaster prevention and management. In P.A. Merriman and C.W. Browitt (Eds.). *Natural disasters: Protecting vulnerable communities.* London: Telford.

Mc Entire, D. A. (1997). Reflecting on the weakness of the International community during the IDNR: Some implications for research and its application. *Disaster Prevention and Management, 6*(4), 221-233.

Mwape, Y. P. (2009). *An impact of floods on the socio-economic livelihoods of people: A case study of Sikaunzwe community in Kazungula District of Zambia* (Master's thesis), University of the Free State, South Africa.

Ng'oma, L. & Mwamlima, H. (2008). *Disaster risk management structures in Malawi: building community-based preparedness for and responses to natural disasters*.

Presentation conducted at the meeting of reflecting the implementation of the Hyogo Framework of Action (10th-13th June). Bangkok, Thailand.

NSO. (2008). *Malawi population and housing census report*. Zomba: Author.

NSO. (2012). *Integrated household survey 2010-201*. Zomba: Author.

Simbeye, E. K. & Phiri, G. R. (2012). *Target in physical geography: Senior secondary school Geography.* Blantyre, Malawi: Bookland International.

Smith, K. (2002). *Environmental hazards: assessing risk and reducing disaster* (3rd ed.). London: Routledge. 392 p.

Tau, E. M. (2007). *Disaster mitigation and preparedness using community based methods within Itirelenge settlement* (Master's thesis). University of the Free State, South Africa.

Thieme, G.E. & Jacobs, C. (2012). *Risk mapping Malawi: Sector disaster risk reduction and emergency aid.* Ondernemen: Cord Aid. p. 5.

Thywissen, K. (2006). *Components of risk: a comparative glossary*. Bonn: United Nations University Institute of Environment and Human security.

Tshilunga, S. E. (2014). *A study of the 2011 floods on human security in Namibia* (Master's thesis), The University of Namibia, Namibia.

UN (United Nations). (2003). General Assembly Resolution 58/214. *World Conference on Disaster Reduction*, 23 December, Geneva: UN.

UN/ISDR (International Strategy for Disaster Reduction). (2002): *Living with risk: A global review of disaster reduction initiative*s. Geneva: UN Publications.

UN/ISDR (International Strategy for Disaster Reduction). (2004). *Living with risk: A global review of disaster reduction initiatives* Geneva: UN Publications.

UN/ISDR. (2005). *Hyogo Framework for Action: building the resilience of nations and communities to disaster –an introduction to the Hyogo Framework for Action.* Geneva, Switzerland: United Nations Inter-Agency Secretariat of the international strategy for Disaster Reduction.

UN/ISDR. (2014). *Progress and challenges in disaster risk reduction: A contribution towards the development of policy indicators for the post-2015 Framework on Disaster Risk Reduction*. Geneva, Switzerland: United Nations.

UNDP, (2016). Malawi: Country Profile: Human Development Indicators

UNISDR, (2015). *Terminology.* Retrieved from http://www.unisdr.org/we/inform/terminology

United Nations Department of Economic and Social Affairs. (2002). Natural disasters and sustainable development: Understanding the links between development, environment and natural disasters. *Background Paper*, No. 5. New York: Author.

United Nations Development Programme. (2009). 2007/2008 *Malawi human development report*: Retrieved from http://hdrstats:undp/counties-fact-sheets/city-fs-MWI.html

Vakis, R. (2004). *Shocks and coffee: Lessons from Nicaragua Social Protection Discussion Paper, No. 0415*. Washington, D.C: World Bank.

Van Niekerk, D. (2005*). A comprehensive framework for multi-sphere disaster risk reduction in South Africa* (Master's thesis), North-West University, Potchefstroom, South Africa. p. 349.

Vincent, K. (2004). Creating an index of social vulnerability to climate change in Africa. *Working Paper*, No.56, Retrieved from http://www.tyndal.ac.uk/publications/working-papers/wp56.pdf

Watts, M. J. & Bohle, G. (1993). The space of vulnerability: the causal structure of hunger and famine. *Progress in Human Geography*, *17*(1), 43-67.

Wisner, B., Blaikie, P., Cannon, T. & Ian, D. (2004). *At risk: natural hazards, people's vulnerability and disasters* (2nd ed.). London: Routledge.

World Bank. (2006). *World development indicators*. Washington, D.C.: Author.

World Bank. (2008*). Economic vulnerability and disaster risk assessment in Malawi and Mozambique: Measuring economic risks of droughts and floods*. Lilongwe: Author.

World Bank. (2010). *Malawi: Economic vulnerability and disaster risk management assessment report*. Washington D.C.: Author.

Zahran, S.D., Brody, G.P. & Arnold V. (2008). *Social vulnerability and the natural built environment. A model of flood causalities in Texas*. *Journal* of Science and Public Policy *32*(4), 537-560. Colorado State University, Fort Collins. United States.

APPENDICES

Appendix 1: Household Questionnaire

HOUSEHOLD QUESTIONNAIRE

My name is Isaac Mwalwimba, a final year student at **the University of Malawi- The Polytechnic**. I would like to request your participation in providing data relating to the flooding situation in T/A Kilupula which will be used in my dissertation in partial fulfilment of a **Master of Science Degree Programme in Water Resources and Supply Management.** The aim of the dissertation research is **"Assessment of Vulnerability and Local Capacity to respond to Flood Disasters in Karonga District, Malawi.** Your participation in this questionnaire will contribute vital information required to achieve this objective. Kindly, note that the data provided will only be used for academic purposes only and will not be discussed to any third party without prior consent except as part of the dissertation academic requirements.

Participant declaration to take part in the interview	I have read & understood the purpose of the study, I therefore:	
	Accept to be interviewed	
	Decline to be interviewed	
Questionnaire Number		
Name of Interviewer		
Date of Interview		

A. BASIC HOUSEHOLD INFORMATION

GVH and Village of household location	Group village	
	Village head	
Household GPS Coordinates	X-coordinate	
	Y-coordinate	

B. HOUSEHOLD DEMOGRAPHICS

B1.	What is the sex of the participant? Ngonde: Ka ngimba uyu tukudalusha nyambala lumo nkikulu?	0= Male 1= Female
B2.	What is the age of the participant? Ngonde: Ka ngimba uyu tukudalusha anifinja filinga?	1= 21- 30 years 2= 31-40 years 3= 41-50 years 4= 51-60 years 5= + 61 years
B3.	What is the marital status of the participant? Ngonde: Ka ngimba uyu tukudalusha mweghi olo akamweghi?	1= Single 2= Married 3= Divorced 4= Separated 5= Widowed
B4.	Is the respondent able to read and write? Ngonde: Ka ngimba uyu tukudalusha amenye pobelenga nulemba?	0=Yes 1= No
B5.	What is the highest education qualification that the participant acquired? Ngonde: Ka ngimba uyu tukudalusha isukulu afikile nayo poki?	1= No formal education 2= Primary level 3= JCE and equivalent 4= MSCE and above
B6.	What is the main occupation of the participant?	1= Formally employed 2= Unemployed 3= Farming 4= Fishing

	Ngonde: Ka ngimba uyu tukudalusha obomba imbombo inki?	5= Business

C.FLOOD ASSESSMENT

C1.	How often have the flooding events happening in this area? Ngonde: Ka ngimba amisi ghakwisula kila kinja?	1= Every year 3= After five years	2= After two years 4= Don't know
C2.	When did you experience last flooding? Ngonde: Amisi gham'maliro ghaliswile ndili?	1= 2015/2016 3= 2012/2013	2= 2014/2015 4= Don't know
C3.	How can you differentiate the intensity of recent floods from the past floods Ngonde: amisi ghalino ghakindene bulebule nagha iyolo?	1= Not severe 3= Very severe	2= Severe 4= Don't know
		Recent floods	
		Past floods	

D. VULNERABILITY ASSESSMENT

D 1.	What factors contribute to generate vulnerability in the area? use a scale of 1-3; 1= less important, 2= important and 3= very important Ngonde: Ka ngimba nongwa ya fiki abanthu bokindilila itolo utamiwa na misi bwilabwila?	
Indicator	Generating conditions	Scale
Physical	• Poor construction standards	
	• Lack of safe shelter awareness	
	• Lack of building materials	
Social	• Lack of knowledge on the prevailing situations	
	• Lack of skills to cope with urgent needs	
	• Lack of institutional support	
Economic	• Lack of markets and income generating activities	
	• Poverty	
	• Lack of alternative livelihoods	
Environmental	• Pressure on cultivated land	
	• Residing in flood prone areas	
	• Water and energy scarcity	
Cultural	• Traditional beliefs (myths about floods)	
	• Cultural conflicts	
	• Defiance to safety precautions measures	
	• Absence of personal responsibility	

D2.	Mention the level of vulnerability of the following elements at risk to floods? Rank 1=not vulnerable; 3= severely vulnerable; 5=slightly vulnerable; 7= Do not know Ngonde: Ka ngimba pa ifi fyofiliku ifi fikonangika fiyo namisi?	
Indicator	**Elements at risk**	**Rank**
Physical	• Houses	
	• People	
	• Wells and boreholes	

	• Roads and bridges	
	• Toilets	
Social	• Health clinics	
	• Schools	
	• Warehousing (Admarc markets)	
Economic	• Staple crops (maize & cassava)	
	• Cash crops (rice)	
	• Livestock	
	• Trading	
	• Fishing	
Environmental	• Forest cover	
	• Quality of land & soil	
	• Trees	
	• River banks	

E.LOCAL CAPACITIES

E1.	What action do you undertake before flood to mitigate its impact on your household? (Tick some) Ngonde: Ka ngimba mupangapo ifiki panyumba phinu ukwitendekesha ngati kumisi?
	1. Elevate part of the house 2. Build houses using reinforced materials 3. Looking for additional sources income 4. Save agricultural produce 5. Thatched houses tying with wire 6. Put heavy items (sandbags, tires) on top of houses
E2.	What actions do you undertake during floods to mitigate its impact on your household? (tick applicable) Ngonde: Ka ngimba mukwiponesha nifiki linga amisi ghafikire
	1. Vacate the house to avoid loss of life 2. Stay in temporary shelter (schools & churches) 3. Use savings money 4. Look for land in flood free areas 5. Work as casual labourers
E3.	What actions do you take after floods to mitigate its impact on your household? (tick applicable) Ngonde: Ka ngimba mupanga ifundufiki linga amisi ghokire?
	1. Source relief items 2. Sell stored items on credit 3. Repair houses with family members to avoid the cost of labour 4. Ask assistance from other communities 5. Borrow money from money lenders 6. Sell stored produce
E4.	What challenges do you face to achieve the coping capacities both at household and community level (select applicable) Ngonde: Ka ngimba ndamyo in'ki isi mukwaghana nasho linga mwikwipoka ku misi?
	1. Lack of income 2. Lack of cooperation among community and people 3. Destruction of trees by livestock and people

4. Bricks/cement and iron sheets expensive 5. Laziness/busy with other activities

F. DISASTER RISK REDUCTION MEASURES

F1.	Do you get adequate training and advocacy on how to mitigate flood impacts from responsible institutions? (tick Yes or No **Ngonde:** Ka ngimba mukwambira ifimanyiro mofwana kunjira shakwipokera ku misi?
	1. Yes 2. No
F2.	Which of the following structural and non-structural mitigation measures are practiced in the community to prevent flood impacts? (select applicable) **Ngonde:** Ka ngimba pafiyengiwa ni ndaghilo isi sipangiwa ukwipoka kundamyo shamisi?
	1. Construction of earth bunds 2. Strengthened dwellings 3. Raised river banks 4. Relocation of settlements 5. Education and awareness 6. Afforestation and reforestation programmes 7. Community partnerships
F3.	Can you relocate from this area? **Ngonde:** Ka ngimba mungasama pamalo agha?
	1. Yes 2. No 3. Neutral
F4.	If no, what are the reason(s) (tick more than one if applicable) **Ngonde**: Linga mukabaghila, nongwa yafiki?
	1. Benefits from agricultural fields 2. Respect forefathers graveyards 3. Poor relocation strategies 4. Limited access to land and chieftainship issues
F5.	How are you able to predict the occurrence of floods? (tick applicable) **Ngonde**: Mumanya bulebule ukuti kulipakuya misi? (Salapo munjira isi)
	1. Indigenous knowledge (traditional practices) 2. Messages via radios and televisions (scientific systems) 3. Other specify
F6.	Do you receive adequate information on early warning system in each of the following? (indicate 0= Yes or 1=No **Ngonde**: Ka ngimba mukwambira ifimanyikilo fimo ufwana naifi? (salapo Ena or Ayi)
	Flood occurrence time
	Intensity of floods
	Magnitudes of floods

THANK YOU VERY MUCH FOR YOUR PARTICIPATION

Your ideas are appreciated

Appendix 2: Key Informants Interview Schedule

Key Informants Interview Guide

Thesis title: Assessment of Vulnerability and Local Capacity to Food disasters in Karonga district of Malawi
1. Vulnerability • Why are people vulnerable? State by explaining the characteristics that generate people's vulnerability to floods. • Can you explain to me who are the most vulnerable groups? • What are the elements at risk which are more vulnerable (list all you know)
2. Local Capacities • What support do you provide from your institution/organization to assist people in flood prone areas to mitigate flood impact and enhance community resilience?
3. Disaster risk reduction • What mitigation measures/policies are used to prevent flood impact in the area? • Do you have an evacuation plan? If yes can you describe it to me by explaining how suitable/unsuitable the plan is? If no, why don't you have it? • What mechanisms have been put in place to inform the people what to do in case of flood? • Explain the challenges faced when providing disaster risk reduction measures

Thesis title: Assessment of Vulnerability and Local Capacity to Food disasters in Karonga district of Malawi
4. Vulnerability • Why are people vulnerable? State by explaining the characteristics that generate people's vulnerability to floods. • Can you explain to me who are the most vulnerable groups? • What are the elements at risk which are more vulnerable (list all you know)
5. Local Capacities • What support do you provide from your institution/organization to assist people in flood prone areas to mitigate flood impact and enhance community resilience?
6. Disaster risk reduction • What mitigation measures/policies are used to prevent flood impact in the area? • Do you have an evacuation plan? If yes can you describe it to me by explaining how suitable/unsuitable the plan is? If no, why don't you have it? • What mechanisms have been put in place to inform the people what to do in case of flood? • Explain the challenges faced when providing disaster risk reduction measures

Appendix 3: Focus Group Discussion Guide

Focus Group Discussion Guide

Participants: VCPC, Chiefs, Community leaders, HSA, Extension workers, teachers and religious leaders
1) Flooding situation • When did start experiencing floods in the area? • When did you record the recent flooding in the area? • How can you differentiate the past floods and recent floods in terms of impact?
2) Underlying disaster risk • Briefly explain the factors that you think worsen people exposure to floods? • Floods happen more frequently in the area, describe to me by explaining why people have accepted to be troubled by floods without being relocating to safer places • Who are the most vulnerable group in the area?
3) Local Capacities • Narrate the actions you undertake before, during and after floods to mitigate its impact? • Which organizations are involved in issues of flood disasters in the area? • Explain what exactly do they do to help people prepare for and respond to floods • Explain if the organizations give people enough power to make decisions during flooding?
4) Disaster risk reduction • Do you receive any warning in case of flood? If yes, can you describe to me by explaining how effective/ineffective the warnings are? • What structural and non-structural mitigation measures are commonly used in the area to prevent flood impact

Appendix 4: Key Terms

Key Terms

Brief description of the concepts used in this thesis
Disaster • The term disaster owes its origins to the French word disaster whereby "des" implies evil and "aster" stands for star. • In this thesis, a disaster is understood as a disruption of the normal functioning of a community, caused by the interaction of natural hazard and vulnerability, which have Physical, social, environmental and economic impacts. • Measures suggested to precisely define disaster include, first property damage must affect more than 20 families or losses must exceed $50,000. Second, death of more than 10 people or more than 50 seriously injured. Thirdly, disruption of social services; communication failures, closure of essential services (schools, airports) severe stress on personnel, finances and equipment for the police, fire fighters and hospital services.
Hazard • It is understood as potentially damaging physical event, phenomenon or human activity that creates a danger to people's wellbeing, livelihoods, property or environment.
Vulnerability • It refers to a set of conditions and processes resulting from physical, social, economic, cultural and environmental factors, which increase the susceptibility of a community to the impact of hazards.
Capacity • It refers to resources and strengths which exist in households and communities and which enable them to cope with, withstand and prepare for, prevent, mitigate or quickly recover from a flood disaster.
Resilience • It is understood as the ability of a system, community or society exposed to hazard to resist, absorb, accommodate to and recover from the effects of a hazard in timely and effectively manner including the preservation and restoration of its essential basic structures and functions
Disaster risk reduction • It is understood as the systematic development and application of policies, strategies to minimize vulnerability and disaster risk throughout the society
Disaster risk management • Refers to a systematic process of using administrative directives, organizations, and operational skills and capacities to implement strategies, policies and improve coping capacities in order to lessen the adverse impacts of disasters.

Appendix 5.1: Summary of the Physical Factors Generating Vulnerability

Summary of the Physical Factors Generating Vulnerability

Outcome variables of the Physical factors	Number of participant in category of less important	% of participants in category of less important	Number of participants in category of important	% of participants in category of important	Number of participants in category of very important	% of participants in category of very important
Poor construction standards	38	19	64	32	98	49
Lack of safe awareness	12	6	56	28	132	66
Lack of building materials	24	12	40	20	136	68

Appendix 5.2: Summary of the Social Factors Generating Vulnerability

Summary of the Social Factors Generating Vulnerability

Outcome variables of the Social factors	Number of participant in category of less important	% of participants in category of less important	Number of participants in category of important	% of participants in category of important	Number of participants in category of very important	% of participants in category of very important
Lack of preparedness	28	14	54	27	118	59
Lack of knowledge on DRR	36	18	60	30	104	52
Lack of local institutions support	34	17	60	30	106	53

Appendix 5.3: Summary of the Economic Factors Generating Vulnerability

Summary of the Economic Factors Generating Vulnerability

Outcome variables of the economic factors	Number of participant in category of less important	% of participants in category of less important	Number of participants in category of important	% of participants in category of important	Number of participants in category of very important	% of participants in category of very important
Lack of markets	96	48	62	31	42	21
Low income	22	11	74	37	104	52
Poverty	10	5	40	20	150	175
Lack of diverse livelihoods	10	5	58	28	132	66

Appendix 5.4: Summary of the Environmental Factors Generating Vulnerability

Summary of the Environmental Factors Generating Vulnerability

Outcome variables of the environmental factors	Number of participant in category of less important	% of participants in category of less important	Number of participants in category of important	% of participants in category of important	Number of participants in category of very important	% of participants in category of very important
Pressure on land	36	18	39	19	125	63
Residing in flood prone areas	18	9	26	13	156	78
Lack of water and energy source	48	24	74	37	78	39

Appendix 5.5: Summary of the Cultural Factors Generating Vulnerability

Summary of the Cultural Factors Generating Vulnerability

Outcome variables of the cultural factors	Number of participant in category of less important	% of participants in category of less important	Number of participants in category of important	% of participants in category of important	Number of participants in category of very important	% of participants in category of very important
Traditional beliefs	72	36	56	28	72	36
Cultural conflicts	76	38	68	34	56	28
Defiance to safety measures	52	26	70	35	78	39
Absence of ownership	38	19	102	51	60	30

Appendix 6.1: Summary of the Physical Elements at Risk

Summary of the Physical Elements at Risk

Scale range: 1= Not vulnerable (0-25%), 7= Slightly vulnerable (26-50%), 5= Vulnerable (51-75%), 3= Severely vulnerable (76-100%)				
Elements at risk	% Do not know	% Not vulnerable	% Slightly vulnerable	% severely vulnerable
Houses	2	5	2	91
Bridges & roads	1	6	12	81.5
Wells	5	3	7	85
Boreholes	13	7	10	71
Toilets	1	2	8	89.5
Average %	**4.4**	**4.30**	**7.7**	**83.6**
Scale comment	Not vulnerable	Not vulnerable	Not vulnerable	**Severely vulnerable**

Appendix 6.2: Summary of the Social Elements at Risk

Summary of the Social Elements at Risk

Scale range: 1= Not vulnerable (0-25%), 7= Slightly vulnerable (26-50%), 5= Vulnerable (51-75%), 3= Severely vulnerable (76-100%)				
Elements at risk	% Do not know	% Not vulnerable	% Slightly vulnerable	% severely vulnerable
Health centres	19	16	36	29
School facilities	14	14	41.5	31
Average	**16.5**	**15**	**38.8**	**30**
Scale comment	Not vulnerable	Not vulnerable	**Slightly vulnerable**	Slightly vulnerable

Appendix 6.3: Summary of the Economic Elements at Risk

Summary of the Economic Elements at Risk

Scale range: 1= Not vulnerable (0-25%), 7= Slightly vulnerable (26-50%), 5= Vulnerable (51-75%), 3= Severely vulnerable (76-100%)				
Elements at risk	% Do not know	% Not vulnerable	% Slightly vulnerable	% severely vulnerable
Maize & cassava	0	3	1	95
Rice	0	1	4	95
Livestock	2	4	13	82
Trading	8	17	42	34
Fishing	12	22	57.5	8
Average %	**4.5**	**9.3**	**23.5**	**62.7**
Scale comment	Not vulnerable	Not vulnerable	Not vulnerable	**Vulnerable**

Appendix 6.4: Summary of the Environmental Elements at Risk

Summary of the Environmental Elements at Risk

Scale range: 1= Not vulnerable (0-25%), 7= Slightly vulnerable (26-50%), 5= Vulnerable (51-75%), 3= Severely vulnerable (76-100%)				
Elements at risk	%Do not know	%Not vulnerable	% Slightly vulnerable	% severely vulnerable
Forest	13	14	50	23
Soil and land	5.5	10	58	26
Natural pasture	6	5	51	38
Rivers	2	3	27.5	68
Average %	**6.6**	**8**	**46.6**	**38.8**
Scale comment	Not vulnerable	Not vulnerable	**Slightly vulnerable**	Slightly vulnerable