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DISTRICT RISK, VULNERABILITY AND CAPACITY ASSESSMENT REPORT

DRAFT

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Brig. Gen. M. Msuya

Director, Disaster Management Department

Facilitator

No.	Name	Institution
1.	Wilhelm Kiwango	University of Dodoma

Disaster Management Technical Team

1. Mr. F.O.S. Kalugendo
2. Mr. M.N. Butondo
3. Ms. S. Chando
4. Mr. E.B. Peter

Kilosa District Technical Team

No.	**Name**	**Department/Designation**
1	Dr. Yusuf Magwai	Public Health
2	Omar Njaka	Education, disaster focal point
3	Mohame Fadhili	Education
4	Simphorosa Mollel	Community Development
5	Vallence Lwomile	Planning
6	Hassan Bakari	Health and Environment

Executive summary

Kilosa District is highly vulnerable to floods. Floods in Kilosa pose a serious threat to communities' livelihoods both in the district and the country at large.

To reduce peoples' vulnerability to natural and man-made hazards and managing disasters in the effective and efficient manner, communities must know the risks that they face, and take actions based on that knowledge. This underscores the need to analyse the vulnerability of people or communities to disasters, as well as the underlying conditions which make disasters happen in the first place, through Participatory Risk, Vulnerability and Capacities Assessment (RVCA).

The RVCA for Kilosa district aimed to identify disaster risks, vulnerability and capacities in the district. The findings from the RVCA form the basis for the preparation of the District's Emergency Preparedness and Response Plan (DEPRP). Consequently, the assignment covered various aspects of RVCA, ranging from hazard identification and analysis; to capacities analysis. Moreover, the assessment covered social, economic and environmental aspects in relation to their risks (exposure), vulnerabilities and their capacities to cope with hazards/disasters at both district and village levels. The combination of these aspects necessitated the application of a variety of approaches in collection of field data. The assignment employed a variety of approached to assess the RVCA for the district in order to capture the required information at the district, village and household levels. Both primary and secondary data were collected, using a variety of tools and various data collection methods. The strategy was agreed in a pre-field workshop.

Findings indicate that Kilosa as a district is vulnerable to a number of hazards which impact on the normal life of most of the communities. However, flood is the most important hazard that has had devastating impacts on people, property and infrastructure. Other hazards, such as land use conflicts, epidemics, wild animals and pests also affect the district, albeit at a lower magnitude and scale. As a result, their impacts are also minimum. Critical infrastructures such as roads, bridges, houses,

community buildings and water sources are all at risk to floods and their vulnerability. Kilosa district is at risk to floods due to its downstream location relative to upstream catchment, so that heavy downpour in Dodoma, and Manyara regions usually result in floods in the district. Kilosa Township itself is divided into two parts by Mkondoa River, making it vulnerable to floods. Secondly, environmental degradation particularly unsustainable agricultural practices along hilly areas and along the river banks have contributed to siltation of the river. In flood disasters, women, children the elderly and physically challenged are more affected compared to men.

Kilosa district communities have different coping strategies that help to reduce the impacts of the flood hazards. These include the construction of the flood protection dyke, planting of vegetation cover (*matete*, reeds) along the banks of Mkondoa River, awareness raising on health and nutrition, and advocacy for building safe and permanent houses away from flood prone areas Various organisations (government and non-government) intervene in disaster situations and help affected communities in terms of food aid, capacity building/training programmes, health services, and seeds for drought tolerant crops such as sorghum.

The assessment recommends the need to apply a holistic approach in responding to impacts of hazards as an effective way to reduce risks and vulnerabilities in the district. Furthermore, it is recommended that in order to reduce risks and vulnerabilities, Disaster Risk Reduction (DRR) should be institutionalised in the development policies and programmes. Capacity building, especially the need for strengthening the capacity of local communities in DRR and training of District, Ward and Village level disaster management committees. Community based disaster management and emergency preparedness and response is recommended. There is also need to develop a disaster risk reduction monitoring and evaluation tool and mechanism which will assist to track impact of the programmes and measure community's resilience to hazards or disasters over time.

List of acronyms

DMD	**Disaster Management Department**
DRM	**Disaster Risk Management**
DRR	**Disaster Risk Reduction**
FGD	**Focus Group Discussion**
HIV/AIDS	**Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome**
LGA	**Local Government Authorities**
KDC	**Kilosa District Council**
PCVA	**Participatory Capacities and Vulnerabilities Assessment**
PMO	**Prime Ministers' Office**
RVCA	**Risk, Vulnerability and Capacity Assessment**
TASAF	**Tanzania Social Action Fund**
UNDAP	**United Nations Development Assistance Plan**
UNISDR	**United Nations International Strategy for Disaster Reduction WFP**
VICOBA	**Village Community Banks**

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CHAPTER ONE

1. Introduction

1.1 Background

In recent decades, Tanzania has experienced natural and man-made disasters that also pose a threat to the communities and the country at large. Natural disasters include, but not limited to drought, floods, earthquake, tsunami, epidemics (cholera, pandemic, influenza, Rift Valley Fever & HIV/AIDS), fire, collapse of buildings, and pests. Man - made disasters include inappropriate policies, marine and road accidents, conflicts and war. These tend to affect communities' livelihoods (Socio economic aspects) and the natural environment at large.

To reduce peoples' vulnerability to natural and man-made hazards and managing disasters in the effective and efficient manner, communities must know the risks that they face, and take actions based on that knowledge. In addition, communities suffer the most during disasters, yet they have a limited understanding of their risks and vulnerabilities that expose them to hazards and consequently, disasters. It follows that understanding risk requires investment in scientific, technical, and institutional capabilities to observe, record, research, analyse, forecast, model and map natural hazards. Tools need to be developed and disseminated: statistical information about disaster events, risk maps, disaster vulnerability, community capacities and risk indicators are essential. Moreover, the application of these tools in the assessment of vulnerability requires involvement of the communities in order to improve their effectiveness and ensure that the assessment is relevant to those who are more at risks.

The need to conduct a Risk, Vulnerability and Capacities Assessment (RVCA) arises from the fact that in the past, disasters were perceived to be caused solely by

external trigger events (e.g. earthquakes, floods-Oxfam, 2002). Moreover, disaster management has tended to focus more on analyzing the hazard itself (such as the severity of drought (Fontaine and Steinemann, 2009). Increasingly, the focus has now shifted to also analyzing the vulnerability of people or communities to disasters, as well as analyzing the underlying conditions which make disasters happen in the first place. In RVCA, the Participatory Capacities and Vulnerabilities Assessment (PCVA) is used as a tool for assessment, acknowledging that different groups of people are affected by different types of disasters in different ways. In other words, vulnerabilities and capacities are context specific and they vary in temporal and spatial dimensions (Brooks et al, 2005). For example, the factors that make a poor rural community in Kilimanjaro region vulnerable to drought are different from the factors that would make relatively wealthier urban areas such as Dar es Salaam to floods. In addition, the need for RVCA arises from the growing understanding that disasters happen in the development context and relief interventions aimed at alleviating the impacts of disasters can have negative or positive consequences to development. In some cases, the lack of understanding of the local capacities and vulnerabilities can result in more adverse conditions (Oxfam 2002).

The primary purpose of the vulnerability and capacity assessment is its use as a diagnostic tool to provide analytical data to support better informed decisions on preparedness, mitigation and relief and development activities. Key adaptation uncertainties arise from a limited understanding of physical/material vulnerability and capacity. The most visible area of vulnerability is physical/material poverty. It includes land, climate, environment, health, skills and labour, infrastructure, water supply, housing, finance and technologies. Social/organisational vulnerability and capacity: This aspect includes formal political structures and the informal systems through which a nation and its communities achieve planned goals. Motivational/attitudinal vulnerability and capacity: How individuals and communities in society view their ability to affect their environment, manage their

risks and take charge of their future direction. Experience shows that groups that share strong ideologies or belief systems, or have experience of successful co-operation are usually the most resilient.

A vulnerability assessment can serve as the basis for developing strategies for reducing risks from disasters. The assessment helps a community to estimate the number of people at risk, including people with special needs; identify the number and location of buildings at risk, including critical facilities such as hospitals and schools; and examine the communication links and networks that are vulnerable to disruption during and after a disaster, including informal networks of communication such as church groups.

It is within this framework that the Government of Tanzania, through the Prime Ministers' Office, (PMO) recognizes that unmanaged risks (natural, physical, social and economic), over a period of time may lead to the occurrence of disasters. It is becoming clear that the nature of vulnerability of the poor is complex and varied. Moreover, reducing risk to the poor requires multidimensional approaches and innovative institutional arrangements at Local Government Authorities (LGAs) level. This calls for collection of proper information and relevant data on risk, vulnerability and capacity at the community level. Henceforth, the PMO - Disaster Management Department (DMD) and Kilosa District Council (KDC) in collaboration with UNICEF, under the United Nations Development Assistance Plan (UNDAP): Emergency Preparedness and Response Programme, will facilitate the assessment of Risks, vulnerability and capacities in Kilosa District, Morogoro region.

1.2 Objectives of the assessment

The main objective of the assessment was to identify disaster risks, vulnerability and capacities in Kilosa District there by address emerging concerns and needs.

The specific objectives were to:

- Identify and understand major risks and vulnerability that expose people to disasters in Kilosa district
- Determine the current capacities of Kilosa district and their stakeholders in addressing DRM;
- Identify necessary resources including human, financial, equipment and material resources required to support DRM in Kilosa district;
- Outline the current capacities including available resources of key stakeholders and committees at Kilosa responsible for DRM; and
- Assess the current disaster information and communication strategies for DRM in Kilosa district.

1.3 Literature review

1.3.1 The Vulnerability concept in Risk and Hazard assessment

In the disaster community, it is widely accepted that hazard and disaster terminologies are used inconsistently, reflecting the wide range of multidisciplinarity on the disaster and hazard research.

The term **"Vulnerability"** originates from the latin word *vulnerare***-** to be wounded. It describes the potential to be harmed physically and /or psychologically as a result of *exposure*. It is the potential to suffer harm or loss, related to the capacity to anticipate a hazard, cope with it, resist it and recover from its impact (Smit and Wandel, 2006; Benson and Twigg, 2007).

Vulnerability can also be defined as a "set of conditions and processes resulting from physical, social, economic and environmental factors that increase the susceptibility of a community to the impact of hazards." (CONCERN, 2005:9; Kumpulainen, 2009:66). Thus, both *vulnerability* and its antithesis, *resilience*, are determined by physical, environmental, social, economic, political, cultural and institutional factors (Benson and Twigg, 2007). It is people's or a system's susceptibility to a given hazard which is determined by the extent to which they can anticipate, cope with, respond to and recover from its impact (CONCERN, 2005, Smit and Wandel, 2006).

Similarly Blakie et al (1994) defines vulnerability as " a combination of characteristics of a person or group, expressed in relation to hazard *exposure* (emphasis added) which derives from the social and economic condition of the individual, family, or community concerned". Vulnerability also encompasses the idea of response and coping, since it is determined by the potential of a community to react and withstand a disaster. The United Nations International Strategy for Disaster Reduction (UNISDR) defines vulnerability as "the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard" (UNISDR, 2009:30).

Although these definitions may appear to be different in the first place depending on the context, they all seem to point out that for an individual. Community, group or a social-ecological system to be vulnerable, there must be some predetermining factors (characteristics) that *expose* (increase the susceptibility of) the individual or a social ecological system to suffer harm or potential loss from the impacts of a hazard. They range from economic, social, environmental political, institutional and physical characteristics. These characteristics also determine the extent to which an individual can anticipate, cope and recover from hazard impacts, commonly known as coping/adaptive capacity.

One important aspect of vulnerability in relation to hazards is that of *exposure*. Exposure (synonymous with sensitivity) of a system to a hazard or risk reflects the

likelihood of that particular system (e.g. a community) experiencing that hazard/risk (e.g. drought) and the occupance and livelihood characteristics of the system which influence its sensitivity to such exposure. (Smit and Wandel, 2006). It is the "people, property, systems, or other elements present in hazard zones that are thereby subject to potential losses" (UNISDR, 2009:15). The occupance characteristics (e.g. settlement location and types, livelihoods, land uses), reflect broader social, economic, cultural, political and environmental conditions, sometimes called ''drivers'' or ''sources'' or ''determinants'' of exposure and sensitivity. (Ibid, Smit and Wandel, 2006).

1.3.2 The relationship between Risk and Vulnerability

According to Brooks et al (2005) risk definitions are usually probabilistic in nature, relating to:

- the probability of occurrence of a hazard that acts to trigger a disaster or series of events with an undesirable outcome, or
- the probability of a disaster or outcome, combining the probability of the hazard event with a consideration of the likely consequences of the hazard (See also UNISDR, 2009)

Risk can be conceptualized as being related to compound disasters resulting from or triggered by various hazards (e.g. drought, extreme precipitation) but mediated by the sensitivity or vulnerability of a particular system (Ibid; Yohe and Tol 2002; Kumpulainen, 2006). Therefore, risk can be viewed as a function of hazard and vulnerability, thus:

$$\text{Risk} = \text{Hazard} \times \text{Vulnerability} \qquad (1)$$

Since vulnerability is also dependent on sensitivity, exposure, and the ability to cope (adaptive capacity) as stated earlier, (Brooks et al, 2005; Fontaine and Steinemann, 2009 it follows that:

Vulnerability (V) = (E +S)/A (2)

Where: E=Exposure

S=Sensitivity

A=Adaptive/coping capacity

The above relationship emphasizes that higher hazard exposure and sensitivity results in high magnitude of the impact and high vulnerability while high adaptive capacity leads to low vulnerability. In other words, vulnerability is directly proportional to exposure and sensitivity and inversely proportional to coping capacity. From (1) above, the risk is high when vulnerability is high and vice versa. Operationalisation of the vulnerabilities can be achieved through the use of "proxies"-social, economic and environmental indicators that can be used to 'measure' how vulnerable a particular community, group or a social ecological system is given a set of determinants.

Risk assessment is "a methodology to determine the nature and extent of risk by analysing potential hazards and evaluating existing conditions of vulnerability that together could potentially harm exposed people, property, services, livelihoods and the environment on which they depend" (UNIDSR, 2009:26)

1.3.3 Vulnerability Assessment

Vulnerability assessment refers to the assessment of threats from a potential hazard to a system/population. Vulnerability assessment involves collecting and analyzing data on the five categories of assets identified in the livelihood framework model above. When these assets are at risk, they are commonly known as the **elements at risk.** (See also PMO, 2003)

Vulnerability assessments describe who and what is exposed to the threat (hazard identification), and the differential susceptibility (the potential for loss, injury, harm, adverse impacts on livelihoods), and impacts of that exposure. In other words, the goal is not only to identify the risk factors (who and what is vulnerable), but also the driving forces that shape vulnerability in a particular place (Hill and Cutter 2001; Birkmann 2006).

1.3.4 Coping capacity

According to the UNISDR (2009), coping capacity is defined as "the ability of people, organizations and systems, using available skills and resources, to face and manage adverse conditions, emergencies or disasters." This implies that the available resources and skills must not be at risk-or, in other words, the existing assets should be able to withstand shocks and stresses resulting from potential hazards. Coping capacity is also "the characteristics of people and communities which can be used to respond to and cope with disasters and on which future development efforts can be built" (Oxfam, 2002). These characteristics can be thought of as relating to the communities' available assets that can be used during disasters.

CHAPTER TWO

2. Methodological approach

2.1. Overview

The need to conduct RVC assessment arises from the fact that, disaster management has tended to focus on the hazard itself[1] (e.g. severity of famine as a result of draught). However, it has become increasingly important to assess the causes, impacts and strategies that are necessary to reduce the impacts arising from hazards, as well as the social economic implications of the impacts.[2]

The assignment required the facilitator in collaboration with the technical team from PMO and Kilosa district council (KDC) to conduct Risk, vulnerability and capacities assessments for KDC and prepare a manual for the assessment of the same. Consequently, the assignment covered various aspects of RVC assessment, ranging from hazard identification and analysis; to capacities analysis. Moreover, the assessment covered social, economic and environmental aspects in relation to their risks (exposure), vulnerabilities and their capacities to cope with hazards/disasters at both district and village levels. The combination of these aspects necessitated the application of a variety of approaches in collection of field data.

A variety of approaches/methods exists for the assessment of risk, vulnerability and capacities depending on, for example, scope, available resources, target group, type of hazards (e.g climate related, physical or biological) and location. However,

[1] Fontaine, and Steinemann, (2009). Assessing Vulnerability to Natural Hazards.
2 Ibid, CONCERN (2005).Approaches to Disaster Risk Reduction.

common in the vast number of approaches in RVC is the need to do it step by step, thus[3],[4]

- Hazard identification and ranking: Issues analysed included hazard history, frequency of occurrence and magnitude/severity.
- Analysis of existing facilities/infrastructure : To determine their degree of exposure and sensitivity, hence their vulnerability and any existing capacities
- Social, economic and environmental analysis : This also determine their degree of exposure and sensitivity, hence vulnerability
- Analysis of existing capacities in terms of physical assets/infrastructure, social and environmental/natural assets.
- Data interpretation, analysis and report writing

2.2. Sampling

Stratified sampling design was employed, to obtain sampling populations at the District level. Hazard history was used to determine sampling strata. Using the 2009/2010 and 2014 floods as baseline, two strata were identified for sampling, namely Kilosa Township and Magole Division. These two areas have been severely affected by floods and other hazards such as strong winds. Within the two stratified areas, households were randomly identified and sampled for household questionnaires. In Kilosa Township, all wards (Mkwatani, Magomeni, Kasiki and Mbumi) were systematically identified for sampling, followed by a random sample of households. In Magole division, Magole and Mateteni wards were systematically identified, followed by random household sampling. The two wards (Magole and Mateteni) were chosen because they were the most affected by floods in 2014. A total of 95 households were

3 Watson, C. (2009). Vulnerability Assessment Tool.

4 CONCERN,(2005). Approaches to Disaster Risk Reduction

sampled from the two areas after thorough processing and cleaning of the data. The interviewed sample consisted of 48 Males and 47 females accounting for 50.5% and 49.5% o respectively. Nearly half of the interviewed people (46.5%) were of the age range between 36-55 years, followed by the age group between 55-70 years (Figure 1). Therefore, the interviewed population was composed of mainly adults who have enough experience and knowledge to understand the various issues that were being asked through the questionnaire.

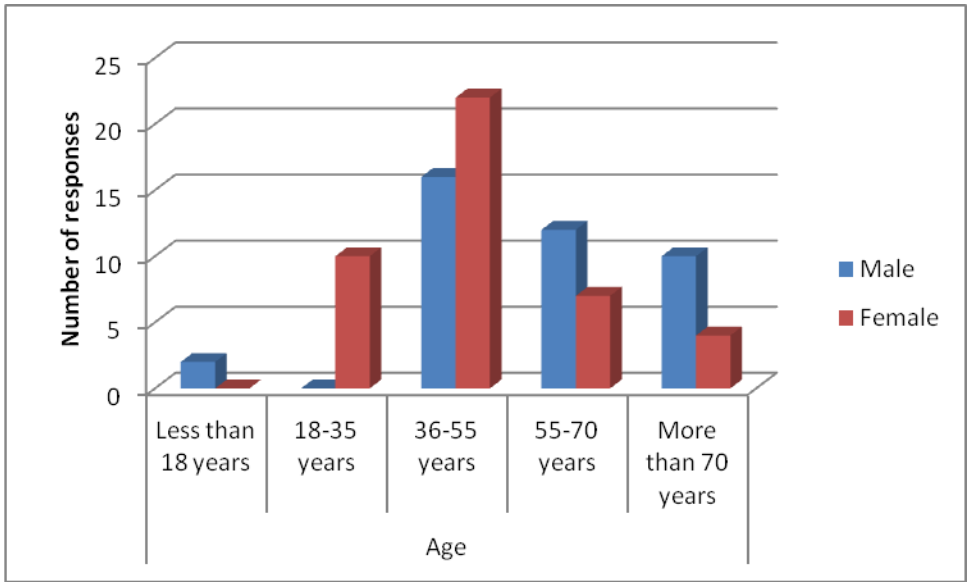

Figure 1: Age groups by sex of the interviewed population, Kilosa District.

Source: Field data, 2015

Focus group discussions were held at Kilosa Township and Magole division consisting of village leaders, influential people, elders, and representatives from non-governmental organisations, extension workers, religious groups, women and the youth in order to validate the information and triangulate it with the household questionnaire. Various Participatory Rural Appraisal (PRA) methods were employed to elicit response and information from the participants, including hazard/resource/vulnerability mapping, historical timelines, Venn diagrams, matrix scoring/ranking, and open ended discussions using a questionnaire guide.

Observations by the assessment team also complimented the data while questionnaires were also administered at the district level to various departments to validate the information collected at the village and household levels.

2.3. General Description of the District

The following section provides a description of the study area in terms of geographical location, size, population, drainage, topography and drainage.

2.3.1. Location and Land Area

Kilosa District is one of six districts forming Morogoro region. It is one of the oldest districts in Morogoro region and the country at large, formed in 1926. The district is located between Latitude 5^{o} 55′ and 7^{o} 53′ South of the Equator, and Longitude 36^{o} 30′ and 37^{o} 3′ East of Greenwhich. Kiloas district has a total land area of 12,393.7 Km^2 which is 17% of the total land areas for Morogoro Region. The district is boarded by Mvomero District on the East, Kilombero District and Iringa Region on the South, Gairo District on the North while it shares a border with Mpwapwa and Gairo District of the West(Figure 2).

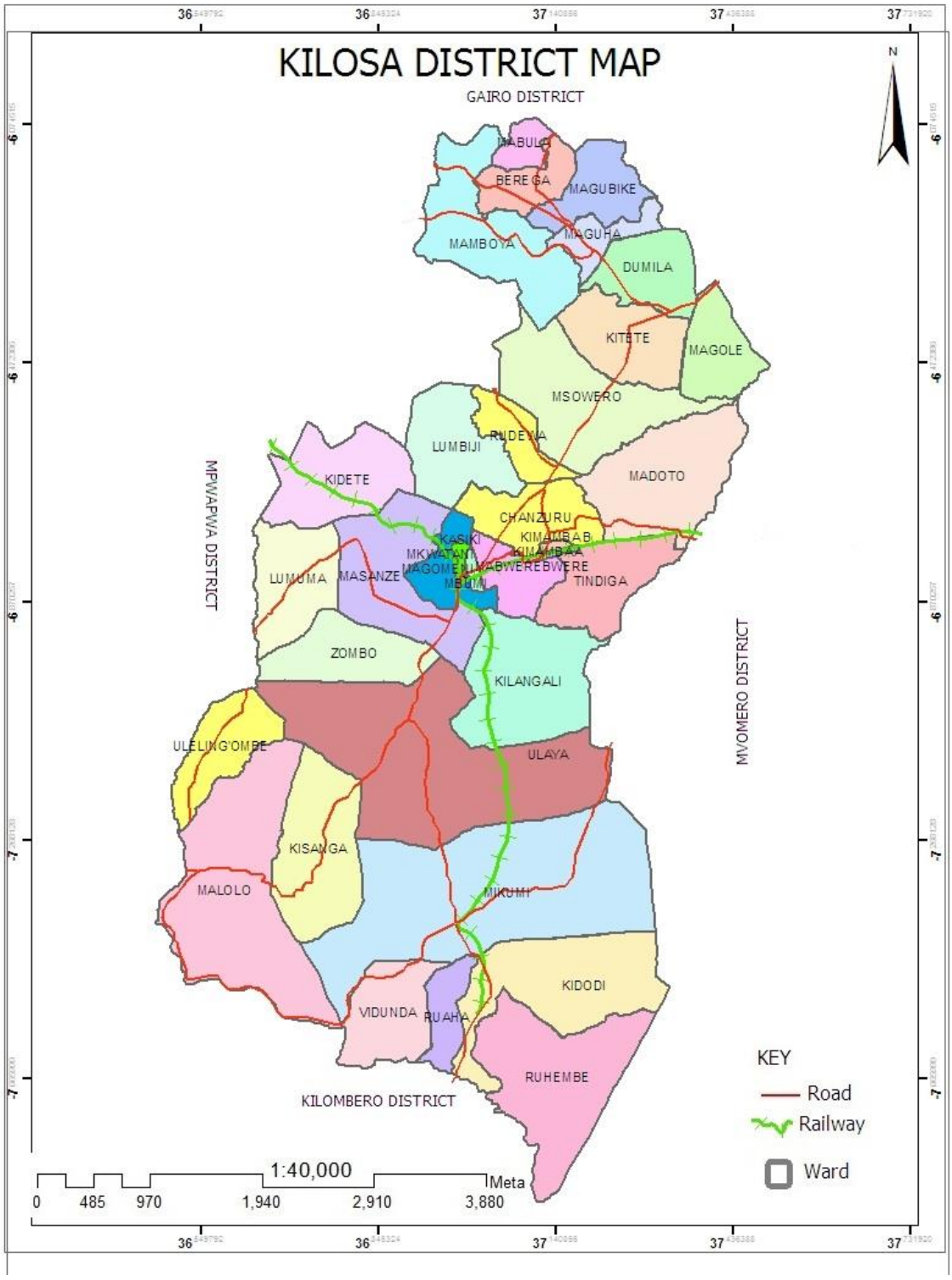

Figure 2: Kilosa District Map

Source:Kilosa District Council, 2014.

2.3.2. Population and Administrative Units

2.3.2.1. Administrative Units

Administratively, Kilosa district is subdivide into 7 divisions, 40 wards and 139 villlages and 835 hamlets/streets.

2.3.2.2. Demographic characteristics

According to the National Bureau Statistics (NBS, 2012) census data, Kilosa district has a population of 438,175 comprising of 218,378 men and 219,797 women, with a population density of 34 per square kilometer. This population accounts for about 19.7% of all inhabitants of Morogoro region. The district has a total of 102,447 households, with the average household size at 4.2 persons per household and a sex ratio of 99. The district has three major ethnic groups: The Kaguru (Swahili: *Wakaguru*) in the north, Sagala *(*Swahili: *Wasagal*a) in the central zone and Vidunda (Swahili: *Wavidunda*) in the south. However, many people from other ethnic groups have migrated to the area over the last decades[5]. These include the Parakuyo Maasai, The Gogo, Sukuma and Barbaig.[6]

2.3.3. Climate

Kilosa district experiences long rainfall season, spanning through eight months of rainfall. The highest rainfall is experienced between February and March. In good rainfall years, the district experiences a bimodal rainfall pattern. The short rains are usually from October to January; while long rains occur between mid February to May

[5] Kajembe et al., 2013. Social economic baseline survey for the Kilosa REDD project

[6] See Benjaminsen, 2009. The Kilosa Kilings: A political ecology.

the mean annual rainfall ranges between 100-1400mm while the mean annual temperature is 25^0C[7].

2.3.4. Topography

The topography of the district can be subdivided into three distinct sub-categories, namely the ***flood plain, plateau*** and ***highland***[8]**.**

2.3.4.1. The Floodplain

The flood plain comprises both flat and undulating plains extending to the foothills in the west, with an altitude of about 550m. It has several rivers, the major ones being the Wami and the Ruaha. The central parts are mainly occupied by pastoralist communities especially Maasai and Sukuma. The soils are poorly drained, black cracking clays in the central parts, and subject to seasonal flooding. In the peripheral western part, sediment fans are of black fertile soils, making them suitable for a range of crops, such as maize, cotton and sisal.

2.3.4.2. The plateau

The ***Plateau*** is situated in the north of the district, with an altitude of around 1,100m, it is characterised by plains and hills and is made up of moderately fertile, well-drained sandy soils. Although these soils are highly erodible, the area is intensively used for maize production and livestock keeping.

2.3.4.3. The highland

The runs from north to south on the western side of the district, with an altitude up to

[7]. Kajembe et al., 2013.

[8] See also Kajembe et al 2013.

2,200m. It is a part of the Eastern Arc mountain range that runs from Kenya down through Tanzania and is represented in Kilosa by three mountains: Ukaguru, Rubeho and Vidunda.

2.3.5. Vegetation

The vegetation in Kilosa District is characterised by both Mediterranean and tropical types, depending largely on altitude along the south–north exterior. Typically it consists of Miombo woodland, with grass and shrub covering the soils. Most of the forests are found in the western part of the district along the Eastern Arc mountain range where all the three pilot villages are located, more specifically around the Rubeho Mountains. The Eastern Arc Mountain range has several unique ecosystems with a variety of species[9].

2.4. Post field activities

2.1.1. Data cleaning, processing and analysis

After the data collection process, all data were put together and checked for incompleteness, errors and gaps in information obtained from the respondents. Both quantitative and qualitative approaches were used to analyse and process data. Statistical packages such and SPSS and Excel were used to process and analyse quantitative data, while transcript and content analysis were used to analyse qualitative information.

[9] Kajembe et al 2013.

CHAPTER THREE

3. Findings and Discussions

3.1.1. Introduction

This chapter presents the main findings of the RVC assessment done for Kilosa district. It covers the social economic characteristics, at the district and household levels, the types, severity and magnitude of hazards, vulnerability analysis for the physical, social and environmental assets, and the coping capacity.

3.1.2. Social economic characteristics

3.1.2.1. *Sex, Education and Household size*

The sampled population in Kilosa district consisted of both males (50.5%) and females (49.5%) from 95 households that were visited during the survey. While majority of the sampled population had primary education (72.4%,Figure 3), this was followed by those with no formal education (12.2%) in the interviewed sample. This section of the population would need special attention in times of emergencies such as disaster occurrences. This is because theirability to make informed decisions and understand carious communication and warning messages is limited compared to those with higher education[10]. However the education level between males and females did not differ significantly ($\lambda^2_{(0.05,\ 4)} = 0.185$) (Table 1). Majority of the sampled households (41.8%) had a household size of 4-6 persons, corresponding to the district average of 4.2 persons per household.

[10] See PMO-DMD 2015 Baseline report for emergency communication strategy in Tanzania.

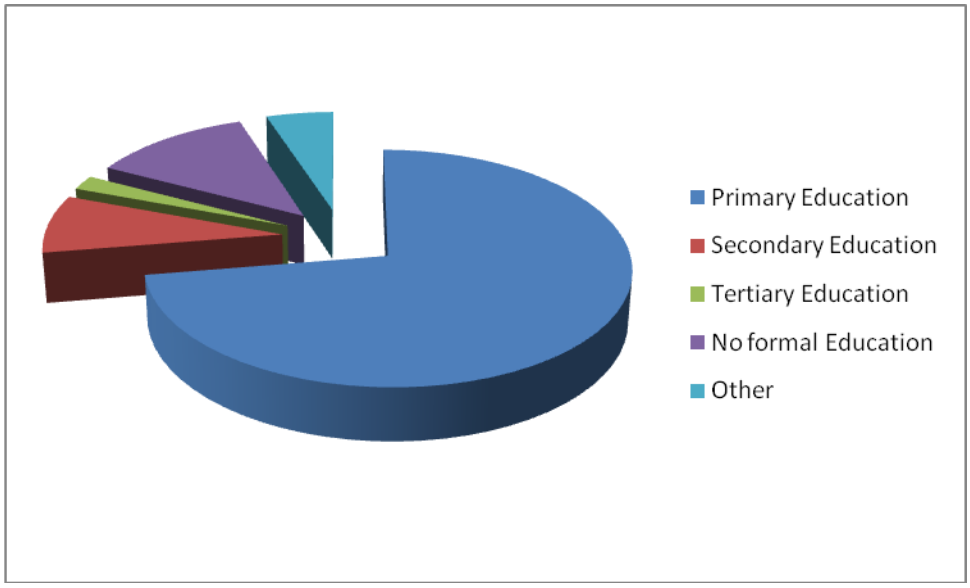

Figure 3: Education level of the respondents in Kilosa district.
Source: Field Data 2014.

Table 1: Comparison between sex and education level in Kilosa District Council

		Sex		
		Male	Female	Total
Education Level	Primary Education	36	34	70
	Secondary Education	4	3	7
	Tertiary Education	2	0	2
	No formal Education	3	9	12
	Other	3	1	4
Total		48	47	95

Source: Field Data, 2015

3.1.2.2. *Main economic activities*

About 80% of the respondents in Kilosa district are engaged in farming activities-mainly in small scale farming and livestock production. The main crops cultivated include maize, rice, millet, cassava, beans, bananas and cowpeas. Besides food crops, the main cash crops are sisal, cotton, coffee, wheat, cashew nuts, coconuts, sugar

cane and tobacco. Some of the food crops are also used as cash crops-sold only when it is considered surplus, particularly in small scale farmers who comprise 90% of the farmers in the district. Kilosa district has eight livestock markets each one operating in a specific day of the month[11] (*minada*) with customers coming within and outside Kilosa district. Formal employment is limited, as wage labour has declined with the decline of sisal and cotton plantations in the district[12]

3.2. Hazard identification and analysis

In the first part of the Risk, Vulnerability and capacity assessment findings, the analysis of disasters in terms of their types, occurrence, frequency, and severity is presented for the sampled population at both the district and village levels. The aim was to find out how the hazards have affected people in the past, their likelihood to occur, magnitude, scale, severity and their impacts the most vulnerable groups and whether there are any indigenous early warning signs in the district.

More than 7 hazards were identified at the household and village levels through focus group discussions and household questionnaires (Figure 4**Erro! A origem da referência não foi encontrada.**). Flood is the single most important hazard affecting Kilosa District, accounting for 66.2 % of all reported cases (N=145). Other hazards include drought (10.3%) and Land use conflicts (10.3%). Strong winds were also reported to have sometimes resulted in disasters.

[11] Benjaminsen, 2009.

[12] *Ibid.*

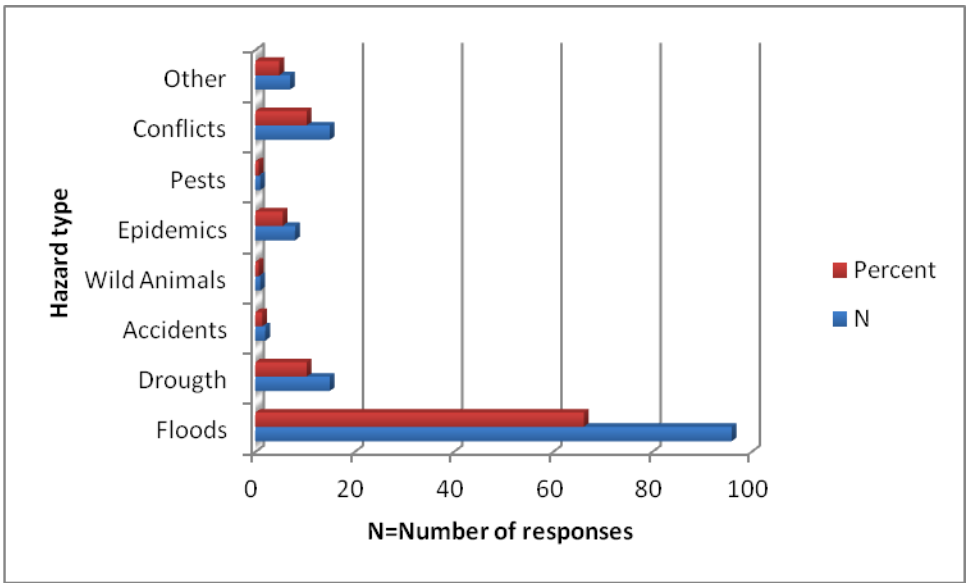

Figure 4: Main Hazard types affecting Kilosa District

Source: Field data, 2015

The main hazards are briefly analysed separately in the following section.

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3.2.1. *Floods*

3.2.1.1. *History, definition, areas affected and trends*

Flood is the main hazard that affect Kilosa district. The hazard has caused disasters in the past, notably in the year 1968, 1997/98 (El Nino), 2009/2010, and 2014. The 2009/2010 floods affected mainly Kilosa township, including all four wards of Mkwatani, Magomeni, Kasiki, and Mbumi. The 2014 floods affected mainly Magole, Kimamba, Kilosa Township, Masanze and Mikumi divisions[13]. However, Magole division was the most affected by these floods. Findings indicate that 68% of the respondents mentioned floods as the hazard that has caused disaster in the past, with a further 57.3% feeling that the trend in the occurrence of the disaster is increasing. Furthermore, 59.1% of the respondents knew that a flood is a rapid onset disaster, taking hours to occur. This shows a high level of risk awareness on flood occurrence among the respondents. Furthermore, majority of the respondents (70.2%) define flood hazard as becoming dangerous when water levels reach a certain height, particularly in Rivers such as Mkondoa and Mkundi (Table 2).

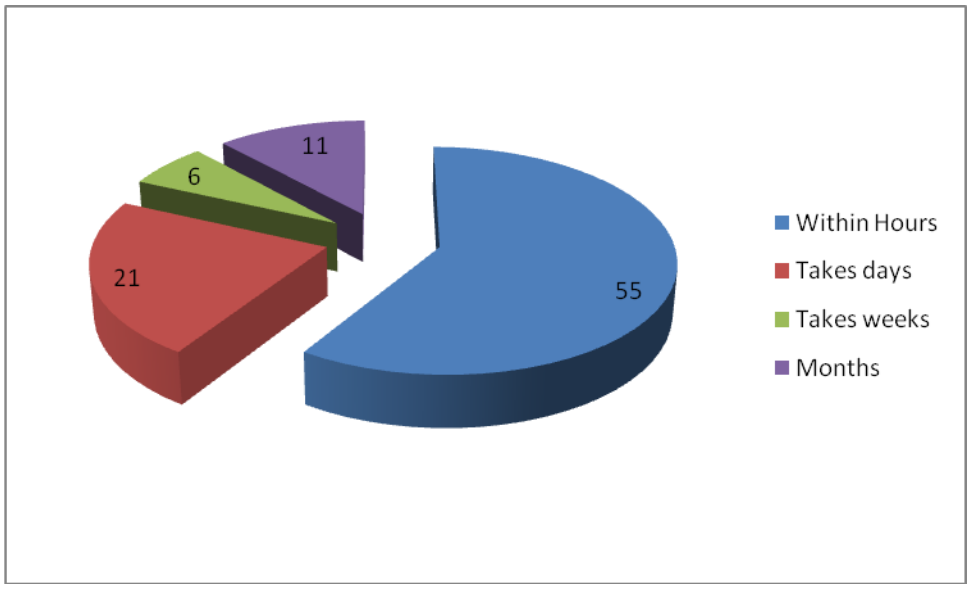

Figure 5: Speed of onset for floods, Kilosa district
Source: Field data, 2015

[13] KDC, 2015. Kilosa Flood Report 2014

Table 2: Flood hazard definition in Kilosa District

		Responses	
		Number of responses	Percent
Hazard definition	Water levels reaching a certain height	92	70.2%
	Crops and Vegetation starts drying	16	12.2%
	Increased Malnutrition rate	3	2.3%
	Animals dying	2	1.5%
	Increased Death Rates	1	.8%
	Household reduced number of meals	4	3.1%
	Increased number of sick people	6	4.6%
	Others(Low production of crops, Destruction of Houses)	7	5.3%
Total		131	100.0%

Source: Field data, 2015.

3.2.1.2. *Underlying conditions*

a) **Location:** Kilosa Township is located in such a way that Mkondoa River (Plate 1) divides the town into two parts. The River itself poses a threat to the township, particularly when heavy downpour occurs in the upper catchment (Mpwapwa and Kondoa districts). Waters from the upper catchment flows through the river and causes flooding. This was the case in the 2009/10 floods in Mpwapwa and Kondoa recorded a 107mm of heavy downpour in 24 hours. This, in turn, resulted in floods that damaged the river banks and inundated the township in the absence of preventive measures such as flood protection dykes. To illustrate the importance of flood protection infrastructure, the 2014 floods in Kilosa Township mainly affected parts where the current flood protection dyke does not cover, such as Magomeni ward.

b) **Environmental degradation**: unsustainable agricultural and livestock keeping, and deforestation contributes increases the risk of floods and compounds the impacts. Cultivation and sand mining along the river banks, shifting cultivation especially along the mountainous areas (without terraces or contour farming), and high number of livestock units contributes to soil erosion, while bush fires, logging and fuel wood collection contribute to deforestation. These activities in totality cause siltation of Mkondoa River, raising the river bed and increasing the risk of flood occurrence.

c) **Failure of the sand dyke at Magole** caused floods in Magole village and poorly constructed culverts along Magole-Turiani road that could not adequately drain the flood waters

d) **Poor town planning**: this is particularly the case in Kilosa Township, in which inadequate town planning has led to construction of poor quality houses in flood-prone areas, and poor drainage system.

e) **Inadequate enforcement of bylaws** with regards to sustainable agricultural practices and cleaning of the drainage system.

Plate 1: Mkondoa River (L) and its important bridge(R).

Photo: W.Kiwango, 2015.

3.2.1.3. *Impacts*

The flood impacts in Kilosa have been devastating, ranging from destruction of infrastructure, houses, crops, and livestock and loss of lives.

a) Destruction of infrastructure: Roads, bridges (e.g. Mkundi Bridge, along Morogoro and Dodoma highway was partly destroyed by the floods blocking road communication between Morogoro and Dodoma) and railway lines. Moreover, the road to Berega hospital was impassable as the 52m bridge was completely washed away. The national fibre optic infrastructure,
b) Destruction of houses: about 520 houses in Magole division were completely destroyed by the 2014 floods, leaving 1,886 people homeless. These included 940 women, 946men and 263 children less than five years old. At the same time, 921 households with 3953 individuals were partly destroyed. The International Federation of Red Cross and Red Crescent Societies (IFRC)

estimate that the 2010 floods impacted about 50,000 people in Kilosa and rendered about 28,000 homeless[14].

c) Destruction of community buildings: about 9 community buildings, comprising of schools, churches, mosques, and courts were affected. For example, one dormitory in Kilosa Secondary schools was set ablaze as a result of electric fault during the floods.
d) Displacement of people: 401 households were given temporary shelter as a result of the floods
e) Destruction of crops: farms were inundated by floods and various crops were destroyed 1,134 acres of banana 663 acres of sugar cane, 1,032 acres of maize and 459 bags of rice.
f) Deaths: One secondary student died in 2014 floods in Kimamba Division.

3.2.1.4. *Vulnerable people*

The most vulnerable people during the floods were women, children, physically challenged and the elderly.

[14] IFRC, Tanzania Floods: Final report, 30 April 2011

Plate 2: Temporary shelters at Magole Village, Magole ward 2014.

Photo: KDC, 2014.

3.2.2. *Others hazards*

Other hazards, in Kilosa are briefly analysed in Table 3 below

Table 3: Other hazards affecting Kilosa District

S.N	Hazard type	Date/Duration	Areas Affected	Level of threat (High, Medium, Low, None)	Underlying conditions
(a)	Floods	1968,1997/1998, 2009/2010, 2014,	Kilosa Township,Mikumi, Magole, Kimamba Masanze divisions	High	Environmental degradation, inadequate town planning, location of the township against flood occurrence,
(b)	Drought	Jan-February	part	Low	Unpredictable rains
(c)	Land use conflicts	Throughout the year	Whole district, mainly between individual farmers, farmers and	high	Historical: estate farming since colonial periods,

			herders, or individual herders		immigration due to estate farms, presence of protected area (Mikumi national Park contribute to difficult accessibility to land. About 50% of land in Kilosa is privately owned.
(d)	Fire (bush)	Dry season	Masugu, Mkadaje and Kasiki	Low	Uncontrolled fires, arsonists
(e)	Wild animals-elephants, baboons, monkeys, crocodiles	Every year	Mainly farm areas-Kilangali, Tindiga, Nambamba, Masuga	medium	Proximity to protected areas, e.g Mikumi national park
(f)	Epidemics (malaria)	Rainy season, after floods	whole	medium	Adequate breeding conditions
(g)	Pests (army worms)	Farming season	Farm areas	Low	Availability of food and breeding conditions

3.3. *Indigenous Early Warning Signs*

The communities use a variety of traditional early warning signs to predict the onset of floods .The early warning signs have been important in helping the communities to prepare, cope and recover from various hazards. The main early warning signs are summarized in Table 4. All signs and warnings are mainly for floods indicating the severity of the hazard.

Table 4: Indigenous early warning signs Kilosa District Council

S.N	Indigenous early warning signs	Interpretation
	- Information on heavy downpour from Kidete ward	- Floods will possibly occur

	- Heavy sounds from Mkondoa River	- Indicates approaching floods
	- Increasing water level in Mkondoa river	- Indicates possibility of flood occurrence

Source: Field data, 2015

3.4. *Gender-Based Responsibilities during disasters*

Men, women and children have different roles to play in disaster situations as indicated in the following analysis in terms of division of labour during disasters. This highlights the fact that some other groups of people such as women are more vulnerable to disasters based on their assigned responsibilities during disasters.

- Responsibilities of men include:
  a) rescue of family members,
  b) draining flood waters from houses,
  c) looking for alternative shelter,
  d) repair of drainage systems,
  e) looking for food
- Responsibilities of women are:
  a) taking care of children,
  b) food preparation,
  c) help in flood drainage from houses,
  d) taking care of the sick especially those admitted in hospitals**,**
- Responsibilities of children are
  - Help mothers

3.5. *Vulnerability Analysis*

3.5.1. Economic assets

The main economic activity for most of the people district is farming employing more than 80% of the workforce. shows the main occupation of the respondents. Other economic activities include fishing, mainly in miombo, Mwimbi, Nala and Zombo dams, casual labor, small businesses, livestock keeping, crafts (baskets, floor mats, pots), local beer breweing, and selling firewood. The most economic asset s at risk include farming, causual labor and small businesses. Since these activities also engage a large section of the population, it imlies that floods would negatively impact in these assets making people even poorer after the disaster. Recovery efforst should aim to revive these activities through soft loans and provision of farm inputs to farmers.

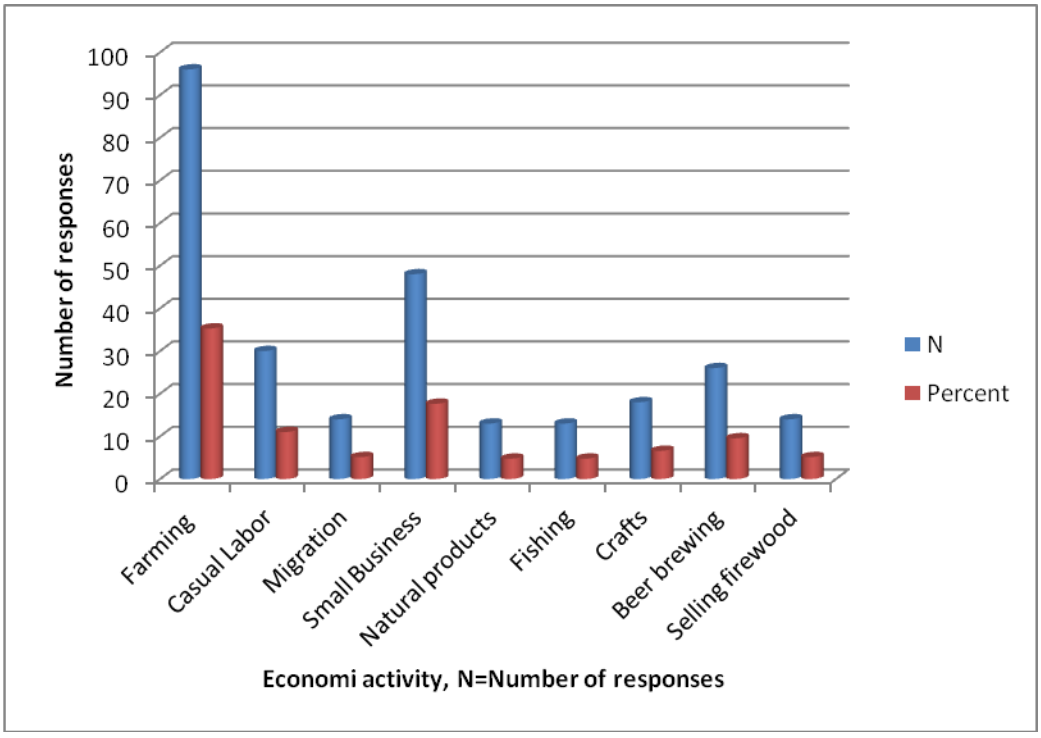

Figure 6: Economic assets at Risk from floods in Kilosa district.
Source: Field data 2015.

The agricultural sector is mostly rainfed and therefore highly vulnerable not only to floods but to general climatic changes that affect larger areas. Kilosa is a wet district compared to other areas making it suitable for agriculture. The district district is traversed by 36 rivers, six perrenial and the rest are seasonal. Perennial rivers include Mkondoa, Mkundi, Lumuma, Zombo, Msowero and Mkata Rivers[15]. However, the the district is impacted by floods that originates from river catchments elsehwere. Floods tend to disrupt the normalcy of the community apart from distruction of farmlands and houses. This explains the vulnerability of agriculture as a whole, small businesses and casual labor to floods in Kilosa.

Further analysis on income indicates that men earns more than women in terms of average income per month ($\lambda^2_{(0.05,\ 5)}$=002). Most men indicated to earn between 100,000-200,000Tsh per month while women earn between 10,000-50,000 per month. The differences in income earned between men and women ahs a significant impact on the ability to respond and cope with the impacts of disasters. It shows that women are more vulnerable than men, considaring endowment of resources such as cash income.

On the other hand, the various use of the income generated from harvested crops can point out to sources of vulnerability. Analysis of various use of income generated from various livelihood activities indicate that a large part of the income is spent in almost equal distributions to health services (23%), buying food (23%), school fees(19%), and (11.%). Very little is left for saving (7%), undermining their ability to respond and cope with disasters such as floods (Figure 7).

[15] Maembe and Mudiguza, 2010. Poverty and Environment Newsletter. Vol.8. Vice Presidents's Office.

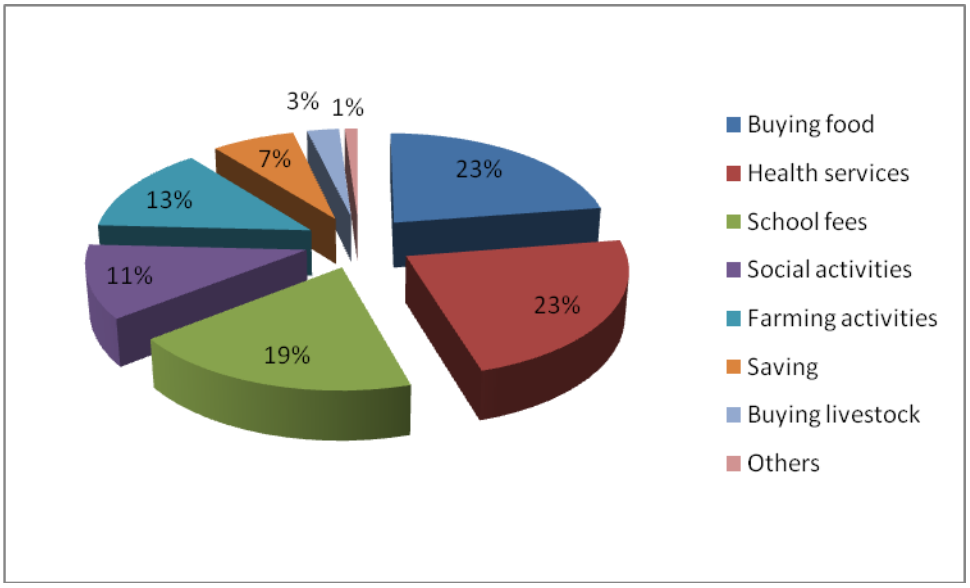

Figure 7: Various uses of income in Kilosa district
Source: Field Data, 2014.

On the other hand, about 40.8% of the communities had access to credit, while 59.2% said they had no borrowing opportunity. Yet the ability to borrow is an important aspect to help in responding and recovery from disasters. For those communities with access to credit, majority borrowed from relatives and friends (42.9%) while 11.9% obtained their credits from banks. Other sources of credit in Kilosa district include "Ligonga" and "Gobogobo,"[16] SACCOS, Village Community Banks (VICOBA) and group savings.

The main purposes for borrowing were for basic household needs such as food (36.2%) and starting business (29.8%). Very few borrowed for the purpose of using the credit in disaster situations. Borrowing for basic needs such as food indicates that most of the interviewed individuals are vulnerable to emergencies such as disaster occurrence. It signifies the high level of poverty-caused by few livelihood options. In this case their ability to cope in times of disaster is low and their vulnerability high.

[16] These are credit schemes operated by individuals who charges very high interest rates-usually 50% for the first month, with a 50% increment in interest rates for every month delay in repaying the loan. In most cases, it compounds the vulnerability of the lonee.

Table 5: Main purposes of borrowing in Kilosa district

		Responses	
		Number of Responses	Percent
Burrowing purpose	Use during disaster	3	6.4%
	For basic household items(e.g. food)	17	36.2%
	For buying household assets(Radio, chairs, plates)	4	8.5%
	For helping relatives/friends	3	6.4%
	For starting business	14	29.8%
	For Farming Activities	1	2.1%
	For other activities like school fees, health care	5	10.6%
Total		47	100.0%

Source: Field data, 2015.

In terms of interest rate, about 57. 5% reported to pay interest in their borrowed money, while 42.5 % reported to pay no interest. The 'no-interest' respondents probably come from those who borrow from relatives and friends, who usually do not charge interest. Interest rates for most of the interviewed population were 5-20%. Only 9% of the respondents reported to have paid interest rates of more than 20%. However, compared to group savings, some forms of lending (e.g. Gobogobo and Lihonga schemes) usually charge relatively higher interest rates (>20%). High interest rates may compound the vulnerability of the communities especially when they fail to pay back in time and are forced to sell their collaterals. Interestingly, a significant number of those who could not borrow feared to borrow-probably due to perceived high interest rates, and the manner in which loans are recovered, and the consequences of defaulting. Others indicated the need to have a proper land title,

and Tax Identification Numbers (TIN) to validate their collaterals such as houses or land as the main obstacle to borrowing.

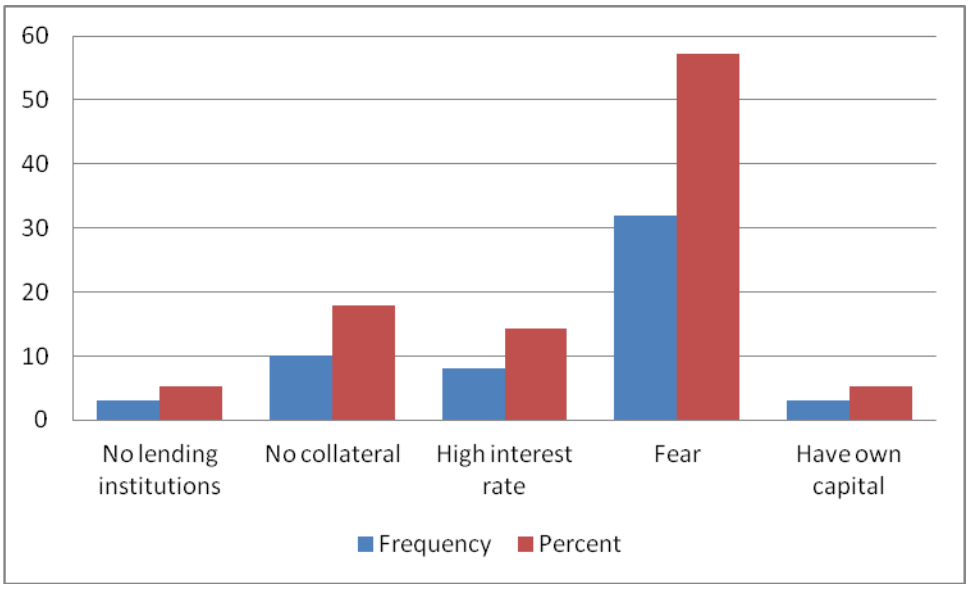

Figure 8: Reasons for not borrowing in Kilosa District

Source: Field data 2015

Land ownership and access in Kilosa district comprises of private land in form of farm estates, which occupies about 50% of the district (Jaka, Pers. Comm.). Protected areas, particularly Mikumi National Park occupies 22.5% of the total land area[17]. Thus, there is a perceived land scarcity in Kilosa district. According to Benjaminsen et al. (2009), land scarcity is attributed to several structural factors: First, the allocation, by the then German and British colonial rules of sisal estate farms to European settlers. This land formally belonged to indigenous people and conflicts started as early as 1930 between the local communities and European settlers. Secondly, the sisal and cotton estate farms attracted immigrants from other parts of the country who settled in the area, and their descendants continue to live in the same area. Thirdly, conservation areas such as National parks and forest reserves contribute to land scarcity as they occupy nearly one-third of the total land area of

[17] Kajembe et al. 2013

the district. Fourthly, evictions from other agricultural areas (e.g. Basuto Wheat farms in Hanang) caused an in-migration of Barbaig pastoralists in the area. The privatization of the farm estates and the confusion created by the current Land acts which categorise land into general land, village land and reserve land has aggravated the land use conflicts as it is not clear to which category the former estate farms should be managed after they had been abandoned by former owners. This was clearly reported in focus group discussions in Kilosa town and even the present Ward councillors and government officials could not clarify the matter. Land use conflicts have long been a source of tension between pastoralists, farm owners and farmers, and have in the past resulted in fatalities. For the respondents who own land, majority won it under customary laws, averaging 1-2 acres. Some have legal titles, and in these farms, herder-farmer conflicts are rare compared to those with no legal titles. Others access land through renting or borrowing from relatives and friends for cultivation. In conclusion, the land access and use scenario in Kilosa district in itself poses a major risk of conflicts between the parties (farmers, pastoralists and farm owners) and poses a major threat to peace and tranquillity. Emergency situations related to these conflicts have already occurred and may occur in the future if the outstanding issues related to land ownership and access are not resolved.

3.5.2. Physical /constructed assets analysis

Critical facilities/assets are "the primary physical structures, technical facilities and systems which are socially, economically or operationally essential to the functioning of a society or community, both in routine circumstances and in the extreme circumstances of an emergency" (UNISDR, 2009:9). The available physical/constructed assets in Kilosa district include houses, community buildings (dispensaries, schools, mosques churches), communication network including roads (Morogoro-Dodoma highway, Dumila-Mikumi road) telecommunications, railways

(central railway line), power supply infrastructure, irrigation schemes, shallow wells and bore holes, bridges and flood protection dykes.

However, much of these critical facilities were at risk due to various reasons, as indicated Table 6.

Table 6: Vulnerability analysis of constructed facilities in Kilosa district

	Physical/constructed facilities at risk	Vulnerabilities analysis (underlying conditions)
1	Houses	- Houses are vulnerable to floods as they are located to flood prone areas - Constructed from poor materials (mud bricks)
2	Community buildings	- Misufini, Mkwatani and Madaraka Primary schools are Vulnerable to floods.
3	Bridges	- Magole and Berega bridges are vulnerable to floods
4	Road	During the rainy season/heavy rains the roads in Kilosa are impassable, especially non-tarmac ones. Some of the roads are impassable since the 2010 floods
4	Shallow wells	- Not well protected,
5	Power supply	- Poles are vulnerable to strong winds and floods
6	Drainage system	- Blocked by floods

3.5.3. Natural assets analysis

The natural assets are the resource stock from which resource flows useful to livelihoods are derived. The actual resources available to an individual household reflects the characteristics of the local resource base and the extent to which the household is able to gain access to these resources, which in turn reflects issues of ownership and entitlements as well as the availability of technologies that make it possible to use the resource potentials (IISD 2003).

Therefore, it is important for the local communities not only to physically possess the natural assets in their area, but also have access and control over their use. The way in which the natural assets are used would determine their sustainability over time, and consequently their vulnerability to various hazards.

The natural assets present in Kilosa district were identified to include water for domestic, water for irrigation, land/soil, trees for produce building material, bush, hills, natural forests/bush, minerals (clay, sand). **Table 7** presents the vulnerability analysis of the main natural assets most at risk and the underlying conditions/reasons.

Table 7: Vulnerability analysis for natural assets in Kilosa district

S.N	Natural assets at risk	Underlying conditions/Reasons
1	Water for domestic/livestock and livestock use)	- Vulnerable to contamination during floods
2	Natural Forest/bush	- Deforestation due to bush fires and collection of trees for fuel wood, shifting agriculture (slash and burn)
3	Land/Soil	- soil erosion due to floods and sediment transport - trampling due to large number of livestock units -
4	Trees for produce, shelter, fuel, building material,	- Deforestation (building poles) - Bush fires
5	Mountains/ hills	- Deforestation, bushfires, logging - Unsustainable agricultural practices, e.g. shifting agriculture, cultivation without terraces/contours

6	Fishing	- Use of chemicals in fishing(illegal fishing)

3.5.4. Individual assets analysis

Individual assets comprise of skills, knowledge and individual strength that individual have in the area. They are also known as human capital: the skills, knowledge, and ability to work and good health important to the ability to pursue livelihood activities. For individual households, this includes both the quantity (number of productive individuals) and the quality (what these individuals know and how hard they are able to work) of human resources. It includes knowledge and skills learned from formal education and through experience and non-formal learning (IISD, 2003).

The main individual assets that people have in Kilosa district include Farming, small business leadership community cohesion evacuation traditional medicine, tree planting, swimming and evacuation. The frequent occurrence of floods in the district has improved evacuation and rescue skills of the communities. These specific skills such as rescue and evacuation are important to save lives and property in times of disasters such as floods.

During disasters, children, women, the elderly, physically challenged and chronically ill are the most affected, while men are least affected. Usually men have more opportunities/safety nets than other categories. For example, men have more resources (financial and material) and can use them to cope with the disaster. On the other hand women have to take care of children and other dependants in the family and cannot leave them behind, while men can go to other places, which are relatively safer from the disaster.

After the hazard, men bear the responsibilities for recovery (reconstruction, looking for alternative shelter, food and other necessities-thus bearing a relatively large burden of responsibilities compared to other categories of people. The effects are mainly psychological (trauma).

The most common effect that happens after a disaster was reported to be the destruction of crops and livestock (20.8%), displaced (18%) illness (15%) and destruction of infrastructure (13.6%) (**Erro! A origem da referência não foi encontrada.**), highlighting the magnitude and severity of floods.

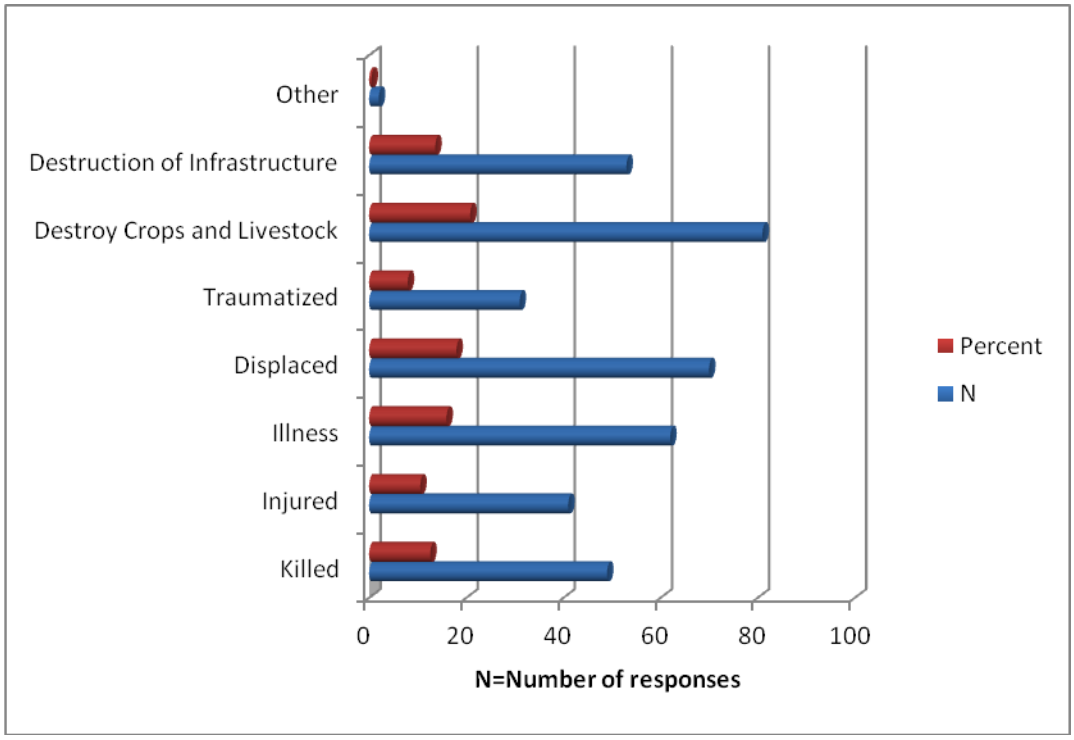

Figure 9: Common effects after the disaster in Kilosa district
Source: Field Work, 2015.

Common diseases reported include malaria, water borne (cholera, dysentery, diarrhoea) Pneumonia, fungus, and HIV/AIDS,

3.5.5. Social assets analysis

These are relationships and networks that exist within the community and people outside the community. According to IISD (2003), these are the set of social relationships upon which people draw in pursuit of their livelihood. This includes the range of contact networks, membership of groups and organizations, relationships of trust and access to wider institutions of society that are important in

the actual operation of livelihood activities and that can be determining in terms of access to markets, credit, government services, assistance in hazard and disaster situations and many other factors of production.

Results indicate that the relationship between the local people and other community groups within the villages and outside the villages ranges from good to average, with relationship worsening in some villages due to boundary conflicts (e.g. Magomeni and Masanze wards) famers and herders, famers themselves, and between local communities and large private land owners. However, these relationships improved during the flood disasters as some private farm owners offered areas for temporary shelter construction (e.g. Magomeni temporary shelter since 2010, Plate 3)

Plate 3: A temporary shelter for 2009/2010 flood victims in Magomeni, Kilosa Township

Photo: W.Kiwango

Other private land owners have provided various relief items to flood victims. Analysis from focus group discussion indicates that Kilosa communities have a good relationship with various NGOs and other organizations working in the area. The various organizations working with communities in the district are presented in Table 8 below.

Table 8: Organizations that exist in the sampled villages, Kilosa district

S.N	Name of NGO/CBO	Area of expertise
1	HUDESA	Human rights, sensitisations, and public dialogue or developmental issues i.e. Climatic change
2	Kilosa Paral Legal Association	Land rights, gender and domestic violence
3	Kilosa African youth association	Youth development
4	World vision	Various development issues
5	Red cross	Rescue and rehabilitation
6	Tanzania Scouts Association	Humanity services
7	CAMFED	Issues of girl children
8	Tanzania Forest Conservation Group	Sustainable charcoal project
9	TACAIDS	HIV/AIDS
10	Financial Institutions (CRDB, NMB), BRAC, FINCA, Bayport, PRIDE	Credits, provide relief items
11	WAMAJUKUU	Environmental conservation
12	MKUHUMI-REDD project	Environmental conservation, tree planting, sustainable charcoal project
13	ISLAMIC FOUNDATION	Constriction of boreholes and shallow wells
14	World Bank	Water Supply
15	European Union	Rehabilitation of areas affected by floods

Source: Field data, 2015

3.6. Capacity analysis

3.6.1. Economic assets

The main economic activities/assets that are least affected by floods is forest. Likewise, assets that are never sold even in very hard times include land and houses The reason for this finding is that land in a village setting has both cultural and economic value, and in hard times land would be the last asset to sell. Culturally land is inherited within the family and is considered one of the valuable asset parents can leave for their children although, in general terms, land ownership and access remains an important matter to the local communities. In hard times,

findings indicate that 41.3% of the individuals can borrow money mainly from individuals and relatives while (58.7%) cannot afford to borrow due to fear, lack of collateral and the general hardships experiences during the disaster.

3.6.2. Natural assets

Most of the natural assets are at risk of floods except some natural forest/bushes, mountains/hills, trees and water for irrigation. Land/Soils in some cases benefit from downward movement of nutrients from the upper to the lower catchment, improving the fertility of the soils.

3.6.3. Constructed assets

In terms of constructed assets, community buildings such as the District Executive Director and District Commissioner offices, the district court, the District Hospital, and the Mkondoa Bridge are not at risk from floods. The community buildings are built in slightly hilly area, where floods cannot reach. Information from Focus group discussion reveals that this places in also known as "uzunguni'Mlimani Boma (Swahili, meaning 'where Europeans dwell) in a reminiscence of the partitioning of the township for Europeans (hilly areas, where floods cannot reach) and Asians in the middle and Africans in the flood prone areas. Moreover, the building of the flood protection dyke after the 2009/2010 has greatly reduced the vulnerability of the township to floods, although the dyke need to be extended to Magomeni Ward in order to have a complete protection of the township from floods.

3.6.4. Individual assets

Men are the least affected category of people during disasters, while women, children, elderly and the physically challenged are mostly affected during the disaster. Men, for example, can sell their property, can do some casual labour, and have more alternatives to look for money, and food compared to other categories.

Moreover, they are sensitive to hazard prevention and easily relocate to other places. Men are more affected after the hazard as compared to women due to various responsibilities that are shouldered to them after the disaster; these include the need to find alternative shelter, food and other family necessities.

3.6.5. Social assets

Relationships grow stronger in some extended families, through provision of remittances, clothing and food particularly in disaster situations. Other community groups provide are usually called upon to help in disaster situations hence strengthen the relationships, while NGOs and other religious groups provide education and assistance, as well as reducing vulnerability through the various development programmes undertaken (Table 8).

3.7. Analysis of community actions

3.7.1. Main flood hazard coping strategies

The main coping strategies for the floods in Kilosa include the following:

a) Construction of a flood protection dyke along Mkondoa River. The dyke extends about 4.2 km, and it was built by the Tanzania People's Defence Forces to prevent river overflow to the township.

Plate 4: A flood protection dyke along Mkondoa River, Kilosa.
Photo: F. Kalugendo, PMO

However, the dyke should be extended to cover the whole area, particularly Magomeni ward.

b) A two planner has been employed. The town planner will coordinate all building activities in the township and advice on location, type of houses and materials to be used in constriction of houses

c) Relocation of flood victims to other areas. The European Union is funding the rehabilitation of infrastructure, including construction of roads, power supply and land survey of new plots. Majority of flood victims have been given new plots in safer areas.

d) Clearing of drainage systems in the township.

e) Awareness raising by various NGOs and government agencies to flood victims on health and nutritional education in order to prevent the outbreak of epidemics such as cholera, dysentery Typhoid and malaria and malnutrition.

f) Planting of vegetation cover (*matete, Reeds)* on the river banks of MKondoa and Mkundi Rivers to reduce erosion and water, and flood speed.

g) Protection of the dyke from encroachment by livestock and discouraging unsustainable agricultural practices along the river banks

h) Raising awareness on risks, vulnerabilities and coping strategies on floods in various meetings conducted in the district.

Communities receive assistance from the government and various organizations to help in coping with hazards in terms of;

- Construction of the flood protection dykes
- Provision of relief aid from various organisations
- Surveying for new plots of land for building
- Identification of safe land site for construction
- Government and non-governmental projects e.g. the European Union on rehabilitation, the World Bank (water provision) etc
- Provision of seeds and other agricultural inputs (Plate 5

Plate 5: Minister responsible for Agriculture, Dr. Christopher Chiza presenting to Kilosa District Commissioner, Mr. Elias Tarimo Rice seeds for flood victims in Kilosa and Mvomero districts.

Photo: KDC, 2015.

In terms of external assistance, communities have received various forms of assistance from government, and non-governmental organisations in various programmes as outlined above.

CHAPTER FOUR

4. Conclusions and recommendations

4.1. *Conclusions*

4.1.1. Kilosa district council is vulnerable to floods. Land use conflicts, wild animals, pests and epidemics are other hazards identified although at a small scale compared to floods. However, the occurrence, frequency and magnitude of these hazards differ within the districts depending on the type of hazard, location and the ability of the current infrastructure to cope with them.

4.1.2. Kilosa is highly vulnerable to floods. Physical/constructed assets such as houses, roads and railways and community buildings area highly at risk. The vulnerability of the district has a bearing on its location (the district is traversed by 36 rivers, 6 of them perennial. Kilosa Township is divided into two parts by Mkondoa River).

4.1.3. Risk factors for floods in Kilosa include its relative downstream location, environmental degradation, unsustainable agricultural practices, deforestation and climate change.

4.1.4. Floods have seriously impacted on the livelihoods of the people and infrastructures in the district. The vulnerability of the district to floods and other hazards calls for the need to have a multi-hazard emergency preparedness and response plan**.**

4.1.5. The capacity of the district to respond and cope with floods and other hazards is limited, in terms of natural, individual, physical and social assets. External assistance will be needed when a serious disaster hits.

4.1.6. The indigenous early warning signs in the district are limited to floods.

4.1.7. Agriculture is the main economic activity depended upon by 80% of the district's workforce. Floods impacts heavily on agriculture-destroying crops and related infrastructure such as roads, bridges and irrigation infrastructure. Dependence on rain-fed agriculture as the main economic activity in the district implies a high vulnerability to the sector.

4.1.8. The good engagement levels among various community groups, organisations and community leaders at district and village level is crucial for effective response and recovery from disasters.

4.1.9. Findings also indicate that the district has received relief aid in all incidences if flood disasters. Various awareness raising on the risks, vulnerabilities and coping mechanisms has been conducted.

4.2. *Recommendations*

4.2.1. Kilosa district is frequently impacted by floods due its location against the main river catchments. The experiences in the flood response over the last 5 years indicate that although flood is the main hazard causing disaster, other hazards such as epidemics may occur especially during the recovery phase. Likewise, pests and wild animals may accelerate the occurrence of famine. Land use conflicts may result into civil unrest and prompting an emergency situation. Therefore, **a holistic approach** in dealing and responding to hazards is highly recommended as an effective and efficient way of reducing risks and vulnerabilities of communities in the district. This includes having an Emergency preparedness and response plan for the district.

4.2.2. Analysis indicates that communities have suffered from the impacts of disasters in the district. To reduce financial and other resources required to respond to the impacts, as well as the risks associated with the hazards, there is need to **institutionalize disaster risk reduction in the plan and programmes** in both government and non- governmental organisations. This will also mean allocating appropriate resources to this, including a budget.

4.2.3. Capacity building at the community level, especially on disaster risk reduction should be undertaken in order to strengthen the capacity of the communities to prepare, prevent and respond effectively to disasters. This will minimise the dependency syndrome often associated with disaster response

mechanisms from the government and other response organisations and agencies. This is of critical importance in Kilosa district which is frequently hit by floods, and which many organisations, private and public, have tended to respond by providing relief aid. Path dependencies may mean a propensity to ignore capacity building programmes and wait for relief aid.

4.2.4. There is also need to develop a disaster risk reduction **monitoring and evaluation tool and mechanism** which will assist to track impact of the programmes and measure community's resilience to hazards or disasters over time. This should also be combined with a feedback response mechanism which will assist to get feedback from both the service providers/facilitators and programme participants or communities

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