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Article

Dynamic Spatial and Temporal Analysis of Natural Disasters in Chikwawa District, Lower Shire Valley, Malawi

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Abstract: This study analyzed the dynamic spatial and temporal distribution of natural disasters in Traditional Authorities Ngabu and Lundu in Chikwawa District in the Lower Shire Valley. The study assessed the vulnerability of people to disasters, evaluated the value of losses and damages incurred when disasters strike and to locate disaster hotspots. The mixed design that embraces qualitative and quantitative approaches was used. Data collection methods such as in-depth interviews, Focus Group Discussion, documentary review, structured interview and Participatory Geographical Information Systems (P-GIS) were employed. The study revealed that farming with 64%, 37% and 76% done before, during and after disasters respectively, was the main adaptive capacity to floods and drought in T/A Ngabu. In T/A Lundu, community members also valued farming with 58%, 55% and 70% done before, during and after disasters respectively. The study found that Traditional Environmental Knowledge Systems (TEKS) were highly valued in T/As Ngabu with 90% and Lundu 81%. The study also unveiled those disasters led to losses of human lives and livestock and damages to properties, environment and critical infrastructures. However, some community members still remained in the disaster-prone areas for farming, fishing, protecting the chieftaincy and ancestral reasons. The study also showed that CBDRM was highly adopted. However, disasters continued to occur and losses were increasing. Generally, CBDRM could be effective through multisectoral approach and good legal institutional framework. Therefore, the research recommends that further studies similar to this, should use GIS in assessing the efficacy of CBDRM approaches to produce hazard maps that will be used as models for disaster risk reduction in Chikwawa District in the Lower Shire Valley.

Keywords: disasters; hazard; gis; resilience; capacity

Introduction

Geographic Information Systems (GIS) is a conceptualized framework that provides the ability to capture and analyze spatial and geographic data. It has since been rising globally, regionally and locally. Since the '80s, the interest for Geographic Information Systems (GIS) has been rising both in the private and the no-profit/humanitarian sectors, as a tool to monitor land use changes, rivers patterns, and evolution of disaster risk (UNISDR, 2015). The great advantage of GIS is the possibility to merge different information from several sources and visualize them on a unique map thanks to a georeferencing process (ESRI, 1990).

In recent years, Geographical Information Systems (GIS)-based spatial statistical analyses in disaster risk management studies have increased across the globe. To this effect, it was imperative to examine the spatial distribution of natural disasters to prevent and mitigate disasters. In this light, natural disasters that happened between 1990 and 2020 have been examined. The study employed mixed research design that embraces both qualitative and quantitative approaches where autocorrelation and Participatory Geographical Information Systems (P-GIS) methods to data

collection were used. Later on, GIS models for visualization were produced for better community-based disaster response.

Research Methodology

Qualitative and quantitative research methods were employed. Qualitative methods were used to elicit people's perception and knowledge of risk and their adaptation responses to disasters. Participatory GIS was used to locate areas that are prone to floods, droughts, inundated areas, identify streams that jump their beds to cause floods, locate social services, areas for cultivation, areas for grazing animals and safer areas in cases of floods. Quantitative methods were used to assess the vulnerability of people, determine the development activities adversely affected by disasters and assess reasons why people still remained the disaster-prone areas. Sampling techniques and modification-detection techniques were employed to select local people and to identify shire valley environmental change.

Data analysis:

The data was analyzed by using ArcGIS, ArcView and QGIS, manual analysis of qualitative data and GIS and remote sensing for image analysis. The data has been presented in term of words, Figures such as Maps, charts, graphs and tables.

Study Site:

Lower Shire Valley is formed by two districts namely Chikwawa and Nsanje where Chikwawa lies to the north and Nsanje to the south. Lower Shire Valley is located between 16° 10' 00" S and longitude 35° 45' 00" E (New Horizon Social Environmental Sciences, 2014). Chikwawa District where the study was conducted is 4,755 km² (NSO, 2018). Chikwawa District is bordered by Mozambique to the west and north is Blantyre District and Thyolo District to the east. To the Northwest of Chikwawa District is also Majete Game Reserve and Central West is Lengwe National Park (New Horizon Social Environmental Sciences, 2014).

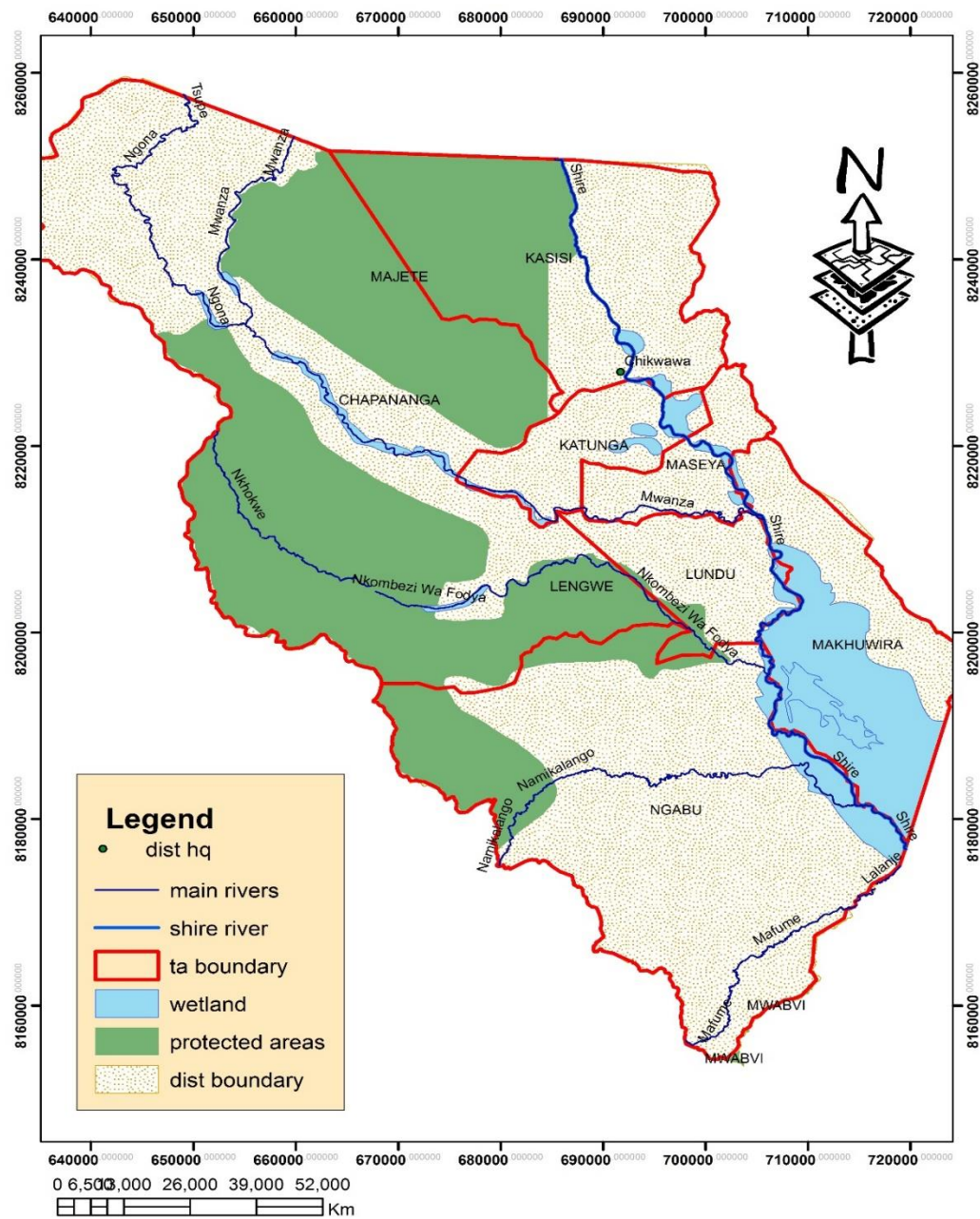


Figure 1. Map of Chikwawa, Source: Authors, September, 2018.

FINDINGS AND DISCUSSION

Vulnerability Assessment of the Communities in T/As Ngabu and Lundu in the Lower Shire Valley

The results revealed that 77% and 83% of the population in T/As Ngabu and Lundu respectively, had no regular meals. In the area of T/A Ngabu, 60% of the population had no food while 58% of the population in T/A Lundu, had no food as well. The study found that 83% of the population in T/A Ngabu had radios while in T/A Lundu, 79% had also radios. The study found that 51% and 59% of the population in both T/As Ngabu and Lundu respectively, had bicycles. the study revealed that

in T/A Ngabu 52% of the population had livestock while 45% of the population in T/A Lundu had livestock (**Table 1**).

Table 1. Vulnerability Assessment in T/A Ngabu and Lundu.

Variable	T/A Ngabu		T/A Lundu	
	Frequency (n)	Valid Percent (%)	Frequency (n)	Valid Percent (%)
Regular Meals				
Yes	20	23	15	17
No	66	77	71	83
Food				
Available	26	30	36	42
Not Available	60	70	50	58
Radio				
Available	71	83	68	79
Not Available	15	17	18	21
Bicycle				
Available	44	51	51	59
Not Available	42	49	35	41
Livestock				
Available	45	52	39	45
Not Available	41	48	47	55
n = 172				

Source: Field Data

Based on the results, it showed that people in the areas of T/As Ngabu and Lundu had no regular meals with 77% and 83% respectively. The study also revealed that in both T/As Ngabu and Lundu, food was not available (70% and 58%). This implies that community members in both T/As Ngabu and Lundu starved to access food. It was revealed that those who were able to have regular meals were employed. This gives an account that economic status of an individual defines one’s own vulnerability. This is also similar to what Thinda (2002) found in Zambia. The study revealed that most of the community members had one meal per day especially the none-working class.

The study findings showed that community members in both T/As had radios. However, many were from T/A Ngabu (83%). The study also revealed that community members liked listening to various programmes such as “*ulimi waleo*” (today’s agriculture) and other weather-related programmes that brought about warnings to disasters. This implies that people were interested to listen to radios as they noticed that they were vulnerable to disasters. This is a good development because personal mitigation is a key to national disaster preparedness and planning. This is also similar to what Mung’ou (2009) found in Kenya. The study aimed at assessing the contribution of ICT in disaster management. It was found that radios were important in information dissemination and awareness. This helped to reduce disaster impacts in Kenya as many people had radios.

The study also found that bicycles were available with 51% and 59% in both T/As Ngabu and Lundu. On average however, the study revealed that not all had bicycles as 55% in both T/As was not a significant number as compared to the population. It was revealed that bicycles were convenient as they provided the communities with cheap means of transport. During emergencies, it became handy to respond to. This is also similar to what Page (2014) found in Northwest Pacific. The study revealed that communities were using cargo bicycles as they were effective in times of fuel and gas shortages. In a more generic sense, bicycles were very important to the communities of T/As Ngabu and Lundu as most of the roads were impassable. Therefore, bicycles played a big role to solve transportation problems.

Based on the results, the study revealed that in T/A Ngabu, 52% of the population had livestock while 45% of the population in T/A Lundu had no livestock. This implies that many community members did not have livestock in T/A Lundu (45%). It was found that livestock provided source of

food, income, transportation and also for prediction of disasters. The study conducted by Tewari (2018) in India found similar results. It was found that animals were used to predict disasters through their behaviour.

The study also revealed that communities in T/As Ngabu and Lundu in Chikwawa District hardly accessed services such as health, education, transportation, electricity supply, sanitation, running water and community standing pipes. Most of the services were unreliable. For example, villages such as Chindoko, Linga, Therere and Nsomo in T/A Ngabu had no piped water, health services, electricity and had poor road network. In T/A Lundu, villages such as Bester, Mafale, Tizola and Sekeni had poor water and sanitation services, roads and health services.

Nature and Characteristics of Hazards in Chikwawa District

In attempt to understand the vulnerability of communities, it was imperative to examine the nature and characteristics of hazards that were prevalent in T/As Ngabu and Lundu. The study revealed that floods, drought, dry spells, strong winds, pest and diseases, HIV/AIDS, pollution, crocodile attacks, fire, suicide and road accidents and price volatility with varied frequency, spread and magnitude were common in T/As Ngabu and Lundu. TASAF (2010) and Rugumamu and Haule (2015) also conducted studies in Tanzania and found that drought, floods and dry spells with high frequency and magnitude affected communities in Tanzania. Therefore, this study sought to rank the disasters in both T/As Ngabu and Lundu in Chikwawa District in the Lower Shire Valley based on frequency, spread and magnitude.

Table 2. Ranking Hazards.

Type of Hazard	Spread	Magnitude	Frequency	Sum	Rank (Cardinal Syste
Flood	2	3	3	8	II
Drought	3	3	3	9	I
Pest and Disease	2	3	3	8	II
Fire	1	1	1	3	VI
Strong Winds	2	2	2	6	IV
Pollution	1	1	1	3	VI
Crocodile Attacks	2	2	3	7	III
HIV/AIDS	3	3	3	9	I
Suicide	1	1	1	3	VI
Roads Accidents	1	1	1	3	VI
Price Volatility	2	1	1	5	V

KEY

For spread or distribution: 3 = All villages affected; 2 = partial and 1 = only a fraction of the area get affected.

For magnitude: 3 = The event is very big; 2 = Modest and 1 = small

For frequency: 3 = occurs every year; 2 = 3 – 4 years event; 1 = the event seldom occurred.

***Cardinal ranking** means the participants are summed.

Source: Field Data

The findings showed that drought and HIV/AIDS (**I**) were the most prevalent hazards in both Traditional Authorities of Ngabu and Lundu in Chikwawa District with high frequency, magnitude and were widely spread. Floods and pests and diseases with high frequency, magnitude and partial distribution respectively, were second (**II**). However, the study revealed that for the past three years, frequency of floods lowered and the magnitude remained high. This is also in line with what South Dakota Mitigation Plan Team (2014) found in Dakota. The study conducted by Bergmann and Samuels (2008) also found that globally HIV/AIDS was a major concern as it was spreading fast.

Crocodile attacks with moderate magnitude, partial distribution and high frequency were ranked third (**III**). The study found that the frequency and magnitude became high during floods since crocodiles moved with the water in search of food in Linga village in the area of Traditional Authority Ngabu. Similar study conducted by Grajavales and Silva (2018) found that crocodile attacks in Mexico particularly Oaxaca, were so alarming. In Mexico, crocodile attacks were associated with fishing where 92% of the victims were men. In the context of Malawi and T/As Ngabu and Lundu in Chikwawa District in particular, this disaster risk can be avoided if people desist from fishing in the Shire River and relocate permanently. Chavula (2012) also argues that permanent relocation in flood disaster prone areas is the best strategy.

Strong winds were ranked fourth (**IV**) as common hazards in both T/As in Chikwawa District. They occurred at a 3-4-year interval thus frequency, but with moderate magnitude and partial distribution. In contrast, the study conducted by South Dakota Mitigation Plan Team (2014) found that winds with high frequency, magnitude and wide distribution were common in Dakota. Although it is difficult to prevent winds from occurring but their effects can be reduced. This can be done by planting trees, building houses with strong materials and avoiding deforestation.

The study also revealed that price volatility with small magnitude and low frequency and partially distributed was fifth (**V**) in T/A Ngabu and Lundu in Chikwawa District. It was revealed that communities depended on white maize which did not do well in the district due to poor climatic conditions. The findings indicated that markets in Chikwawa District were competitive. Most of the maize came from Mulanje, Phalombe and Thyolo districts and prices were mostly high. The changes in prices affected communities' way of life as most of the people depended on 'ganyu' known as casual labour. These results are also similar to what Mtembenuzeni and Kushe (2017) found in Chikwawa District particularly in Traditional Authority Makhuwira.

The results of the study also showed that pollution, fire, road and suicide accidents were ranked six (**VI**). It was revealed that these hazards were not widely spread and had low frequency and magnitude. In contrast, Vennemo et al. (2009) conducted a study in China and found that pollution was widely spread and had high frequency including magnitude in terms of impact. The study conducted by Coon (2017) found that suicide accidents were common in India. This study revealed that 800,000 people died of suicide accidents and this was a significant number. In the context of Malawi, particularly T/As Ngabu and Lundu, using public education and awareness, the suicide disasters can be prevented.

Singh and Misra (2001) also found that in India, road accidents fatality rate was high due to over speeding. It is therefore imperative to observe road safety rules. The study conducted by Murali and Vijayalaskshmi (2014) and Sundrama, Pradesh and Krishna (2016) also found that fire disasters were

caused by electric faults and affected India and Bangladesh. Switching off electric appliances, monitoring young children when playing with fire and public education and awareness can best reduce occurrences of fire accidents.

Development Activities Adversely Affected by Disasters

The study found that 47% of the population in T/A Ngabu said that agricultural activities were affected while T/A Lundu was represented by 48%. Out of 86 respondents in T/A Ngabu, 5% said that road infrastructure was adversely affected. In T/A Lundu, 3% of the population also said that road infrastructure was affected. Respondents who said electricity supply was affected in T/A Ngabu were 3 representing 3% while T/A Lundu was represented by 3%. Only 37 respondents representing 43% said that building infrastructure was affected in T/A Ngabu while in T/A Lundu there were 36 respondents representing 42%. Out of 86 respondents in T/A Ngabu, only 2 representing 2% of the sample population said that disasters such as floods affected water supply. In T/A Lundu there were 3 respondents representing 3% of the population who said that water supply was adversely affected by disasters (Table 2)

Table 3. Development Activities Adversely Affected by Disasters.

Location	Agriculture	Road	Electricity	Buildings	Water Supply	Total
		Infrastructure	Supply			
T/A Ngabu	40 (47%)	4 (5%)	3 (3%)	37 (43%)	2 (2%)	86
T/A Lundu	41 (48%)	3 (3%)	3 (3%)	36 (42%)	3 (3%)	86
Total	81 (47.09%)	7 (4.07%)	6 (3.49%)	73 (42.44%)	5 (2.91%)	172 (100.00%)

Source: Field Data

On average, the findings showed that disasters highly affected agricultural sector (47%) in both T/As Ngabu and Lundu in Chikwawa District. However, T/A Lundu was highly affected than Ngabu. The other developmental activity that was highly affected was building infrastructure in T/As Ngabu and Lundu with 43% and 42% respectively. However, T/A Ngabu was highly affected. Others were road infrastructure, electricity and water supplies. The study also revealed that floods, drought, dry spells, winds and pests and diseases, caused more damage to crops leading to hunger. The study unveiled that these disasters set back the development clock of Chikwawa District in the Lower Shire Valley hence increasing community vulnerability.

The study also unveiled that disasters such as floods brought problems of transportation and communication in both Traditional Authorities. This increased community’s vulnerability as community members could hardly access health services because roads and bridges were impassable (Plate 1).



Plate 1: A Bridge Damaged by Floods at Chindoko Villagw, T/A Ngabu.

Source: Photo Taken by Tobias (Author), November, 2018

The study also found that electricity was affected by disasters such as strong winds, floods and drought. Winds caused electric poles to fall down (**Plate 1**). When the area was also flooded, most of the electric poles fell down affecting electricity supply. If electricity supply was affected, water supply was also affected in the district. Electricity was used to pump water from the ground. This implies that water supply depended on electricity hence compounding disasters.



Plate 2: Electric Poles Damaged by Strong Winds in T/A Lundu

Source: Government (2018)

The study also unveiled that turbidity and debris in the Shire River during the rainy season affected hydro-power generation. These blocked the hydro-power plants. Drought also lowered the ground water table. This then affected both water and electricity supplies. However, the study revealed that the geographical location of Chikwawa District increased the vulnerability of the communities in T/As Ngabu and Lundu. This is also in line with what Wisner et al. (2005) contend in PAR model. Therefore, relocation can be a better strategy to reduce the losses incurred when disasters strike.

Rivers and Inundated Areas in T/A Ngabu in Chikwawa District

Through P-GIS the study revealed that Chimbamera, Nyakamba, and Nyakakupa caused floods in T/A Ngabu and the villages such as Nsomo and Chindoko were the inundated areas (**Figures 2**). The study also found that Chimbamera, Nyakamba and Nyakakupa rivers originated from the western part of Ngabu. These rivers passed through Nsomo, Malemia, Chindoko and Nyambiuro in T/A Ngabu. It was also established that these rivers caused damages to properties, crop fields, roads, schools, bridges and health facilities. This is also similar to what Kienberger (2005) found in Mozambique using P-GIS. In this case, plans for development and the development projects taking place in the areas must be reversed. If need arises, all development actors must work together for better disaster response.

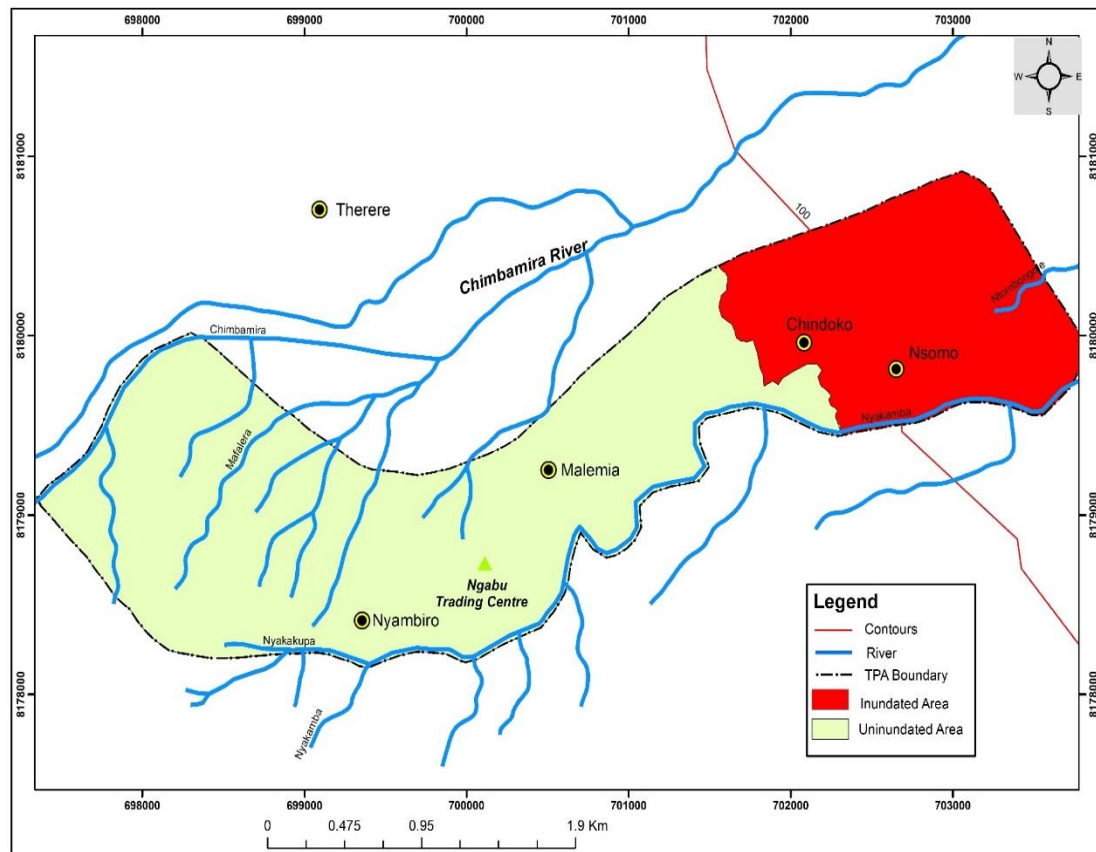


Figure 2. Rivers and Inundated Areas in Traditional Authority Ngabu.

Areas Under Cultivation in Traditional Authority Ngabu in Chikwawa District

The study also sought to locate areas under cultivation and for grazing in T/ A Ngabu. The study revealed that Nsomo and Chindoko were suitable for cultivation and also part of Malemia (**Figure 3**). However, these were inundated areas. The area suitable for grazing animals was Northwest of Ngabu. Based on the results, the study showed that communities in T/A Ngabu were vulnerable as they did not have a better place to live. Through P-GIS, the study found that Ngabu was at an altitude between 50-100 metres above sea level. This implies that the area was relatively flat where the likelihood of floods occurrence coupled with numerous rivers was high. Based on this, it can be concluded that the geographical location increased community vulnerability. This is in line with what Letsei (2015) found in Lesotho. However, the study found that 70% of the population lived in ecologically fragile mountainous terrain.

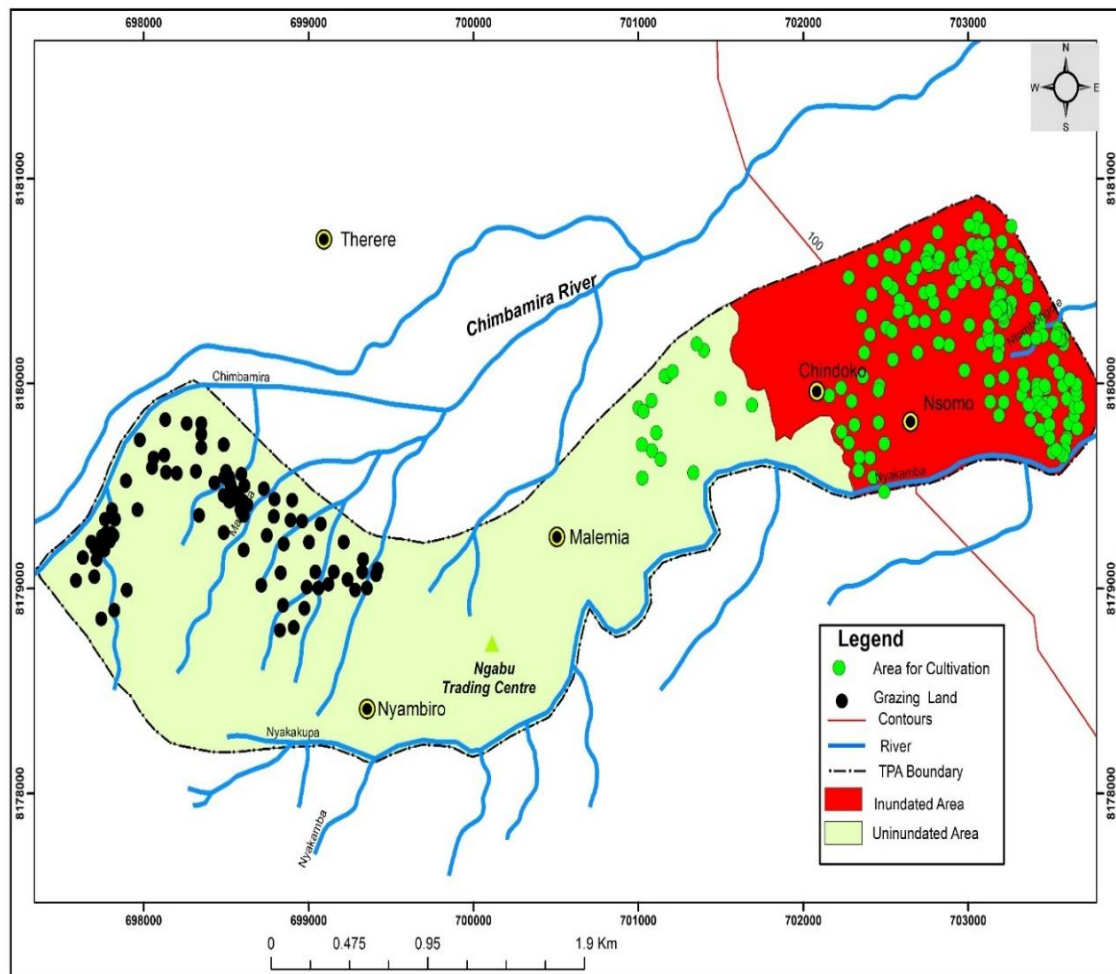


Figure 3. Areas Under Cultivation in Traditional Authority Ngabu.

Source: Tobias, November, 2018

Distribution of Social Services in T/A Ngabu

Using P-GIS, the study showed the distribution of social services in Traditional Authority Ngabu. Some of the social services that were identified were health, education and water supply. The study revealed that these were unevenly distributed and others were located in inundated areas (**Figure 4**). The uneven distribution of social services increased the vulnerability of communities. The study also found that political will was the main cause. This is also in line with PAR model (Blaikie et al. 1994). This model holds that political systems can contribute to community vulnerability. Therefore, the need to distribute resources evenly, is of paramount importance in order to reduce community vulnerability.

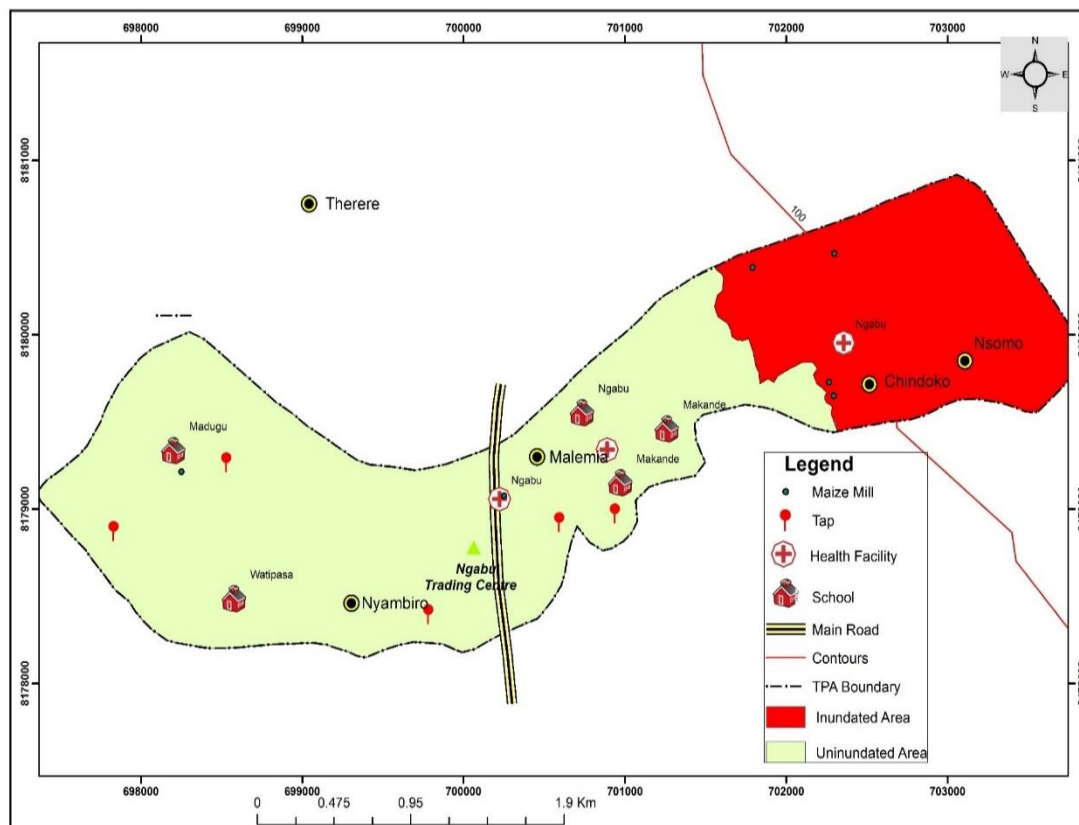


Figure 4. Distribution of Social Services in T/A Ngabu.

Source: Tobias, November, 2018

Inundated Areas and Distribution of Social Services in T/A Lundu

The study found that south, central and northeastern parts of Traditional Authority Lundu were inundated areas (**Figure 5**). The northwestern part of Lundu was a drought prone area. The study revealed that Shire River caused most of the flooding in villages such as Sekeni, Pangilesi, Mada, Tizola and Mafale. The study also found that Nkombezi River caused flooding at Nchalo. During flooding, roads became impassable. The study also unveiled that the western part of Lundu was Majete game reserve which threatened the lives of people of the surrounding communities. The southwestern part of Lundu was highly polluted due to sugar production at Nchalo. Through buffering of Shire River (100m), the study also revealed that villages along the Shire River such as Mafale, Tizola, Kanseche, Namachuwa, Biasi, Chabuka, Thom, Nyamphota and Malemia in Traditional Authority Lundu were highly exposed to floods. The results showed that communities in T/A Lundu were vulnerable. Therefore, relocation can be a better way to reduce disaster impacts. This is also similar to what Kienberger (2005) found in Mozambique using P-GIS.

The study also revealed the social services that were available. These included education, health and water supply. These were not evenly distributed (**Figure 5**). Unequal distribution of these social services increased the community vulnerability in Traditional Authority of Lundu. This is also in line with what Wisner et al., (2005) in PAR model contend. The model entails that community vulnerability is brought by dynamic processes at different scales and different access to resource profiles.

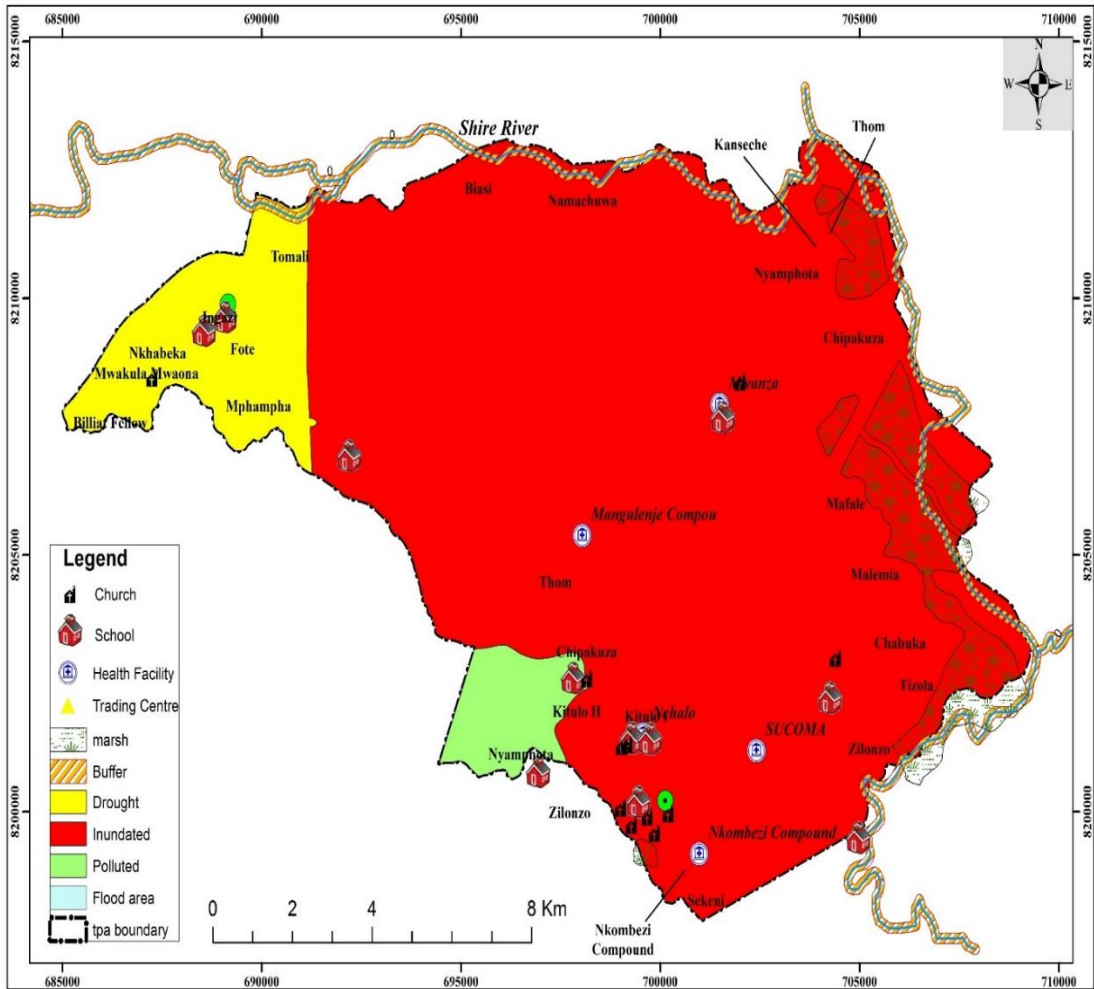


Figure 5: Inundated Areas and Distribution of Social Services in T/A Lundu

Source: Tobias, November, 2018

Areas Under Cultivation and for Evacuation in T/A Lundu

The study revealed that areas along Shire River were important for cultivation (Figure 6). It was found that alluvial soils brought by flooding of the Shire River, influenced agricultural production along this river. In this case, floods were taken as an opportunity. This is also similar to what Stephenson (2005) found in El Salvador where earthquake provided window for opportunity. The study also unveiled that Southwest was for evacuation during floods.

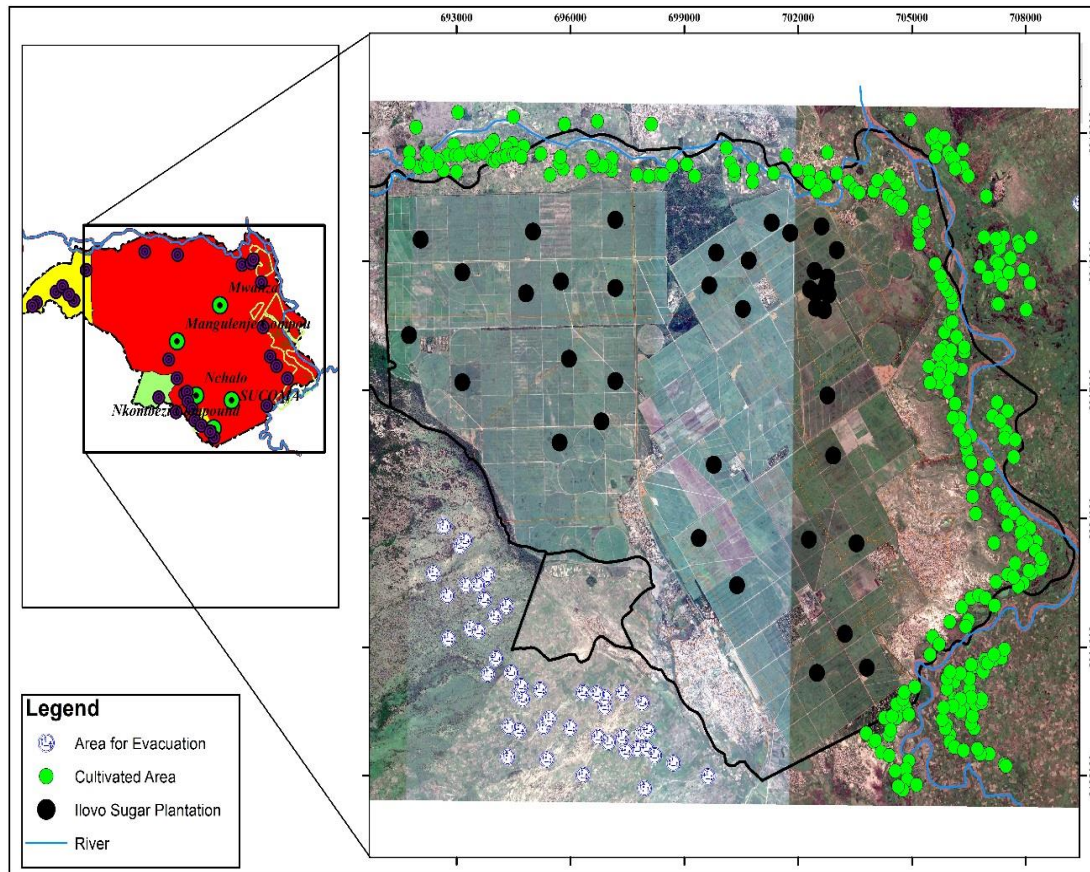


Figure 6: Areas Under Cultivation and for Evacuation in T/A Lundu

Source: Author, 2019

Reasons for Remaining in Disaster Prone Areas

The study found that 29% of the sample population in T/A Ngabu said that farming enabled people to remain in the disaster-prone areas. In T/A Lundu, 29% of the sample population also opted to remain in the disaster-prone areas for farming. In both T/As Ngabu and Lundu, 17% of the sample population said that fishing made them remain in the disaster-prone areas. In T/A Ngabu, 17% said that they were used to their places and disasters were part of life and acts of God. In T/A Lundu, 21% also said this. Those who said that the land belonged to their forefathers and they needed to enjoy this privilege were represented by 16% and 13% in T/As Ngabu and Lundu respectively. In T/As Ngabu and Lundu, 2% represented those who said that they remained in the area for fear of loss of chieftaincy in each case. In T/As Ngabu and Lundu 7% and 3% of the population respectively, said that geographical location restricted them to move out of the area. Those who said that lack of basic amenities in evacuation camps in T/As Ngabu and Lundu were represented by 9% and 10% respectively. The population which said that relocation was the wastage of time were represented by 2% and 3% in T/As Ngabu and Lundu respectively (**Figure 7**).

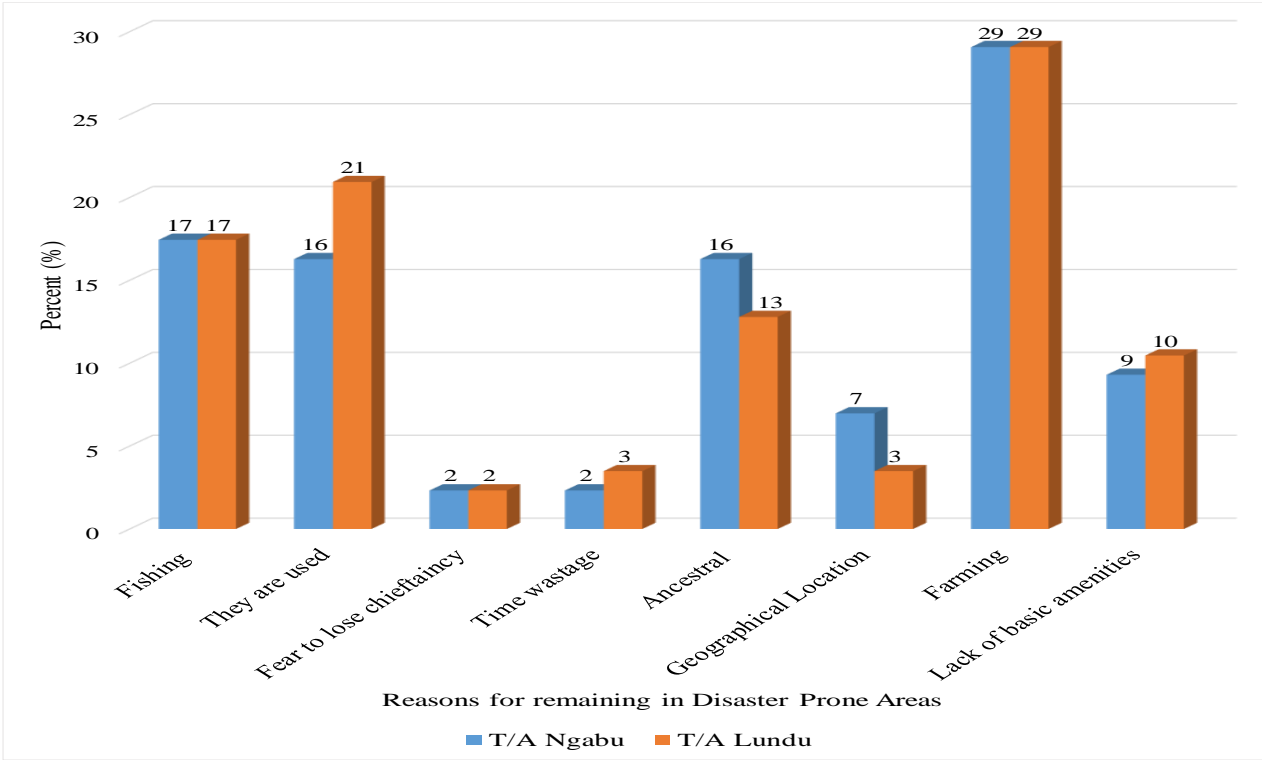


Figure 8. Reasons why Communities Remain in the Disaster-Prone Areas.

Source: Field Data

The findings showed that farming (29 %) was the main reason that prompted people to continue staying in the disaster-prone areas in both T/As Ngabu and Lundu. It was revealed that people had knowledge of the impending disasters such as floods. The study found that floods brought them with alluvial soils which were good for crop production. Therefore, despite their negative effects, it was an opportunity to communities in T/As Ngabu and Lundu in Chikwawa District. Gren and Helander (2017) conducted a study in Tigdaranao in Philippines and found that farming prompted people to live in high risked areas. This is similar to the results of this study. However, risking life at the expense of farming is not a good strategy to reducing the impacts of disasters. The best strategy is to relocate.

Box 1: Are Disasters a Blessing and/or a Curse?

One of the respondents said “disasters are an opportunity as they bring about fertility good for crop production. Most of the parts of the district are dry and the soils are acidic. Maize does not grow well in arable lands. It only does well in areas where floods have occurred as they bring with them soil fertility suitable for maize crop production. Therefore, floods are necessarily evil. Floods also lead to employment opportunities hence development. Since there is no any other place to live and grow crops, we opt to remain here. However, disasters are a foe as they affect the health and standard of our wellbeing. Disasters lead to spreading of Sexually Transmitted Infections (STIs). For example, during floods in evacuation camps, family members are separated. This provides room for sexual malpractices hence transmitting Sexually Transmitted Infections (STIs) including HIV/AIDS. Lack of basic amenities and sanitary conditions in the evacuation centres also provides a platform for disease outbreaks such as cholera. During the onset of drought, women and children walk long distances to search for water. Sometimes they are raped hence spreading of Sexually Transmitted Infections. The disasters also lead to long

term trauma. Children in this case are the most vulnerable population". A Community Member at Chindoko Village, T/A Ngabu

The study also revealed that community members from Traditional Authorities Ngabu and Lundu were used to their areas and disasters were acts of God. However, more people (21%) were from Lundu. The findings revealed that community members just looked at these areas as their homes and disaster related impacts were part of life. The study found that even if people shifted to other areas, they would still be affected by disasters. The community members from Linga, Chindoko and Nsomo villages in Traditional Authority Ngabu argued that disasters were normal. In T/A Lundu, community members from villages such as Mafale, Pangilesi, Bester, Tizola and Sekeni, also said that disasters were not aberrant. They also argued that even if they would leave for upland areas, they would still face drought. Askman, Nilsson and Becker (2018) also conducted a study in Akuressa, in Southwest Sri Lanka and found that people had a sense of place implying they were used to it. This is also similar to what (Gren and Helander, 2017) found in Tigdaranao in Philippines.

The study found that people were protected by God and there was no other safer place than where they were living. This implies that disasters are inevitable. This is in line with what Contract-Expand and Disaster Management Continuum Models postulate. These models assume that disasters are inevitable. However, disasters are not. Disasters are as a result of failure to manage risks. This implies that a disaster in Malawi cannot be a disaster in Tanzania or United Kingdom. What is important is to have capacity to absorb the shocks or prepare in advance.

The findings also showed that fishing (17%) and 2% in T/As Ngabu and Lundu respectively, made people remain in the disaster-prone areas. Based on the findings, more people were from T/A Ngabu. The study revealed that people from Linga village in T/A Ngabu depended much on fishing and decided to settle along the Shire River. In T/A Lundu, community members from Sekeni, Thom, Pangilesi and Bester, used to go for fishing in the Shire River. This is similar to what (Gren and Helander, 2017) found in Tigdaranao in Philippines. The study found that fishing was a means for subsistence and a source of income. This then implies that disasters can be both a blessing and/or a curse. Disasters can bring back years of development and at the same time is a catalyst for development.

In line with this, Sanderson (2000) found that in Turkey, disasters turned back the development clock, destroying years of efforts and labour, and perpetuating poverty for those already poor in Turkey in 1999. However, Stephenson (2005), argues that disasters can provide unique windows of opportunity in development. In the wake of the 1986 earthquake in El Salvador for example, the health sector took advantage of the severe damage to the large children's hospital to restructure and decentralize services so that the nation would not be dependent on the services of the mega hospital. This means that disasters bring windows for development opportunities including employment.

The findings of the study showed that resistance to relocate was aligned to ancestral reasons in T/A Ngabu with (16%) and 13% in T/A Lundu. It was revealed that land was a possession from their forefathers and they needed to enjoy this privilege. Leaving the land for some places, it was an insult to their forefathers and they would be angry with them. This is also similar to what Mtembenuzeni and Kushe, (2017) found in Traditional Authority Makhuwira in Chikwawa District. This was suggested by respondents who were above 61 years old and did not attain primary or secondary

education. This implies that education has a bearing towards development. It is therefore important to civic educate communities to shift from such a thinking in order to reduce disaster related impacts.

The study also found that lack of basic amenities in areas that were set as permanent homes after relocation with 9% and 10% in T/As Ngabu and Lundu respectively, influenced people to remain in the disaster-prone areas. The findings showed there were lack of social services such as health, education and potable water including good transport networks. The absence of these services made community members to continue staying in the disaster-prone areas. This is in contrast with what Gren and Helander (2017) found in Tigdaranao in Philippines. Their findings showed that in Tigdaranao, there were primary schools and other services. Therefore, communities saw it not important to relocate while the services were available despite the occurrence of disasters. However, children who wanted to start high school were traveling long distances and parents met transportation costs.

The results also showed that geographical location 7% and 3% in T/As Ngabu and Lundu respectively, restricted communities to relocate. However, respondents from T/A Ngabu were more than those from T/A Lundu. The study unveiled that the geographical or physical location of Chikwawa District in the Lower Shire Valley forced people to remain in the disaster-prone areas. It was revealed that there were no other good places than where they were. This is also in line with what Wisner et al., (2005) in Pressure and Release (PAR) Model proclaim. This model assumes that physical factors determine communities' vulnerability.

The study also found that people preferred to stay in the disaster-prone areas as they were afraid of outbreak of diseases in evacuation centres such as dysentery and cholera. This is similar to what Mtembenuzeni and Kushe (2017) found in Traditional Authority Makhuwira in Chikwawa District. To be precise, in evacuation centres there are normally few or no toilets. People are usually alienated to right to privacy as scores of people live at one place.

The findings showed that people were resisting to move out of the disaster-prone areas for fear of loss of chieftaincy with 2% in each T/A. The traditional leaders fear of losing the chieftaincy if they moved out. They feared that they would not be recognized as traditional leaders where they would resettle. Gren and Helander (2017) also had similar findings in Tigdaranao in Philippines. Their study revealed that leadership was a factor to remain in the disaster-prone area. Based on this, it can be deduced that power relations can lead to community vulnerability. This is also in concomitant with what Pressure and Release (PAR) model assumes. This model states that social systems lead to vulnerability of the community.

Box 1: Secondary Disasters

One of the local leaders said "I am a Group Village head and I have my own area of jurisdiction with my subordinates. If I would relocate, shall I still retain my chieftaincy? The government also must be serious on the welfare of people in the evacuation centres in case of floods. People are not well supported throughout the period when they are in evacuation camps. Sanitary conditions are also poor. Imagine scores of people against one toilet or bathroom. Is this healthy? Men and women usually meet in the bush as they go out for a call of nature. Assume people of different sexes have met in the bush, what would happen? This leads to another disaster (Sexually, Transmitted Infections including HIV/AIDS)". One of the GVHs in T/A Ngabu.

Conclusions

Based on the major findings in this study as discussed in the preceding chapter, the concluding remarks have been made on the following areas:-

As per the major findings on the adaptive capacity of the community to disasters, this study concludes that communities at risk had their own mechanisms to adapt to disasters. These included; farming, river dredging, planting of trees, village savings, bee and livestock keeping, building houses like nests and stocking items. Despite not being recognized in the Malawi Disaster Policy, TEKS were highly valued in disaster risk reduction in Chikwawa District. It was found that community

vulnerability was caused by geographical location, corruption, poor governance, lack of commitment by both communities and government, social, cultural and environmental factors.

Based on the major findings on the losses and damages incurred when disasters strike, this study concluded that disasters in Chikwawa District led to loss of human lives and livestock, damage to homes and crops including critical infrastructures such as roads, bridges, schools and electricity supply among others. However, disasters were also taken as an opportunity. Communities in Chikwawa District resorted to stay in floods disaster prone areas for farming, fishing, ancestral reasons and some were used to their place. The disasters that mostly affected people were drought and HIV/AIDS seconded by floods. Some of the disasters that were prevalent included; dry spells, strong winds, pest and diseases, pollution, crocodile attacks, fire, suicide and road accidents. These varied in frequency, spread and magnitude.

Based on the major findings on the adoption level of CBDRM in Chikwawa District particularly in Traditional Authorities of Ngabu and Lundu, this study concluded that communities adopted the CBDRM approach. Community participation was good and people were well organized. Despite the adoption of CBDRM, disaster episodes and losses were increasing in Chikwawa District. This implies that CBDRM was not a solution to the problems related to disasters in Chikwawa District hence was not effective. Lack of adequate timely support from government and other stakeholders in form of funds and humanitarian related resources to build the required capacity, made it ineffective. It can therefore be deduced that multisectoral approach to DRR was the best strategy to develop a robust Community-Based Disaster Risk Management (CBDRM) approach for disaster risk management and sustainable development in Chikwawa District. This can play an important role to the policy makers, decision makers, development actors and other stakeholders.

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