IMPACT OF NATURAL DISASTERS ON RURAL HOUSEHOLD POVERTY - A CASE STUDY OF FLOODS IN LOWER KANO PLAINS, KENYA

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DECLARATION

This research project is my original work and has not been presented for a degree or any other award in any other institution.

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Declaration by supervisors

This research project has been submitted for the examination with my approval as university supervisors.

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DEDICATION

To my parents Mr. and Mrs. Omungu for their love, financial support and encouragement through my studies. They gave me the will and determination to complete my masters.

ABSTRACT

Disasters have disproportionate effects on the poor as they are relatively more vulnerable to disaster events. In the Kenya's Nyanza region, floods in the Kano Plains have been a major cause of impoverishment in the household. This study examined the impact of flood events in the lower Kano plains of Kisumu County, Kenya with a view of recommending appropriate interventions to increase community resilience. The study specifically sought to know the impact of annual flood cycles on property, life and livelihoods. On the basis of a case study research design, the study collected data from a convenient sample of 160 households in Ogenya sub-location using a survey questionnaire. Key informant interviews were administered to selected officials from government and NGOs as well as elders from the community. Also, the study conducted focus groups on various population segments including men, women and youth. Observations were done to verify actual effects of flood events. Data obtained from the field were stored in an SPSS system and appropriate analytical procedures applied on the dataset. The results show that the lower Kano Plains experience three flood events every year and the floodwaters lasted an average of 14 days. The flood events most severely affected crop fields, housing, and infrastructure and also inflicted loss of human life. Accesses to food and water, education, income and housing have reduced due to flood events in Kano Plains while morbidity rates have increased. Hypotheses tests show that there is no relationship between flood frequency and flood duration in Lower Kano Plains. The chi-square test rejected the hypothesis that stated ''there is no difference in the effect of flood events and impacts of flood on poverty indices''. The households used different coping mechanisms that were found not to be effective in reducing flood induced effects. The study concluded that flood is a major cause of household poverty in Kano Plains and recommended effective response to floods early warning systems and capacity building on flood coping strategies.

Keywords: Floods; poverty; rural households; Kano Plains, Kenya, Natural Disasters

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ABBREVIATIONS AND ACRONYMS

APFM	Associated Program on Flood Management
CBDA	Lake Basin Development Authority
EC	European Commission
IFM	Integrated flood management
IFRC	International Federation of Red Cross
IWRM	Integrated Water Resources Management
UN	United Nations
UNISDR:	United Nations International Strategy for Disaster Reduction
WMO	World Metrological Organization
WWF	World Wide Fund
ZVAC	Zambia Vulnerability Assessment Committee

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Poverty has become a global concern with many countries trapped in it. Millennium development goals and vision 2030 are all in the battle against poverty but their achievement is far from reality. Kenya is not an exception in this battle. But even as it put enormous resource to eradicate poverty, the battle has remained unsuccessful for several decades (Oluoko-Odingo 2008).

Disasters are known to contribute to poverty even though there are other causes of poverty. Disasters cause serious disruption of the function of the community interrupting human development process. Lives are lost, social network are disrupted, lifelong capital investments destroyed, and development funds diverted to emergencies and relief (Freeman 2000: UNISDR, 2000)

Globally natural disasters events and losses are escalating. Since 1970, natural disasters have affected more than 5 billion people globally with over 1 trillion US dollars financial lost (Centre for research on epidemiology and disasters 2011)

More than 225million people were affected by natural disasters globally each year on average between 1994 and 2003, with a range of 68 million to 618 million. During the same period, these disasters claimed an average of 58,000 lives annually with a range of 10,000 to 123,000.In the year 2003 1 in 25 people worldwide were affected by natural disasters. (center for research on epidemiology and disasters(2011) .According to (2000) world bank report 1.5 million people have died in the past two decades while more than 225 million are affected annually by natural disasters.

The occurrence and recurrence of floods, droughts, landslides, lightning and other natural disasters, which have played havoc in Kenya and continue to do so in the risk-prone parts of the country, have been the subject of great concern both within and outside the country (Suda, 2010). There are several reasons for the concern. First, natural disasters in Kenya have come to be closely associated with unprecedented deprivation and suffering of the most vulnerable

population groups, especially those living in fragile ecosystems. Secondly, some natural disasters like droughts, floods and landslides have contributed to severe environmental degradation in both urban and rural areas of Kenya, and threatened lives and livelihoods on a vast scale.

1.2 Disasters and human development

During the decade ending 2010, the world experienced natural disaster events, which included earthquakes, heat waves, floods, volcanoes, super typhoons, landslides and droughts which led to loss of at least quarter million human lives and $130 billion in economic losses (Ghesquiere & Mahul, 2011). The number of people at risk has been growing each year and the majority are in developing countries with high poverty levels making them more vulnerable to disasters compared to people in the developed world.

Additionally, natural disasters are an increasingly phenomenon that we clearly perceive and know that may have a direct impact on the welfare of regions where it hit and also on specific households indicators in such areas. The impact of a natural disaster may also cause inequalities (Rodriguez-Oreggia et al., 2013). The poor, who suffer from income fluctuations, and also have limited access to financial services, in the aftermath of a disaster may be more prone to reduced consumption and have a decreasing shock in other household indicators as a consequence. In addition, there are a number of non-poor, or close to be, who are not insured against these risks, and they may fall into poverty as consequence of recapitalizing when coping with the shock, depending on the impact and likelihood of falling into poverty of the initial stock assets and coping mechanisms.

Natural disasters are seen as a function of a specific natural process and economic activity (Raschky, 2008). The indicators used to detect the impact of natural disasters on national economies include long-term recovery businesses, changes in flow variables such as annual agricultural output, variations in fiscal pressure and effects on the labour market (Zissimopoulos & Karoly, 2010).

Further, disasters can act as a barrier to development, increasing poverty and having a small but significant negative effect on economic growth (Raschky, 2008). This effect can return a society to the level of human development it had achieved two years prior to the disaster (Rodriguez-Oreggia et al., 2010). Indirect societal effects such as decreases in productivity in people affected

by disaster can influence economic growth (Popp, 2006). Human capital can be directly affected by these disasters through death or injury and indirectly affected when damage to schools decreases human capital accumulation (in poor countries, decreasing school attendance rates caused by reductions in family expenses can occur).

Flooding is a general temporary condition of partial or complete inundation of normally dry areas from overflow of inland or tidal waters or from unusual and rapid accumulation or run off Jeb and Agawam, (2008). According to EC (2007), a flood can be defined as a natural phenomenon that results in the temporary submerging with water of a land that does not occur under normal conditions. As they are naturally occurring, they cannot be prevented and have the potential to lead to fatal causes such as displacement of people and damage to the environment (Adeoye, Ayanlade and Babatimehin, 2009)

According to Nyakundi et al., (2010) physical damage to property is one of the major causes for tangible loss in floods. This includes the cost of damage to goods and possessions, loss of income or services in the floods aftermath and clean-up costs. Some impacts of floods are intangible and are hard to place a monetary figure on. Intangible losses also include increased levels of physical, emotional and psychological health problems suffered by flood-affected people (Popp, 2006). Floods cause habitations to collapse and/or develop major cracks and/or have their roofs blown off. In many places the standard of the affected habitations are most of the times already poor due to poor workmanship and/or use of poor quality building materials such as pole and mud. In addition, most of the affected habitations are localized in areas prone to flooding such as the flood plains and riverbanks. In rural areas, most of the people who lost their habitations as a result of the floods are absorbed or integrated within the communities (Skidmore & Toya, 2002). In isolated cases the affected people find refuge in tents, churches or rural health and community centers.

1.3 Disasters and poverty

Poverty is an ex-post measure which refers to being deprived of basic levels of economic well-being (absolute income poverty) and human development (Dercon, 2001).UN (1995) defined poverty as a condition characterized by severe deprivation of basic human needs, including food, safe drinking water, sanitation facilities, health, shelter, education and information. It depends

not only on income but also on access to services. Disasters form a key part of the global poverty agenda. Disasters are widely acknowledged to affect disproportionately the poorest in a community as they have relatively higher sensitivity to disaster events compared with communities of higher development status. According to Kim (2012), the poor do not have the adequate capacity to escape from the disaster or cope up with it. In addition, disaster itself can also cause poverty or increase poverty levels such that many households often are unable to break out of the poverty cycle. Communities that depend mainly on primary production are much affected by natural disasters. When floods occur, it sweeps the crops and animals leaving the community with food insecurity and dependent on aid. It takes long for the community to get on its feet because crops and animals do not grow overnight (Mirza, Dixit & Nishat, 2003).Regions that receives frequent disasters is always trapped in cyclic poverty because as they try to develop another disaster strikes again.

Disasters increase poverty on already poor communities or household. Particularly given that they do not have the financial assets to respond, recover and rehabilitate quickly. The effects of floods add pressure on their poverty status. Poverty makes people more vulnerable to disasters (Hofer & Messerli, 2006). In addition, Jeb and Aggarwal (2008) argue that disasters serve as a powerful downward trigger to poverty by continuously destroying assets, wiping out infrastructure and investments. In disaster-prone communities with a low resilience, natural disasters can act as a poverty trap unless a sound disaster risk reduction and management is a practice.

Disaster risk management essentially aims at a reduction of vulnerability. Consequently, vulnerability is a key concept in the discussion about disaster risk management. According to Siegel and Alwang (2003), not all types of natural hazards can be prevented, above all earthquakes, volcanic eruptions or tsunamis. Especially in these cases, disaster risk management is focused on the reduction of vulnerability. For other kinds, such as landslides and floods, measures can be taken towards both the reduction of the hazards and of the vulnerability factors. In many developing countries the relevant actors at local, regional and national levels are not capable of implementing the appropriate preventive actions on their own (Harris, 2010)). Budgetary funding is lacking, while governmental and local institutions are too weak to integrate disaster risk management efficiently into the different sectors. The population often does not

know how to reduce their risk or how to avoid the creation of new ones. Partners often do not have access to knowledge about the different instruments and measures of disaster risk management (Lin & Chang, 2013).

The question that arises, however, is how local knowledge should be understood with reference to disaster risk management and, particularly, to coping systems at the local level. For the purposes of this study, local knowledge can be understood as the stock of skills, strategies, and courses of action which local communities have developed over the years to come to terms with threats to their livelihoods (Srivastava, 2009). Development activities are geared towards strengthening the ability of communities to withstand adversity. Adversity can come in the form of a hazard that is beyond local coping capacities as well as in the form of destitution. Both (the inability to cope and destitution) can be a cause as well as an effect of disaster. More often than not, then, the challenge lies in explicitly making the connection between disaster risk management and poverty reduction in more development initiatives (Hofer &Messerli, 2006).

Experiences with disaster risk management and with coping systems at the local level reveal that development practice has, indeed, a wealth of experience that only needs to be explicitly applied. Development practice should and often does include both disaster risk management and poverty reduction, but the intrinsic connection between the two must be reflected in the intentional design of interventions (Adgera, 2006).

1.3.1 Disasters and household Poverty

The poor, who suffer from income fluctuations and have limited access to financial services, in the aftermath of a disaster may be more prone to reduce consumption and have a decreasing shock in other household indicators as a consequence (Mirza, Dixit &Nishat, 2003). In addition, there are a number of non-poor, or close to be, who are not insured against from those risks, and then may fall into poverty as consequence of decapitalizing when coping with the shock, depending the impact and likelihood of falling into poverty of the initial stock assets and coping mechanisms.

It is widely acknowledged that the poor often live on marginal lands and in poorly constructed houses, and often have poor access to water and sanitation—for example, 80 per cent of the poor in Latin America, 60 per cent of the poor in Asia, and 50 per cent of the poor in Africa live on

marginal lands characterized by poor productivity (World Bank 1997). According to White et al. (2004), people living in such conditions generate a range of immediate 'unsafe conditions'. Such conditions make the poor more sensitive to disasters and exacerbate their poor economic status. While those better-off may choose to live in higher risk areas, the poor often have no other choice. The poor thus live in poorly constructed houses, have poor access to water and sanitation, and often do not have food and nutritional security. Living in poverty thus increases their sensitivity to disaster (Tilak, 2005). Given limited income and limited financial savings (if any), the ability of the poor to respond to and recover from disaster is limited at best. Further, the poor cannot easily adapt to disaster by investing in options such as disaster-proof technology, relocating to less hazardous areas, replacing lost items or even taking out insurance (World Bank, 2000).

It has been noted that disasters can even induce poverty, especially among those living near the poverty line. The World Bank (2000) also noted disasters and the destruction of assets of the poor can trap families in chronic poverty because they will not have the necessary income to rebuild their homes, replace assets and meet basic needs. In other words, disasters can be a source of poverty.

1.4 Statement of the Problem

The frequency of natural disasters has been increasing over the years, resulting in loss of lives, damage to properties and destruction of the environment. The prevalence rates of floods in Kenya stands at 27% and affects 5% of the population affected by disasters. Floods related fatalities constitute 60% of disaster victims in Kenya (Oundo, 2010).

Kano plains are known to have a series of problems ranging from climatic disasters to poverty with 70% of the households living on less than 2,500 shillings annually (Hellen et al 2010).The area is affected mainly by floods and droughts both of which cause economic, social and environmental losses to the community with floods as the major contributor .and the leading cause to food insecurity in Lower Kano Plains. (Oluoko Odingo, 206).

Over 5,000 people are affected every year by floods in Kano Plains (Nyakundi et al., 2010). This generally happens during the long and short rains, especially after spells of intense and heavy rainfalls in the catchments of the rivers. The average annual damage is about US$ 850,000 with

annual relief and rehabilitation measures costing US$ 600,000 in the Kano Plains (Eitel & Ochola, 2006).

In 2009, approximately 1126 people (206 households) had their houses submerged and an additional 3,000 people were affected in one way or another by the floods, schools were submerged and subsequently closed, flood related diseases such as cholera breakout was recorded and about 2,000 farmers had their crops destroyed (Vella 2012). According to Karanja et al., (2002), the high vulnerability to flood risk in western Kenya is as a result of high poverty rates, bad land use practices (such as deforestation and settling and cultivating along river banks), low education and illiteracy levels and the state of infrastructure that is in neglect (Vatsa & Krimgold, 2000).

Although many studies have been done on the floods in Kano Plains, little information exists on the flood induced effects and household poverty in the Kano Plains. Most of the studies focused on floods with respect to destructions and losses to the environment and communities while others focused on households' vulnerability to flood risks in the study area. This study filled this gap by investigating the impacts of floods on households' poverty in the Kano plains, Kenya. It was achieved by assessing floods induced effects on the following poverty indices: reduced access to housing, water, education, health, food and infrastructure. The study addressed the following research questions:

i. What are frequency and duration of floods in the Lower Kano Plains in the last 10 years?
ii. What are the impacts of floods on rural households' poverty in the lower Kano?
iii. Are coping strategies used by the community to respond to flood-induced effects on rural household poverty effectiveness in the lower Kano plains?
iv. What is the nature of floods induced effects in Lower Kano Plains?

1.5 Objectives of the study

1.5.1 General Objective of the Study

The general objective of this study was to investigate the impact of floods on rural household poverty in lower Kano plains, Kenya.

1.5.2 Specific Objectives of the Study

The specific objectives of the study were;

i. Determine the frequency and duration of floods in the Lower Kano Plains in the last 10 years.

ii. Assess the impact of floods on rural household poverty in the lower Kano plains.

iii. Evaluate the effectiveness of coping strategies used by the community to respond to flood-induced effects on rural household poverty in the lower Kano plains.

iv. Determine the nature of flood induced effects in Lower Kano Plains.

1.6 Hypotheses

i. H0 There is no relationship between flood frequency and duration of flood in Kano plains.

ii. H0 There is no difference in the effects of floods and poverty indices in rural households in Kano Plains.

iii. H0 There is no difference in effects of flood events and flood coping mechanisms used by rural households in Kano plains.

iv. H0 Flood induced effects are not minimal in Kano plains.

1.7 Justification of the study

Poverty has become a global concern with many countries trapped in it. Millennium development goals and vision 2030 are all in the battle against poverty but their achievement is far from reality. Kenya is not an exception in this battle and even after putting enormous resources to eradicate poverty, the battle has remained unsuccessful for several decades (Oluoko-Odingo 2008).

Destructions and losses caused by disasters are known to contribute to poverty by disrupting the functioning of the community and interrupting human development process (Freeman 2000: UNISDR, 2000). According to World Bank report (2000), more than 225 million are affected annually by natural disasters with 1.5 million people deaths in the past two decades.

Kenya experiences floods annually in many parts of the river basins but the most affected areas are Kano plains, Nyatike and Budalangi. It has been reported that, in 2003 alone, 170,000 farmers were affected by floods in Kano Plains and that the mean loss of agricultural production per year for the crops has been estimated at US $1.3 million. In Budalangi, an amount of 63 million shillings is spent every year on relief and rehabilitation of about 12,000 displaced persons (Ochola, Eitel & Olago, 2010). Given the spatial extent of Kano plains, the populace, natural and economic resources that go to waste due to floods, there was need to evaluate how the cyclic trends in floods have contributed to the households poverty in the Kano plains, a fact that has never been adequately addressed. It is believed that the findings and recommendations from this study will constitute a geo-database that could be used by all the stakeholders in formulating policies and actions that would help the community cope with flooding and create environmental equity for sustainable development and poverty alleviation.

1.8 Scope and Limitations of the Study

This study focused on the impact of flood on household poverty in the Kano Plains of lower Nyando River, Kenya. Further, it was limited to households living downstream in Lower Kano Plains. Only household heads were interviewed to meet the objectives of the study.

The researcher encountered quite a number of challenges related to the research and most particularly during the process of data collection. Due to inadequate resources, the research was conducted under financial constraint. The data was therefore collected from one sub-location that experienced a lot of floods. Since the area experiences frequent flooding, some respondents were not able to answer some particular questions due to inadequate memory of frequent flood events.

1.9 Definition of Terms

Coping Mechanisms: An adaptation to environmental stress that is based on conscious or unconscious choice and that enhances control over behavior or gives psychological comfort

Floods: A temporary rise of the water level, as in a river or lake or along a sea coast, resulting in its spilling over and out of its natural or artificial confines onto land that is normally dry.

Preparedness: Refers to a set of actions that are taken as precautionary measures in the face of potential disasters.

Disaster management: Actions taken to unexpected events that are adversely affecting people or resources and threatening the continued operation of the organization.

Human Activity: Something that people do or cause to happen.

Poverty: Deprivation of basic human needs (food, water, housing, health and education)

Household poverty: Inability of a family to meet its basic needs.

Hazard: A dangerous phenomenon, substance, human activity or condition that may cause loss of life injury or other health impacts, loss of livelihoods and services, social and economic disruption or environmental damage.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Impact of disasters on human development

Natural disasters have become a great concern because of the damage they cause to property and loss of human lives. Globally, natural disasters have killed more than 1.5 million people in the past two decades and affected 255 million annually. Ninety-seven per cent of disaster related deaths reported globally occurred in developing countries World Bank (2000). Almost every year a natural disaster is reported. This means that more properties are lost especially in the developing countries that lack the capacity to cope with these disasters. Economic losses associated with natural disasters are now estimated to be 15 times higher than they were in the 1950s and disasters caused approximately US$67 billion in losses in each year from 1994 to 2003 (World Bank 2006).

2.1.1 Economic Development

Disasters tend to bring down the economic development of a nation. When structures are destroyed and development finances are diverted to disaster responses, then the development of a country is either slowed down are taken back.

Major natural disasters can and do have severe negative short-run economic impacts. Disasters also appear to have adverse longer-term consequences for economic growth, development and poverty reduction. But, negative impacts are not inevitable. Vulnerability is shifting quickly, especially in countries experiencing economic transformation - rapid growth, urbanization and related technical and social changes (Toya & Skidmore, 2007).

In the Caribbean and Bangladesh there is evidence of both declining sensitivity to tropical storms and floods and increased resilience resulting from both economic transformation and public actions for disaster reduction (Burrus et al., 2002). The largest concentration of high risk countries, increasingly vulnerable to climatic hazards, is in Sub-Saharan Africa. Risks emanating from geophysical hazards need to be better recognized in highly exposed urban areas across the world because their potential costs are rising exponentially with economic development. In addition, natural disasters cause significant budgetary pressures, with both narrowly fiscal short-term impacts and wider long-term development implications. Reallocation is the primary fiscal response to disaster.

Benson and Clay (2003) have argued that the long term impact of natural disasters on national economic growth is negative, while Skidmore and Toya (2002) argue that such disaster may have a positive impact in the long run growth, derived from a reduction to returns to physical capital but an increase in human capital, leading to higher growth. Strobl (2008) finds for the US coastal regions that hurricanes decrease county's growth initially by 0.8 per cent, while recovering after in 0.2 per cent. This author also finds for Central America and the Caribbean that the impact from a destructive hurricane is a reduction of 0.8 percent of economic growth (Strobl, 2008).

In addition, Carter et al (2007) analyzed the impact of droughts in Ethiopia and of hurricane Mitch in Honduras on growth of assets at the household level. For Ethiopia, they find a pattern of assets smoothing among low wealthy families, i.e. such household hold on their assets even if they are few in periods when income and consumption decreases, such as after the big drought occurred. They find for Honduras households that relatively wealthy families recovered faster from the shock than low income families, and that a poverty trap is set below a given level of income.

Burrus et al (2002) also analyzed how low intensity hurricanes can impact local economies through interruption of activity. They use data from the local Chambers of Commerce surveys in North Carolina and because of their frequency the impact could be a reduction between 0.8 and 1.23 per cent of annual output and up to 1.6 per cent of regional employment. In addition, Ewing et al (2009) found for Oklahoma that after the big tornado that affected the area, the labor market improved in the aggregate, being positive for most of the economic sectors.

The impact of hurricane Katrina sparked some analysis on the effects on the local economy. Thompson (2009) for example found that the impact of the hurricane impacts the local economy in about 5.2 per cent decline, representing about eight years of development. Groen and Polivka (2008) also find for Katrina evacuees that those who did not return to the area of the impact were performing worse than those who did return. A similar pattern is found by Belasen and Polachek (2009) for hurricanes hits in Florida, finding a decrease of about 4.5 per cent on wages on those areas directly hit. Whether due to Katrina, or the hurricanes in Florida, wages tend to decrease in areas where evacuees migrate.

2.1.2 Social Development

A disaster can be decomposed into a shock, the damaging physical event, and the disaster proper, the net impact of the shock on the population. A single modest shock may result in a severe natural disaster and severe shocks may result in moderate disasters. The outcome depends predominantly on social factors – the degree to which housings and human infrastructure are exposed to shocks and vulnerability. The causes and manifestations of vulnerability are largely social and political (Wisner et al. 2004)

Indonesia is a pivotal state with respect to responses to resource scarcities being the world's fourth most populous state and a regional power. Factors argued to be relevant in the climate change and conflict literature such as poverty, land based livelihoods, ethnic diversity, regime transition, and inequities (Buhaug, Gleditsch, and Theisen 2008) are all present. Indonesia is therefore not 'just another case', but a central country in this concern. As earlier studies have found an effect of resource scarcities/natural disasters on conflict (Barron, Kaiser, and Pradhan 2009) a disaggregated study of natural disasters and the contexts that could affect its local conflict effect is warranted.

2.1.3 Environmental Sustainability

The increasing incidence and intensity of natural hazards and climate change have a distinct impact on the environment and vice versa and must therefore be seen as an integrated whole. In this context environment refers to all of the external factors, conditions, and influences that affect an organism or a community. This includes everything that surrounds an organism or organisms, including both natural and human-built elements (Toya & Skidmore, 2007). Environmental concerns are essential components of human well-being and contribute positively to human security, providing basic materials for good life, health and social relations. If these are being compromised and overexploited it will ultimately lead to increase of natural hazards.

When natural hazards becomes a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources it is referred to as a disaster (Carter et al., 2007).

Disasters are often portrayed as acts of nature, or of a natural order. Yet this is not an accurate reflection of reality. The major factors influencing disaster risks are human and social vulnerability, matched with the overall capacity to respond to, or reduce the impact of natural hazards. An integrated approach including environmental conservation is often enough adopted in the field of disaster risk reduction (Buhaug, Gleditsch, and Theisen 2008). At the same time relief organizations tend to focus on damage to life and property, ecological services and their indirect economic values are often omitted completely from disaster assessments. Mainstreaming ecosystem concerns- both ecological and economical- into the development agenda and integrating them into disaster risk reduction, becomes essential. An ecosystem is a functional unit consisting of all the living organisms (plants, animals and microbes) in a given area, as well as the non-living physical and chemical factors of their environment, linked together through nutrient cycling and energy flow. An ecosystem can be of any size – a log, a pond, a field, a forest or the Earth's biosphere – but it always functions as a whole unit. It is only by addressing environment and natural hazards together with poverty that we can separate communities trapped in a grinding poverty cycle, and the ones who secure lives and livelihoods (Goldstone, 2001).

Poverty is heavily contributing to escalating disaster risk by reducing existing coping capacities and future resilience. Another patch of common ground is that the less privileged are suffering the most from the immediate and long term disaster impacts. Environmental losses are often overlooked, even if this might have the most significant and long term effects on livelihood as an income sources (e.g. agriculture) for the poor (World Bank, 2008). Disasters should therefore be seen as an integrated part of development and without major efforts to address disaster losses, disasters will become a serious obstacle to achieve of the Millennium Development Goals. Consequently, hazards, vulnerabilities and capacity building needs to be considered in projects and activities aiming at enhancing environmental conservation and reducing disaster risk.

2.1.4 Disasters and Poverty

Although disasters do not determine who to hit, the poor are always the most affected. This is because of various reasons such as lack of knowledge or lack of resources to cope up with or recovery from the disaster. From the data collected shortly after the hurricane in 1988, Morris *et al*. (2002) report that poor rural households lost 30-40% of their crop income and measured poverty immediately increased 5.5 percentage points, rising from 69.2% of households to 74.6%.

They also report that lower-wealth households lost 15-20% of productive assets (land, livestock, and plantations), compromising their capacity to generate earnings and livelihood. Unclear, however, from this early study is whether households were able to recover from losses of this magnitude and rebuild their assets and livelihoods. The poor mainly depend on agriculture as their source of livelihood. This makes them more vulnerable because these assets, takes long time to grow. Therefore, it takes very long for them to recovery from the effects of disaster. During this period, the affected community is left with nothing to depend on but to remain poor until that time that they will recovery from the loss. What sometimes happen is that the same disasters hit when almost or just months after recovering from their losses. 1998 total economic losses estimated to be approximately US$65.5 billion. Over half of these losses US $30billion were Asian flooding losses and 30 billion china losses from immense flooding along Yangtze river.66% of the losses were from developing world. This indicates that the poor suffer more from the impact of disasters as compared to the rich

Not only do the losses of properties lead to poverty but also loss of lives. Many lose their lives through diseases break out like cholera or just from the impact of the disaster. When flood occur there are most f the time contamination of water causing cholera break out sometimes leading to death. Infrastructure damage also makes it almost impossible to assess health facilities resulting into death of the sick. In 1999 natural and manmade disasters claimed 105,000 lives across the globe Swizz Re (2000).This took away most of the bread winners. Children who are left behind as orphans are most of the times left languishing in poverty. They cannot afford their basic needs. Most are forced to drop out of school to get a source of income or because of lack of income to cater for their education.

Some of the reasons for school dropout resulting from flood may be due to lack of income to cater for school needs, destruction of infrastructure making it imposable to reach schools ,child labour to earn enough income to sustain the family after floods among others. Flood has resulted into crop destruction. Losses of crops due to flooding have had severe impact in south Asia. Crop damage leading to food insecurity have always been encountered.1974 flood damaged about 0.6 million tons of crops and generated severe unemployment to farm workers. Famine broke out in Bangladesh due to food insecurity and it cost the lives of 1-1.5 million people Alamagir (1980)

In October 2012 world poverty day in Nigeria, it was reported that flood has rendered 42 million Nigerians homeless with large track of farmland and means of livelihood destroyed.25% of Nigerian population is left homeless as a result of flood

A research conducted by Ochola (2010) in the lower Kano plain showed that flooding has inhibited cotton cultivation and lowered crop acreages. The output was low because the flood either delayed the farmers planting time or destroyed the crops already in the field. Cotton is a cash crop in the community. Insufficient or lack of production will lead to reduced income.

In February 2000,severe flooding in Limpopo province of south Africa resulted into 84 people losing their lives, destruction of road infrastructure worth more thanUS$165m,the closure of schools,300,000 people being left homeless due to 45,000 dwellings being damaged and severe food and water shortage among the affected communities (Sowetan 2000)

According to world health organization Europe report (2002), flood is the most common natural disaster causing loss of life and economic damage in Europe. It point out on some of the health impacts of flood which are deaths, injuries and mental health illnesses during the flood event itself, during the restoration process, or from knock-on effects brought about by damage to major infrastructure including displacement of populations.

The flooding in 2011 wiped about one percentage point off annual gross domestic product, and Queensland's 56 coal mines took months to return to full production capacity. Total damage was estimated at 6 billion Australian dollars (US$6.24 billion), while insurers together suffered losses of some US$2.5 billion.

Douglas(2009) say that although during the 1988 and 1998 floods, the Bangladesh government managed to balance food supply and demand, this did not necessarily ensure food security at household level. He continues to warn that the serious problem of getting food to those who need it which exist even in the normal years, will affect the increasing number of people living below the poverty line when bigger floods occur in future. According to Shahabuddin (2000) crop damage and unemployment caused by flood will make an even larger section of the population extremely vulnerable to starvation, malnutrition and even death.

Economic crises caused by natural disasters have been a recurrent phenomenon in the developing world. Their impacts are felt even after the disaster. Recent examples of these types of aggregate shocks abound: the 1995 and 2002 financial crisis in Argentina, the 1994–95 peso crisis in Mexico, the effects of elninno on Philippines and Indonesia, and the1998 currency crises in East Asia (Skoufia, 2003)

From 1990 to 1998, 97 percent of all deaths related to natural disasters were in developing countries. Hurricanes, earthquakes, landslides etc. caused unnecessarily high death tolls and damage in low-income countries. But poor people have also been especially vulnerable to less sudden, long-term environmental changes: millions have suffered from undernourishment or died of hunger during droughts and flooding

De Ville and Griekspoort (2007) indicate that natural disasters are the major factor contributing to poverty and suffering worldwide. They also argue that economic losses from natural disasters represented 60 percent of the total global losses.

Enarson and Fordham (2001) found that structural factors increasing women's poverty and economic insecurity placed women at higher risk than men after the disasters, as poor women had a harder time withstanding material losses and rebuilding their homes. Comerio et al. (1994) reported that following the Loma Prieta earthquake, the low-income victims had a more difficult time with housing in the reconstruction period. Nearly three-quarters of the units destroyed in San Francisco were rental units. One year after the disaster, the single family homes were rebuilt, but of the multi-family units, 90% were still out of service. Four years later, 50% of the multifamily units remained unrepaired or unreplaced. The authors explained that the projects that were the most vulnerable and the slowest to recover were those that were occupied by very low-, low-, and moderate-income renters.

Rubin and Popkin (2001) found that two years after Hurricane Hugo, the social class disparities that had existed prior to the disaster were as apparent in the communities as they had been before. However, on a more optimistic note, some communities used the disaster as an opportunity to improve living conditions. After Hurricane Andrew there was some indication that replaced or restored public housing units were better than the ones there before the storm, and new community projects were implemented to improve poor neighborhoods.

2.2 Impact of floods on human poverty (Global scenario)

2.2.1 Urban Poverty

In the short-term and for urban settlements in developing countries in particular, the factors affecting exposure and vulnerability to flooding are increasing rapidly, as puts more people and more assets at risk. Rapidly growing informal settlement areas, often termed slums, in central city and peripheral suburban or periurban locations, are particularly vulnerable to flood impacts.

The concentration of people in urban areas increases their vulnerability to natural hazards. Vulnerability to flooding is particularly increased where inappropriate, or inadequately maintained infrastructure, low-quality shelters, and low resilience of the urban poor intertwine (World Bank, 2008). The fact that rapid urban expansion typically takes place without following structured or agreed land use development plans and regulations makes conditions even more problematic. In addition, as the urban poor are often excluded from the formal economy, they lack access to adequate basic services and because they cannot afford housing through the market they are located in densely populated informal slum areas which may be vulnerable to flooding.

The houses of poor people in these most vulnerable informal settlement areas are typically constructed with materials and techniques that cannot resist extreme weather or natural disasters (Parry et al. 2009). Rapid urbanization in low-income and middle-income nations tends to take place in such relatively high-risk areas, thereby placing an increasing proportion of the economies and populations of those countries at risk (Bicknell et al. 2009)

Urbanization and consequent increases in urban populations, accompanied by urban expansion, can result in declines in average densities, as built-up areas spread outwards. This can compound flood risk and weaken urban resilience to flooding. Even though some of this increase is the natural consequence of urban population growth, urban expansion, which is often referred to pejoratively as urban sprawl, can also be associated with inefficient land use and planning policies (World Bank 2008). However, the need for accommodating expanding urban populations does require the consumption of more land. Similarly, higher densities are not always or necessarily a panacea for alleviating urban flood risk, as they often are coupled to increases in non-permeable surfaces, the occupation of vulnerable terrains, and levels of

congestion which can compromise or even overwhelm the operation of infrastructure services such as solid waste.

Two-thirds of direct deaths from flood events are caused by drowning and one-third by physical trauma, heart attack, electrocution, carbon monoxide poisoning or fire (Jonkman and Kelman 2005). Most deaths occur during flash flood event as against the slower riverine events (Du et al. 2010). In developing countries such as Bangladesh, the majority of flood deaths have been found to be caused by diarrhea and other water-borne diseases, or from drowning and snake bites. In Vietnam, electrocution is the biggest cause of death in the immediate aftermath of flooding, followed by respiratory diseases, pneumonia and exposure to cold. Diarrhea-related deaths are primarily caused by a lack of pure drinking water, improper storage and handling of drinking water, poor hygiene practices and the often total deterioration of sewage and sanitation facilities which lead to the contamination of drinking water in flood affected areas (Kunii et al 2002). These deaths can occur during the period following the reported flood and, therefore, are not necessarily recorded in disaster databases.

In addition, large-scale disasters like floods can reduce food availability in cities, but such urban food insecurity is, for the most part, considered to be a food access problem, rather than a food availability problem. Food shortages lead to rising prices, so that the poor cannot afford to buy it as incomes decrease due to lack of work; this results in economic and financial hardship (IFRC 2010).

Dhaka is most vulnerable of the 11 coastal and delta cities in Asia examined to climate change impacts. This large, relatively poor city sits just meters above current sea levels, is regularly impacted by tropical cyclones and flooding, and has very limited adaptive capacity (WWF, 2010). Severe flooding has already impeded the development of Dhaka significantly, but of the eight major floods that have occurred in the last 50 years, the three most recent (1988, 1998, and 2004) have been the most damaging (Reid and Sims, 2007). The key sectors affected by floods are infrastructure, industry, commerce and utility services. Productivity reduces in during and after major flooding increases the vulnerability of the urban poor. Further, as the adverse impacts of climate change on rural areas cause increased migration to urban areas in search of non-agricultural employment, they are putting greater pressure on scarce housing, water, sanitation,

and energy services (Kelkar and Bhadwal, 2007) and increasing the number of vulnerable urban poor who are particularly at risk from climate related disasters.

2.2.2 Rural Poverty

The rural population depends mainly in primary production. Agriculture and informal industries are some of their sources of income. There are Poor infrastructure, high illiteracy rate and inadequate resources. All this contributes to rural poverty. These factors also make the rural population more vulnerable to disasters. The fact that they depend heavily on agricultural production put them at a higher risk when floods occur.

Study conducted by ZVAC (2007) within the agricultural sector in Zambia, floods and water logging impacted adversely on staple crops in all assessed areas, followed by livestock, cash crops, aquaculture and wildlife. Crop loss was mainly through rotting of root crops and leaching of fertilizers from the late planted fields. Both staple food crops (maize, millet, sorghum and cassava) and cash crops such as rice, soya-beans and groundnuts were severely affected. However in some of these districts such as Kawambwa, the crop losses (cassava) were attributed to diseases such as the cassava, mealy bug and the cassava mosaic virus and not necessarily due to floods. The damages caused by the floods on roads and bridges also affected the delivery of agricultural inputs such as fertilizers.

2.2.3 Material Poverty

Disaster incorporates the multidimensional socioeconomic and political issues including the physical characteristics, social structure with socioeconomic capability, and political perception. The magnitude of any disaster creates the risks of disaster vulnerability in different ways that apply to different groups (Bhatti et al., 2011). When people face the risks of disaster vulnerability, they face the decrease of capability, which creates the multi-dimensional socioeconomic and political crises. Materially, this involves damage/loss of physical assets, infrastructure, domestic assets, and agricultural output. Non-materially, social relations, status-role linkages, norms, values, crime, grievance, conflicts and the rhythm of everyday organized social and cultural life are disturbed. The major victims are usually those who are marginalized people: the poor and the destitute, women, and children, who have the lack of capability on the context of unequal access to resources. The effects will be felt in increases in malnutrition,

violence, exclusion, illiteracy, and various forms of exploitation. The risks of disaster vulnerabilities differ on the context of family, community, and society, which are influenced by education, ethnicity, class position, gender, caste, disability, and age structure. Vulnerability downgrades the existing social structure and social order, which is reflected in the process of the cultural system, demographic scenario, social process, socialization, good governance and women empowerment

According to Nott (2006), physical damage to property is one of the major causes for tangible loss in floods. This includes the cost of damage to goods and possessions, loss of income or services in the floods aftermath and clean-up costs. Some impacts of floods are intangible and are hard to place a monetary figure on. Intangible losses also include increased levels of physical, emotional and psychological health problems suffered by flood-affected people.

According to ZVAC (2007) report, heavy rains and floods cause habitations to collapse and/or develop major cracks and/or have their roofs blown off. In many places the standard of the affected habitations was already poor due to poor workmanship and/or use of poor quality building materials such as pole and mud. In addition, most of the affected habitations were localized in areas prone to flooding such as the flood plains and riverbanks. In rural areas, most of the people who lost their habitations as a result of the floods were absorbed or integrated within the communities. In isolated cases the affected people found refuge in tents, churches or rural health and community centers.

2.3 Floods in Kenya

2.3.1 Causes of Floods in Kenya

Floods occur due to natural factors like heavy rainfall, river floods and coastal floods. They may also occur due to human manipulation of watersheds, drainage basins and flood plains. For example, in some cases floods have occurred in the river basins even with normal rains because of excess surface water run-off occasioned by deforestation, land degradation upstream (Moinde-Fockler et al., 2007).

Kenya is affected by floods following torrential rainfall. These force thousands of people living in the lowlands to move to higher grounds (Wieczkowski, 2009). The people affected are mostly in western and Nyanza provinces and in Tana River district. However slum dwellers in towns

like Nairobi who have erected informal structures near rivers are not spared. In Nyanza Province River Nyando is notorious bursting its banks during the rainy season hence causing flood in the area.

Kenya's record of flood disasters indicates the worst floods recorded in 1961-62 and 1997-98, the latter ones being the most intense, most widespread and the most severe. During this season the flooding was associated with the El Nino phenomenon, a weather pattern that affects most parts of the world. El Niño is a disruption of the ocean-atmosphere system in the tropical Pacific having important consequences for weather around the globe. It may cause increased rainfall in some areas and drought in others thus changing the normal weather pattern (Sang, Gathenya & Ndegwa, 2007).

Most parts of the nation experience river floods which are slow onset and mostly predictable. However some parts experience more severe floods than others including most parts of Kano plains (Nyando district) and Nyatike (Migori district) in Nyanza province, Budalangi in Western province resulting from river Nzoia and the lower parts of Tana River.

Factors contributing to vulnerability to floods and causing flood disasters in Kenya include location of settlement in the flood plains and cultivation of crops along slopes adjacent to the floodplains, causing massive erosion and destruction of trees in the catchments. In addition, lack of awareness of the flood hazard by the local communities increases vulnerability to floods. Further, poor building materials leading to non-resistant structures and foundations that cannot withstand the running waters increase vulnerability to floods.

2.3.2 Impacts and consequences

As mentioned earlier, flood has both social and economic consequences. The consequences also depend on the intensity of the flood. Different regions have experienced different impacts. In the lower reaches of Malakisi River, the riverine areas of Busia district were affected almost every year in a narrow width of about 100m. Though the depth of inundation was only about 0.5m it lasted for a day or more causing limited damage to agricultural crops and affected grazing. In the lower reaches of river Sio, the district witnessed considerable flooding in widths up to 3 Km. Inundation lasting a day or more affected farm lands and water supply intake for Busia Water Supply without causing any significant damage (Wieczkowski, 2009).

The low-lying areas of Busia district especially the Yala Swamp were affected due to large scale flooding from the Yala and Nzoia rivers. An area of about 110 Sq Km is affected almost every year with depth of inundation ranging from 0.5m to 1m and lasting about a month. The floods cause serious damage to agricultural crops – mainly paddy and maize, and loss of livestock. Besides, road communications are badly disrupted often with damage to roads and bridges.

The floods of Nzoia and Yala rivers also affect parts of Siaya district around Yala Swamp and the flood situation is similar to that in Busia district. In Kisumu district, floods affect The Kano plains almost every year from the spills of river Nyando and small rivers like Kibos, Luanda, Ombeyi, Nyaidho and Awach Kano. The worst floods were, however, those of 1961, 1982 and 1988. An area of about 200 Sq Km experienced flooding with inundation of 0.5m to 1m lasting for about a week. The floods affected agricultural crops of paddy, sugar cane, maize and cotton and inundated many towns and villages including the town of Ahero. Thousands of people had to be evacuated to safe places and provided with relief supplies of essential commodities. Minor roads and bridges were sub merged and sometimes damaged. The lower Kadianga area of Kisumu district was affected by the flood spills of Sondu River. The area affected was about 10 Sq Km and the inundation lasted about a week affecting, to a limited extent, the farmlands and sub merging community roads and bridges (Ochola, Eitel&Olago, 2010).

In recent years there were 3 major flood events in 1997-1998, 2002 and 2003 (Wieczkowski, 2009). The 1997- 1998 flood was the consequence of El Nino related long and intensive rainfall during the months of October and November when precipitation was 300 to 300 percent of the normal (Ibid). The floods had a tremendous impact on the environment and the population. A weir on Kipchoria River, a tributary of the Nyando, was washed away and a water supply dam in Kericho district was silted up. Almost the entire Kano Plain was inundated and agricultural crops were completely destroyed. The floods also caused land degradation and increased soil erosion with consequent silting of hydropower dams and extensive damage to 240 river gauging facilities due to severe bank erosion. The protective dykes were over topped and breached at several places. In Budalangi Division of Busia district more than 12,000 people were affected due to floods in Nzoia River. The dykes suffered extensive damage due to over topping and breaches which cost the government over 42 million shillings in repair and rehabilitation. In UasinGishu district 2 earthen dams were washed away (Wieczkowski, 2009).

There is at present no systematic arrangement for assessment of flood damages and maintenance of damage data. Damage assessment is usually made by various line departments after every major floods but due to lack of coordination, the data is rearly compiled to have a comprehensive appreciation of the actual socio-economic and environmental impact of floods. However, as per the assessment made after recent floods, in the last 20 Km reach of the Nzoia River the annual damage is of the order of 46 million shillings. An amount of 63 million shillings is spent every year on relief and rehabilitation of about 12,000 displaced people. The repair and restoration of damaged dykes is expected to cost 37.2 million shillings (Ochola, Eitel&Olago, 2010).

2.4 Floods in Kano Plains

2.4.1 History of Floods in Kano Plains

Humans have inhabited the Kano Plains since 1950s (Ayiemba, 1976). The first major flood was recorded in 1961 during which year flooding was also experienced in many other parts of Kenya (Ochola, Eitel & Olago, 2010). Between 1963 and 1964, the Nyando floods covered 8000 ha in the Kano Plains.

Impeded drainage is the main cause of flooding in the Kano Plains. Today the Nyando flows out into the Miruka swamp south of the Plains only to find its course hindered further by an ever growing area of papyrus reed which promotes silting conditions and dams up a backlog of waters during flood times. In addition, there is a lot of crop cultivation in Kano plains. Cultivation of crops along slopes adjacent to the flood plains causes massive erosion and destruction of trees in the catchments. In addition, there is lack of awareness of the flood hazard by the local communities. Further, poor building materials used in Kano plains households (e.g. mud) lead to non-resistant structures and foundations that cannot withstand the running waters (Vella, 2012). In addition, Deforestation of the headwaters have been singled out as one of the poor land use practices that have increased runoff, erosion and the cycles of flooding of the Kano Plains by the Nyando River.

Floods have increased the incidence of a number of water associated diseases among people and animals, constrained crop and tree selection, made transportation more difficult, interrupted schooling and destroyed property and infrastructure. In addition, flood devastation results in loss of lives, widespread crop destruction, water borne diseases and associated economic disasters.

The mean lost agricultural production per year for the crops has been estimated at US $1.3 million because of flooding and impounded drainage. The total area of the Kano plains is about 70 000 ha out of which 28,500 ha are cropped. The total value of production is estimated at US $3.5 million. Flood control may release the remaining over 40 000 ha for annual cultivation and increase the agricultural income nearly three times (Ochola, Eitel & Olago, 2010).

East Kano is one of the most neglected rural sections Kenya. There were 320,000 people farming in the area according to the 1999 census. In 2003, 170,000 of the farmers were affected by a flood. Floods continue to be reported almost every year In Kano. (Ochola, Eitel & Olago, 2010).

2.4.2 Flood forecasting in Kano Plains: Scenarios

With the adaptation of the Integrated Water Resources Management (IWRM) in Kenya and the subsequent sector reform, the Ministry of Water and Irrigation has made tremendous progress nationwide. The IWRM is recognized as the most appropriate approach for sustainable development of water resources, of which Integrated Flood Management (IFM) forms an important subset. The Associated Program on Flood Management (APFM), a joint program between World Meteorological Organization (WMO) and the Global Water Partnership supports the efforts of countries towards implementing Integrated Flood Management. A number of pilot projects are being implemented in different parts of the world to develop and apply various components of the Integrated Flood Management concept. In June 2003, the Minister of Water Resources Development and Management, Kenya, asked the WMO to assist Kenya in developing a Flood Management Strategy (Ochola, Eitel & Olago, 2010).

A pilot project for developing a Strategy for Flood Management for the Lake Victoria Basin in Kenya was therefore undertaken by WMO, with full participation of national experts from various concerned ministries, as well as the then Ministry of Water Resources Management and Development (MWRMD). The long-term view of the project was to strengthen national capabilities, so that eventually national experts can develop a flood management strategy for the entire country (Lalah & Wandiga, 1996).

2.5 Conceptual Framework

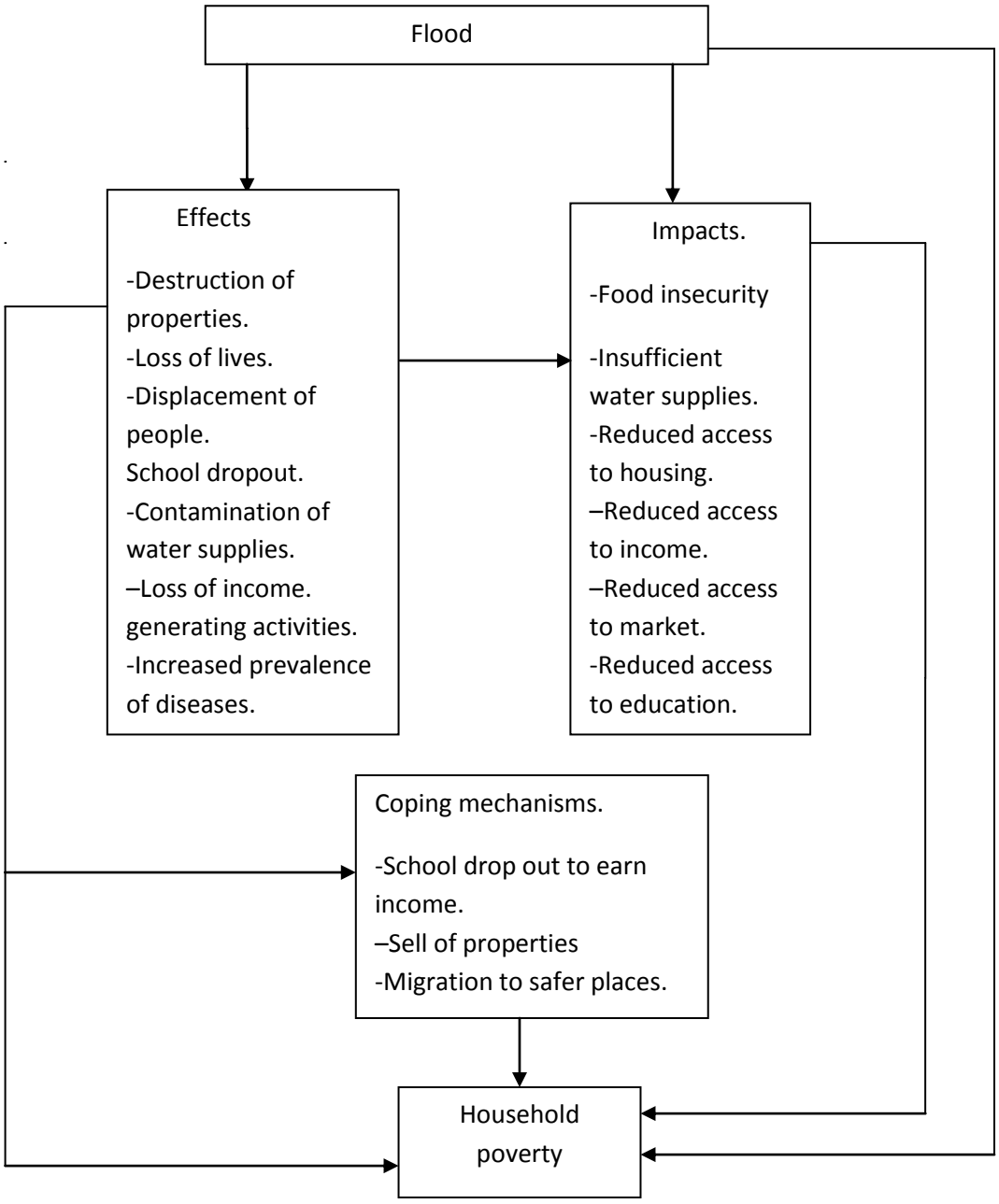
As indicated by Niña, et al. (2003) floods severely damage crop and threatens the food security of tens of millions of households in Kenya. Government food transfers to the affected people

helped limit the impact of the flood on household access to food. However, since floods occur annually in some parts of the country, households living in these areas are caught up in food insecurity and hence they have to regulate their consumption. Further, floods lead to destruction of household properties, infrastructure and income generating sources. Houses are most of the times swept away, roads and schools destroyed. These limit accessibility to food, shelter and education contributing to household poverty. Floods also contribute to loss of lives through flood related diseases such as cholera or drowning. When lives are lost, orphans widows and widowers are left behind. If the lost lives were bread winners, then the dependents are left in poverty.

Households apply different coping mechanisms to reduce flood induced effects. These coping mechanisms include selling of properties to earn income and migration to safer places among others. Sometimes the coping mechanisms can land the households into poverty. Selling of their properties may leave them with no assets to earn them income. Selling of properties can give short term income but long term poverty.

Orphans may also be forced to drop out of school in search of income to support them. Sometimes children drop out of school to help their parents recover from flood effects (child labour).lack of income to support education can also result to school dropout. Education is a weapon against poverty and when children are denied education it contributes to long term poverty. Flood coping mechanisms can also be a poverty trap to the households. Figure 2.1 shows the conceptual framework.

Figure 2.1: Conceptual Framework



Flood leads to different effects in the households which ranges from losses to diseases. Flood long term effects then lead to impacts in the household. Flood impacts leads to reduced accessibility to human basic needs which results into household poverty. Flood induced effects may force the households to apply different coping strategies to enable them overcome or minimize financial constraint attributed by the losses. Coping mechanisms used by households can also push them further into poverty because they are of short term benefit but in the end result into poverty. Example, School dropout leads to lack of education which is a cause of poverty. In summary, flood induced effects lead to flood impacts. Flood effects and flood impacts lead to household poverty. Flood induced effects results into coping mechanisms which in turn lead to household poverty

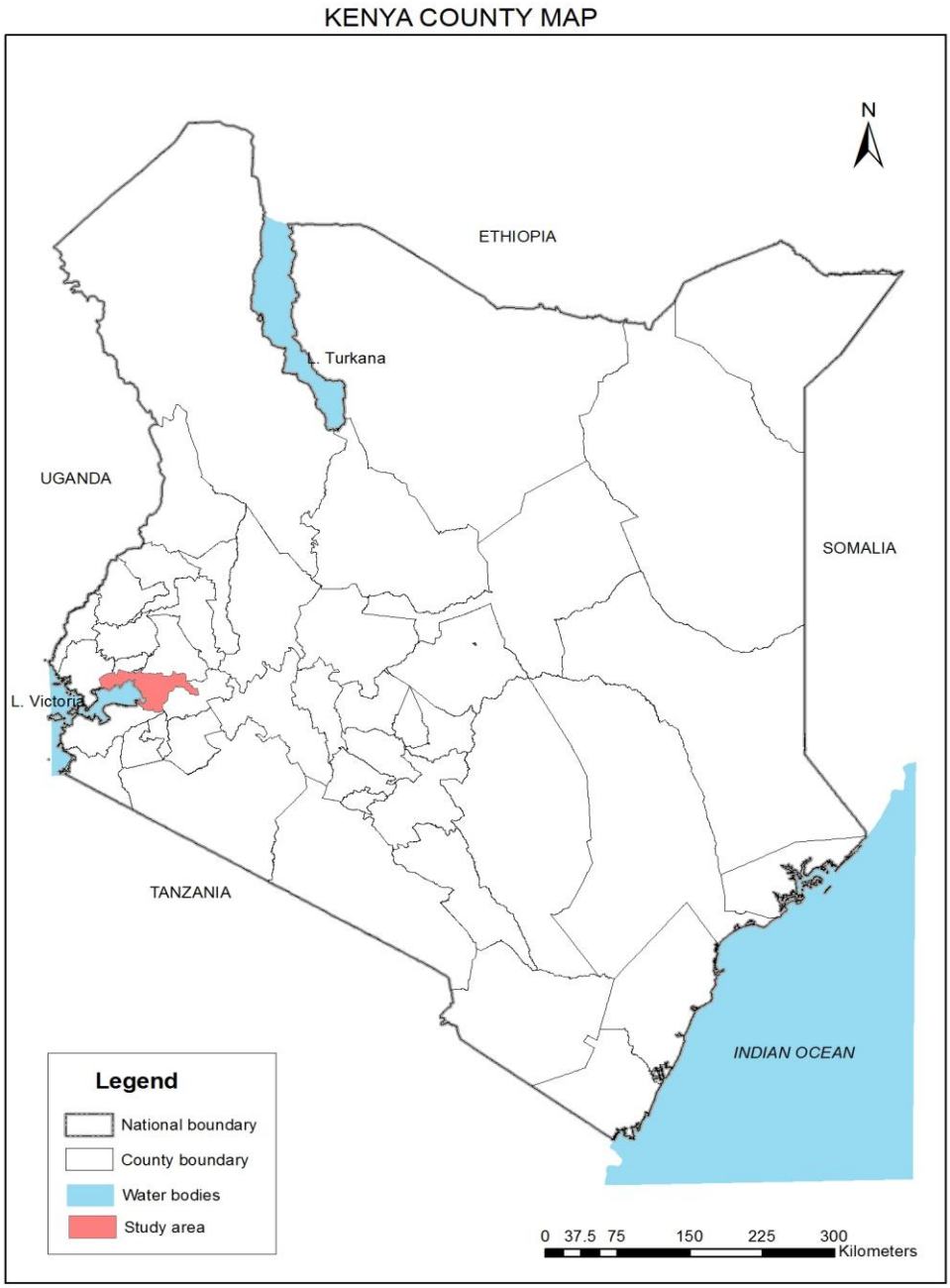
CHAPTER THREE

3.0 STUDY AREA

3.1 Location and geographic setting of Kano plains.

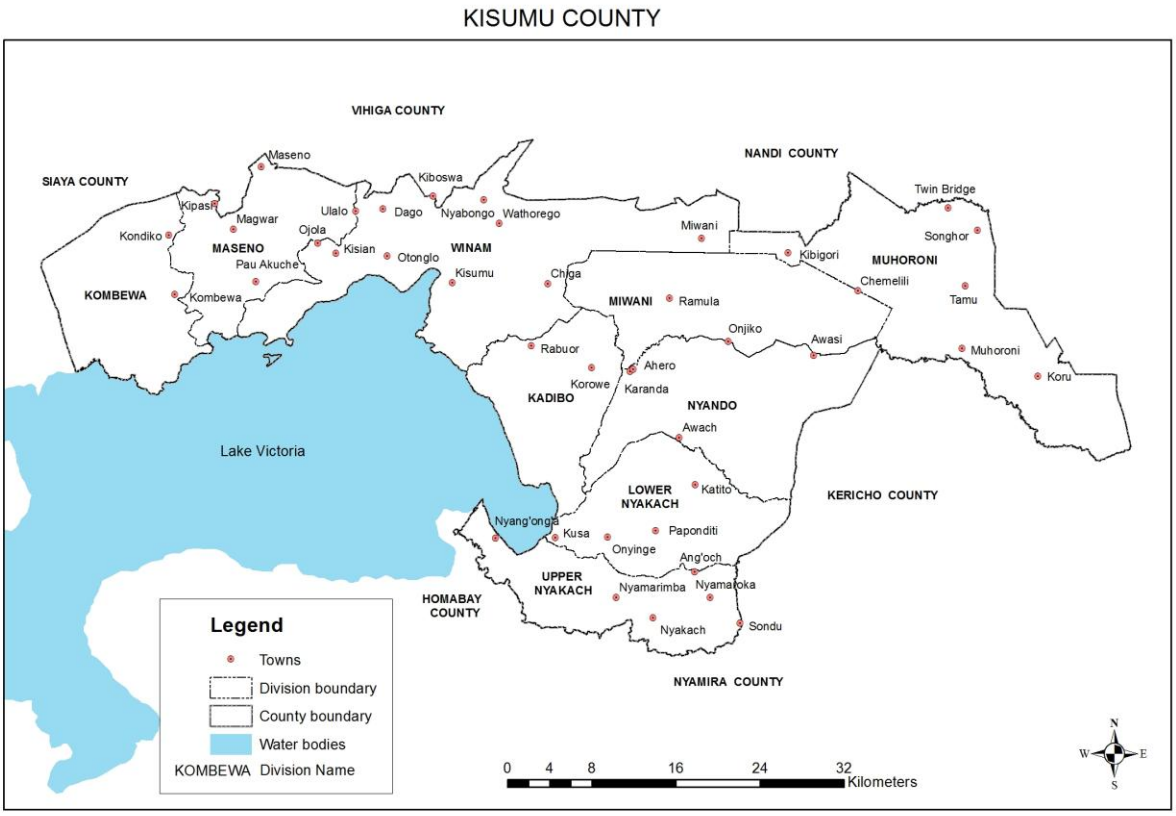
Kano Plain lies between longitudes $0^{o}50'S$ and $0^{o}10'S$ and between latitudes $33^{o}05'E$ and 34^{o} 25'E (National Environmental Management Authority, 2004). The entire area of the Kano plains cover approximately 430 $km^2$and are located about 300 km from Kenya's capital city Nairobi. It is located in Kisumu County. The plains border Nandi Hills to the north east, Nyabondo Escarpment and Kavirondo Gulf. The specific study area is Ogenya sub location located in Kadibo division. Location of the study area is presented in figures 3.0, 3.1 and 3.2 respectively.

Fig 3.0 showing location of Kano Plains



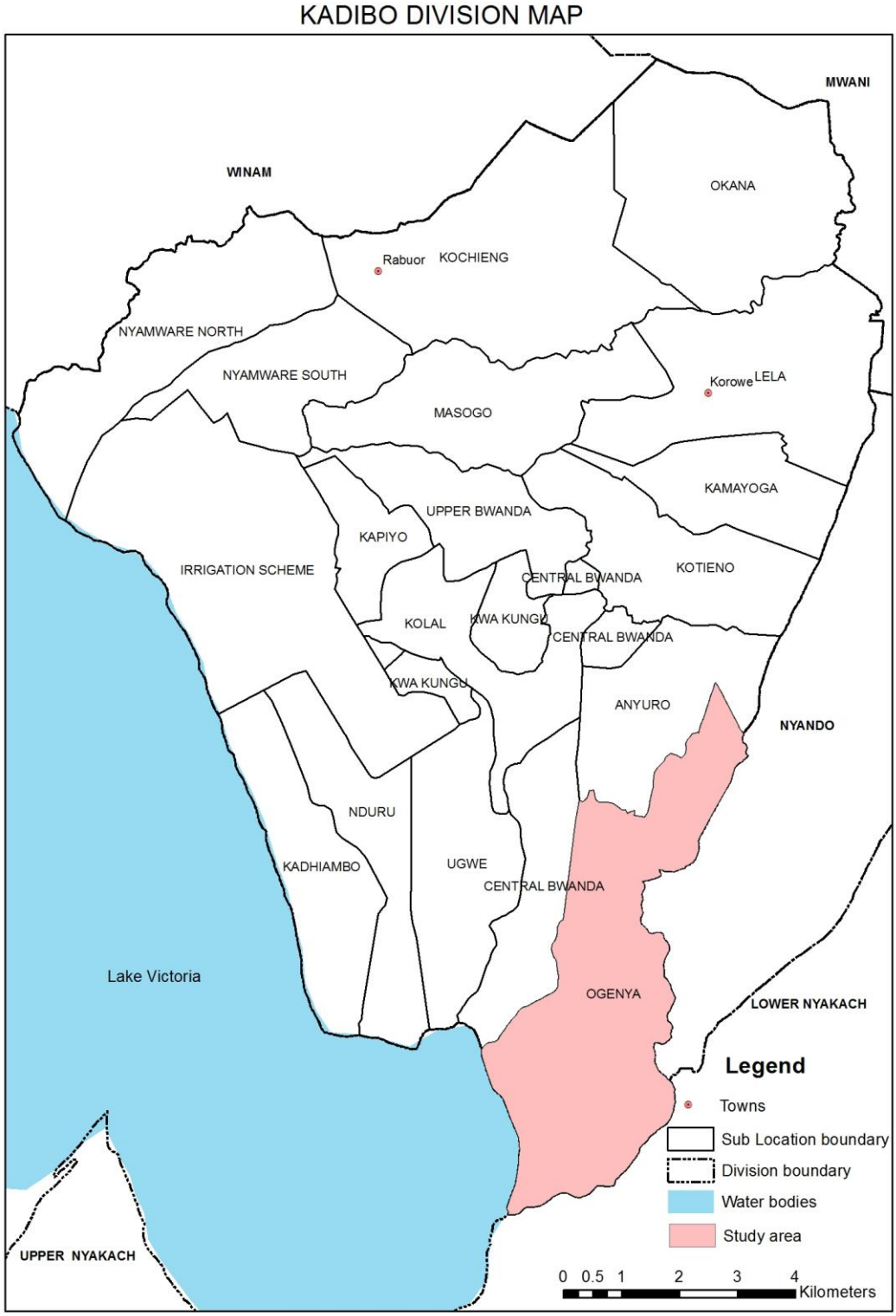
Source:survey of kenya (2011)

Figure 3.1: Map of Kisumu county showing location of Kadibo division and the bodering locations



Source:survey of kenya (2011)

Figure 3.2: Map of Kadibo division showing location of Ogenya sub-location



Source:survey of kenya (2011)

3.2 Topography and climate

The Kano Plains area is surrounded by series of fault line escarpments that descend abruptly onto the Plains which lie between 1160 meters and 1300 meters above sea level (Ayiemba, 1976).

Kano plains are situated in a sub humid zone. It is characterized by four distinctive seasons; two rainy seasons and two dry seasons. They are then further sub divided into long and short rainy season, and long and short dry seasons respectively (Republic of Kenya 2002). Long rainy season starts in March through to May with nearly 40% of the total rainfall. It is followed by long dry spell which starts in June and ends august. Short rainy season starts in October and ends in November followed by short dry spell which starts in December through to February (National Environmental Management Authority 2004)

The mean maximum temperature ranges from about 27c to 32c which is recorded June and July. Annual minimum temperature from 14c to 18c with peak minimum temperature recorded in September (LBDA 1992; Republic of Kenya 1985a) Maximum temperatures occur in long dry spell and minimum temperatures in rainy seasons.

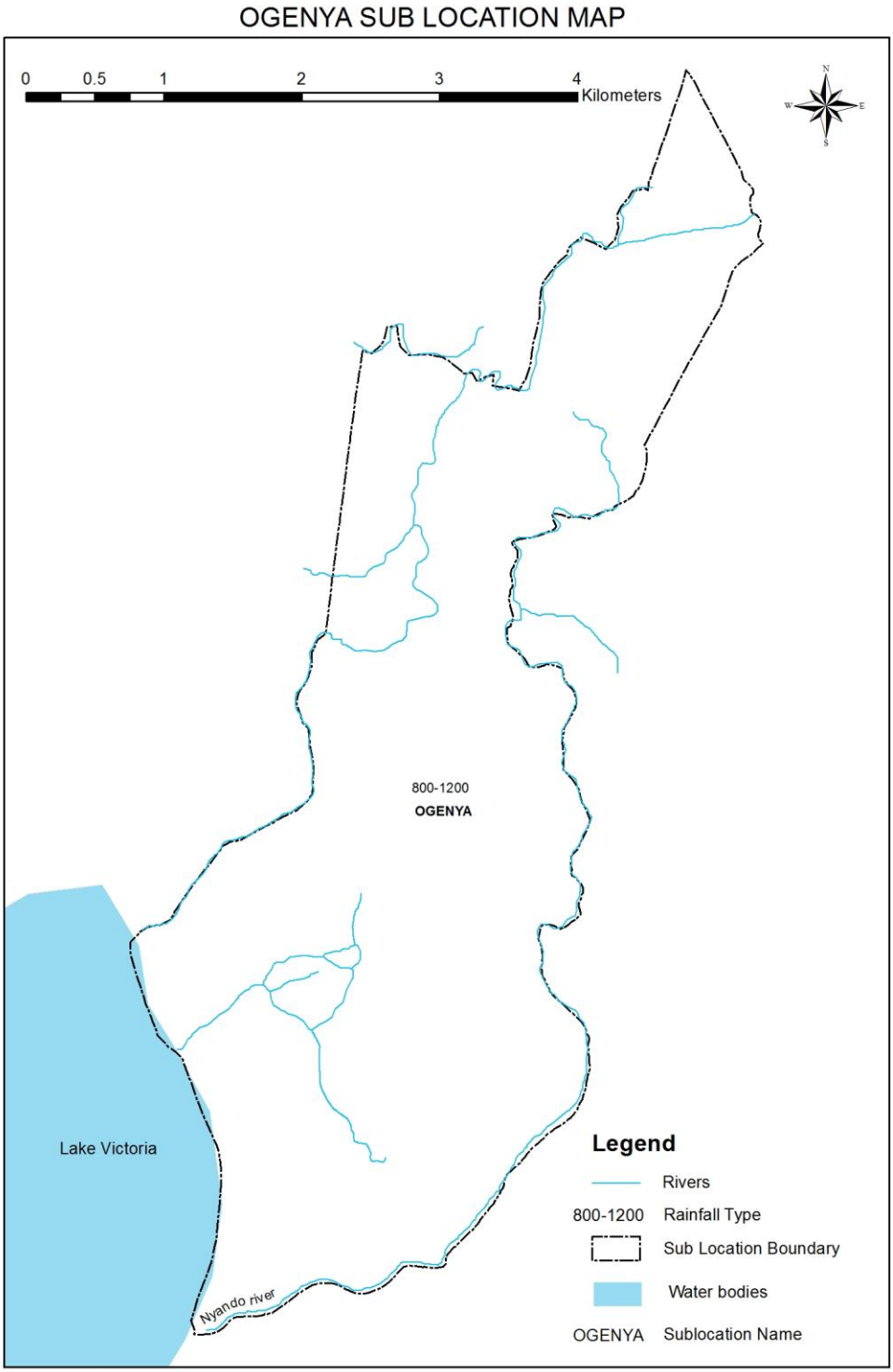
Various theories exist as to the sources of rainfall over the area but broadly speaking two main causes can be identified: The inter tropical convergence zone which is responsible for modulation of tropical African climate (Mititu 1999) together with the penetration of Atlantic airs which are moist and humid east wards from the Congo basin which are then re-charged in moisture content over Lake Victoria (Lalah & Wandiga, 1996).

3.3 Drainage

Nyando River has a catchment of about 3,600km and has a discharge of approximately 15m3s-1(jams B and Sarah 2012).All the rivers flowing across the Plains rise in mountain areas which have 1500 to 2000 mm of rainfall per year. The drainage of the study area is complex. It seems that the main river, the Nyando once reached Lake Victoria by a more direct course than at present flowing westwards through a series of swamps to share a common outfall with the Kibos River at a point South of Kisumu. Today the Nyando flows out into the Miruka swamp south of the Plains only to find its course hindered further by an ever growing area of papyrus reed which promotes silting conditions and dams up a backlog of waters during flood times.

About 50,000 ha of the Kano Plains are arable and natural vegetation areas while an area of 13,000 ha in the lower reaches is under swamps. Approximately 50 per cent of the arable land has been developed for paddy cultivation with supplemental irrigation supply from the Nyando and other small streams. An area of about 20,000 ha is prone to flooding from over bank spills of the river. The drainage of the study area is shown in figure 3.3 below.

Figure 3.3: Drainage of Ogenya sub-location



Source:survey of kenya (2011)

3.4. Geology and Soils

Kano plains is composed of granite rocks granitized during subsequent geological periods.(Rogger Miller 1973).Deformation and fracturing movement began in Kano in the lower Maocene period with gentle warping and development of shallow lakes. The deposits which accumulated in the lake consisted chiefly of diatomite which forms stratum underlying large parts of Kano plains at 6 meters depth. More intense deformation of the Nyanza rift zone was followed by eruptions which gave rise to the tuff and agglomerates which cover large area of the landward sides of the plain. At the same time rifts and faults scarp developed to the North and South of an area which was further down warped to become the site of the Gulf and Kano plains (RM Shackleton 1951).

Soils in Kano are made of hill wash and alluvial deposits. The soil consists of predominantly clay and clay loam which has a considerable range in both their physical properties. Immediately to the North, South and East of the plains, soils are formed from deep accumulations of hill wash that are formed by local flash floods and became mixed with lenses of alluvium. The soil colours range from brown to black which corresponds to variation in clay content of between 35% to 60% respectively in the top soil and of between 40% and & 70% in the sub soil. Silt content is more than 20% in the top soil. Top soil has small amount of organic nutrients and the soil blackness is due to presence of unoxidised minerals in the soil matrix which are due to prolonged water logging due to floods when there is little free air in the soil. These soils are known as 'black cotton soils' and are found in depths ranging between 77cm and 1.2 meters on the plains. Occasionally these soil conditions occur to a depth of 1.8 meters or more. Below them are clay silt sediments with cement like structures. They have poor drainage causing water logging. That explains the flood. (Roger Miller 1973)

3.5 People and culture

The inhabitants of the Kano Plains consist of Luo people and Kalenjin tribes of Kipsigis and Nandi (Lalah & Wandiga, 1996).Luo entered western Kenya in 17th century, they then begun to spread in the Siaya and Kisumu districts in the 18thcentury.By the end of 19thcentury they were well established in Kano plains. They pushed the Nandi, Kipsigis and Masaai people that had occupied the land before them. The luo group of clan called Nyakach occupied the southern

plains while clan called Kano settled in what is known now as East and West Kano (R.Millman 1969).

The luos are Lake Nilotes while the kalenjins are highland nilotes.The luos of Kano plains practice farming and fishing. Their major commercial produce is rice and cotton. Maize, millet and other farm produce mentioned in economic activities of people in Kano are mainly subsistence even though some sell them to earn income.

There is polygamist among Kano plains residents with several children in a homestead. Even in homes with one wife, there are many children.

The Luo of Kano practice Patriarchal system of land ownership. The land is inherited by the male children from their fathers.

3.6 Economic activities in Kano Plains

The economy of Kano Plains consists of agriculture, fisheries, and a wide range of informal sector activities. In terms of cultivation, about 50,000 hectares of the Kano Plains are arable and can be cultivated .The main crops being cultivated are rice, maize, beans, sorghum and sweet potatoes. Approximately 50 per cent of the arable land has been developed for paddy cultivation with supplemental irrigation supply from the Nyando and other small streams. An area of about 20,000 hectares is prone to flooding from over bank spills of the river. (Ochola, Eitel & Olago, 2010).

Commercial agriculture in Lower Kano Plains focuses on sugar cane, dairy farming, irrigated rice and small-scale horticulture. Subsistence agriculture focuses on maize, beans, sorghum, livestock and sweet potatoes (Ochola, Eitel & Olago, 2010).

All the rice in the Kano Plains is produced through irrigated cultivation. Most of the water for irrigation comes from River Nyando, whose annual floods not only displaces huge numbers of people but also deposit a lot of fertile silt all across the plain. The northern and eastern fringes of the Kano Plains also play host to some of Kenya's most productive sugarcane fields.

CHAPTER FOUR

4.0. METHODOLOGY

4.1 Research Design

This study used a case study research design. A case study research excels at giving an understanding of a complex issue and can extend experience or add strength to what is already known through previous research. Case studies emphasize detailed contextual analysis of a limited number of events or conditions and their relationships. It provides in-depth understanding of problem under investigation. Since this study was investigating flood in lower Kano plains, case study was the best study design to apply.

4.2 Types and Sources of data

Both primary and secondary data were used in the study. Primary data was obtained from household questionnaires, key informants interviews, focused group discussions, observation and photographs. Key informant interviews were directed to area Chief, District Officer, Red Cross, world vision and area elder. Key informant Interviews and focused group discussions were conducted to give an in depth understanding of the information got from the households interviews. The interviews also provided information that was used in the analysis of impact of floods on rural household poverty. Questionnaires were used to obtain information from the household heads on effects they experience as a result of flood. Observations on the destructions of properties by flood backed up the information got from the interviews. Information from the Observation was then recorded using photographs.

Secondary data was obtained from review of relevant books, publications from various government and nongovernmental organizations to provide relevant information on the area of study. Government hospital records in Lower Kano Plains were used to obtain data on flood related morbidity.

4.3 Data Collection

4.3.1 Target population and sample size

The study area had a population of 2,552 people (1,231 males, and 1,321 females) and 531 households in the 2009 population census (KNBS, 2009). The study used households population

as target population. It focused on household heads because they had knowledge on the household flood related effects.

As proposed by Peters (1996) and Neumann et al. (2003), sample ratio of 30% was obtained due to insufficient finances and time to cover the whole area. A ratio of 30% as presented in table 4.1 below was the best because it neither provided a larger size to cover nor a smaller size to provide inaccurate data.

Table 4:1 Sample Size

Village	Target population	Sample Size (30%)
Ogenya	532	160

4.3.2 Response Rate

Out of160 respondents selected for the interview, only 119 were able to provide answers to all questions. 100% response was therefore not achieved. 74.4% response rate was attained and according to Mugenda and Mugenda (1999), a response rate of 70% and over is excellent for an analysis. It therefore goes that the study registered an excellent response rate. This is presented in the table below.

Table 4.2: Reponses Rate

Questionnaires	Frequency	Percent (%)
Responded	119	74.4%
Non-response	41	25.6%
Distributed	**100**	**100.0**

Source: Researcher (2014)

4.3.3 Data Collection Instruments

Both primary and secondary data were collected from the field using various instruments. Primary data was collected by use of interviews and observations. Questionnaires provided both qualitative and quantitative data while interview guide provided qualitative data for in-depth understanding and verification of household findings.

Secondary data was obtained from existing records in health facilities of Ogenya Sub-location. The data obtained from the health facilities provided statistics of flood related morbidity. The health facilities did not give full data since morbidity in some years were not recorded. This data helped back up the data obtained from the household questionnaires and interviews.

4.3.3.1Observation

Observation focused on available properties destroyed by floods and the nature of destruction. Agricultural assets, houses and household goods were observed. Observed effects were in relation to the questionnaire therefore increasing validity through giving a better understanding of flood induced destructions.

Observation was recorded by use of photographs. Even though observation was undertaken in every household, only important destructions were photographed because almost all the households experienced destruction and not all destructions could be recorded due to limited space.

4.3.3.2 Questionnaire

The study used semi structured questionnaires administered by the researcher to collect both quantitative and qualitative data from the households.160 questionnaires were administered to household heads. Questionnaires were based on objectives of the study providing information on household flood induced effects, severity and frequency of flood, impact of floods on poverty indices and effectiveness of household flood coping strategies used in reducing flood induced effects. This information helped in assessing the impact of floods on household poverty in the study area. The semi-structured questionnaire allowed respondents give their own view of the situation under investigation.

4.3.3.3 Interviews

Key informant interviews and focused group discussion were used in the study. Key informant interviews are qualitative in-depth interviews with people who have knowledge on what is going on in the community. Key informant interviews were used to collect information from area elder, governmental and nongovernmental sectors. An interview with area elder provided information on the trends of floods, its effects and contributions to poverty in the study area. World vision and Red Cross were interviewed on the type of humanitarian assistance they provide to flood

victims and its significance in reducing flood induced effects in the area of study. Chief of the area provided information on floods and poverty. Ministry of agriculture was interviewed on effects floods on agricultural production in the study area. These interviews provided in-depth understanding of impact of flood on rural household poverty in lower Kano plains.

Focused group discussion was carried out to support household findings. The group consisted of six individuals who did not participate in the households interviews. Six male and female household heads and six youths were selected in the discussion group. Longford et.al (2002) recommends six to ten persons in focus group discussion while Morgan (1997) warns that a group with more than twelve members make it difficult to the moderator while a group with less than six members makes it difficult to sustain a discussion. The criterion used to select individuals was intended to represent relevant groups and gender in the population. Gender was used to help us understand whether male and female headed households had different opinions on floods and household poverty. The youths were selected to help in understanding flood induced effects they experienced and their contribution to rural household poverty. Focused group discussion gave in-depth understanding of floods and household poverty in Kano Plains.

4.3.4 Sampling procedure

Kano Plains is diverse and due to limited time and finances, the study could not cover the entire plains. Due to these limitations, Ogenya sub location which is the study area was purposively selected from the plains because it is the most affected by the floods.

Out of 531 households, 160 households were randomly selected to provide the required sample size. From each household, a household head was selected for interview.

These sampling techniques were used to get households that experience floods in the area because they had required knowledge for the study.

4.4. Data Processing and Analyses

The collected data was both quantitative and qualitative in nature. Data obtained from the field was entered in SPSS (statistical package for social science) and various statistical methods of analysis applied to test hypotheses and meet each objective of the study. To determine the frequency and duration of flood for the past 10 years, frequency table of flood duration and flood

frequency was generated. A chi-square was then tested on the hypothesis that stated 'there is no relationship between flood frequency and flood duration in Lower Kano Plains'.

To access the impact of floods on rural households poverty, household poverty indices were measured in terms of access to food and water, assess to education, access to housing, access to income, access to markets, and change in morbidity and mortality rates. The study assumed the impact of flood on rural household poverty could be evaluated by relating flood impacts and flood induced effects. Flood induced effects were measured in terms of losses of housing, food storage facilities, transport and communications infrastructure, livestock, crops and household goods and, human displacement, contamination of water supplies and increased prevalence of diseases. The study recognized that there were multiple poverty indices and this was accommodated in the analysis process by use of multiple response approach. A table of poverty indices and effects of flood was then generated using cross tabulation analysis and the results subjected to chi-square test of independence to test the hypothesis that stated 'there is no difference in flood induced effects and poverty indices in Kano Plains'. If the impact of floods and flood induced effects were independent statistically then flood induced effects do not cause household poverty in Kano Plains.

To determine the effectiveness of flood coping mechanisms, the study assumed that the effectiveness of coping mechanisms could be evaluated by measuring the relationships of the flood coping mechanism with the effects of floods on households. Because there were multiple coping mechanisms used by each household, a multiple response analysis process was applied to flood coping mechanisms and flood effects. A table was then generated using a cross tabulation analysis. A chi-square test was used where if the coping mechanisms and the effects of flood were independent statistically, then the coping mechanism used are not effective in reducing the effects of floods.

Chi-square formula

$$\Sigma = \frac{(O-E)^2}{E}$$

E=row total x column total/grand total

O=observed……

E=expected…….

All the chi-square were calculated at a significance level of 0.05

The study used qualitative analysis method to determine the nature of flood induced effects in the last ten years. The study assumed the nature of flood induced effects could be determined by evaluating the total destructions. Interviews with the area elder and chief also provided information for qualitative analysis on effects of floods.

CHAPTER FIVE

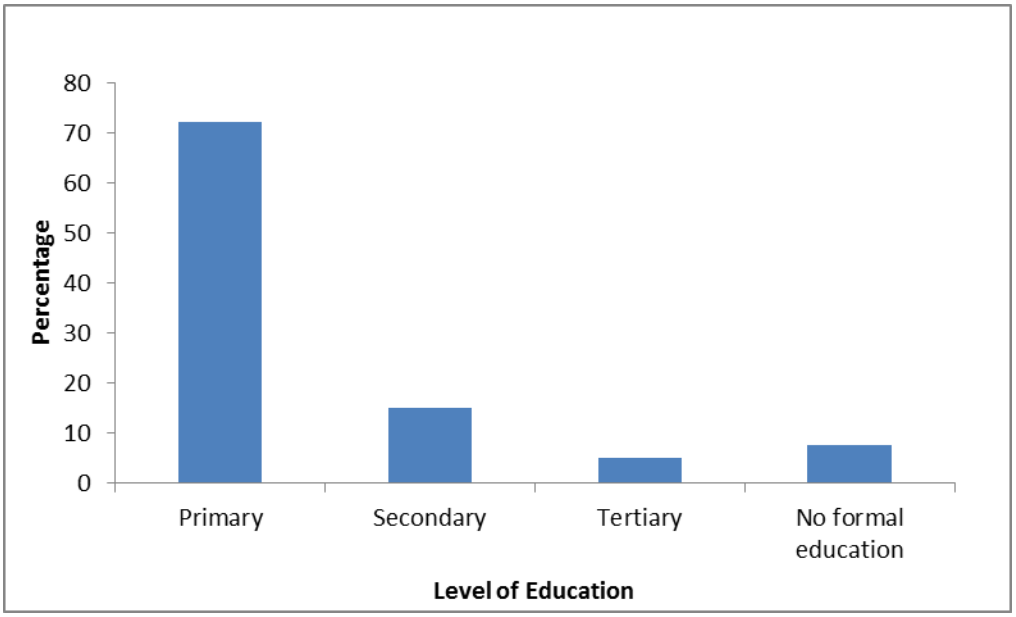
5.0. RESULTS AND DISCUSSIONS

This chapter presents the results and discusses the findings of the study.

5.1 Characteristics of the household sample

Figure 5.0 present the household head level of education

Fig 5.0 Household Heads Level of education



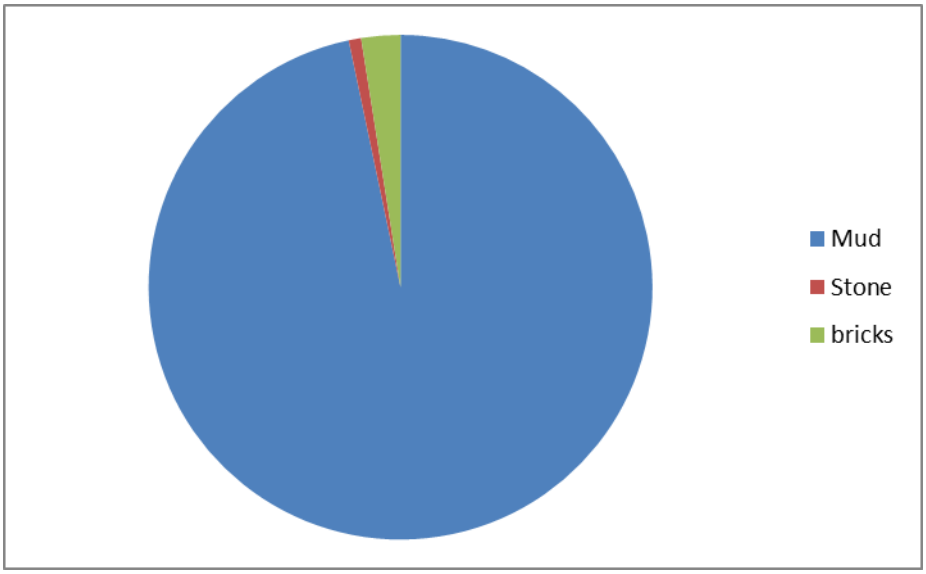
Education was used measurement of poverty in determining the impact of flood on household poverty hence it was important to indicate the household head level of education. The study revealed that the highest level of education among the household heads in Kano Plains is primary education which stands at 72.3% followed by secondary education at 15.1%. Tertiary level of education is the lowest which was recorded at 5%. Poverty can affect level of education and education level can also have an effect on sources of income. Those with formal education are likely to get formal employment hence do not have to entirely depend of primary production which are the most affected by floods.

Education can also have impact on coping mechanisms because those with formal employment as a result of education do not have to sell their properties to get immediate income. They use their employment salary to cater for their needs after floods induced losses. Their children do not

also drop out of school to help them earn income. Unlike households with low level of education that entirely depend on agricultural production for their livelihoods.

Figure 5.1: Type of housing (Walls)

Figure 5.1 below presents the type of housing in terms of materials used for wall construction.



Majority of households had mud walled housing (96.6. %). 2.5% of the households had brick-walled houses and only 0.8 % had stone walled house. Determining the type of housing was important in understanding whether destruction of the houses were determined by the materials used in construction. The findings indicated that mud, brick and stone walled houses are all destroyed by floods.

Plate 1: stone walled house destroyed by floods

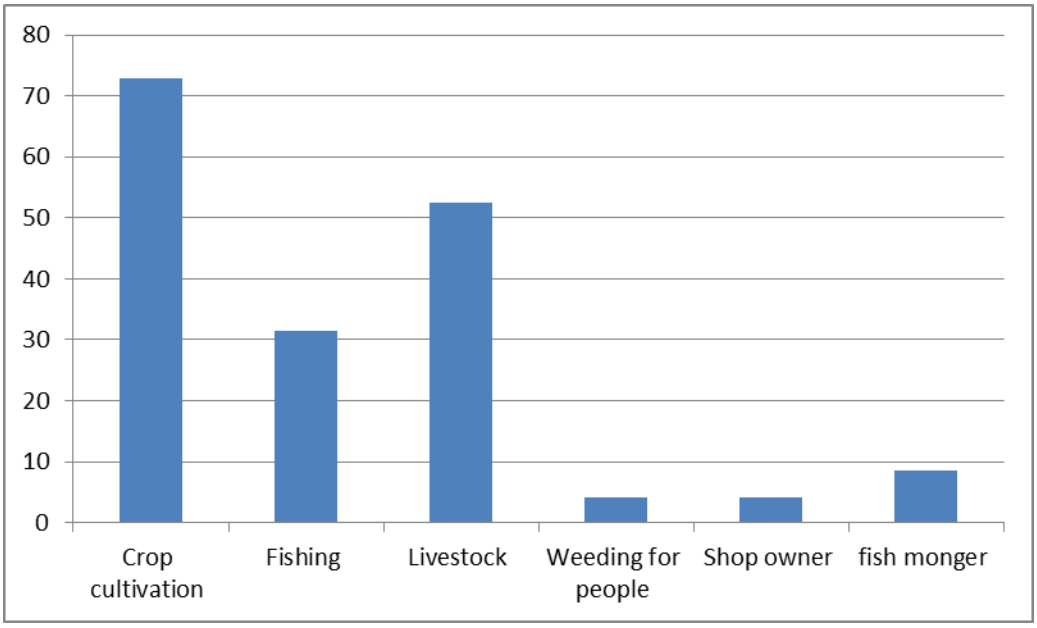
Source: researcher (2014)

Plate 2: Mud walled house destroyed by 2013 floods

Source: researcher (2014)

Figure 5.2 Main Sources of livelihood

Figure 5.2 below shows the main sources of household livelihoods



Based on the findings of the study, majority of the households 42 % depend on crop cultivation for their livelihoods. This is followed by 30.2% who keep livestock. Only 18% practice fishing, 2.4% weeding for people and 4.9% are fish mongers.

Sources of livelihood are important in determining flood induced poverty. Households that absolutely depend on agricultural production are more likely to face poverty after floods than those with formal employment. This is because during floods crops and arable land are the most destroyed and it takes longer time for their recovery from the destructions. Crop cultivation after floods becomes almost impossible because of destruction of farm land too.

Plate 3: Fishing as a source of livelihood

Source: Researcher (2014)

5.2 Frequency and duration of Floods between 2003-2013

Figure 5.3 and 5.4 show frequency and duration of floods respectively.

Figure 5.3: Frequency of floods 2003-2013.

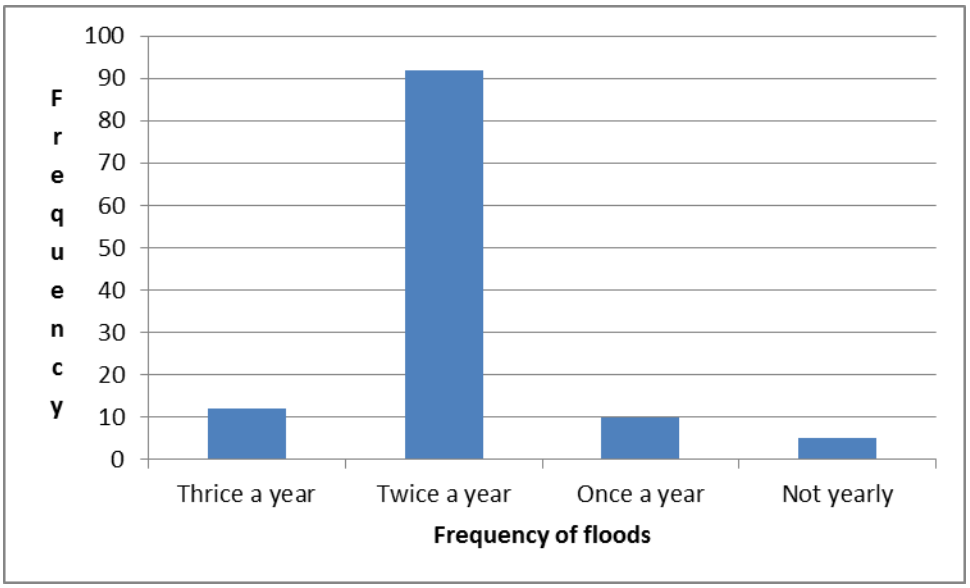
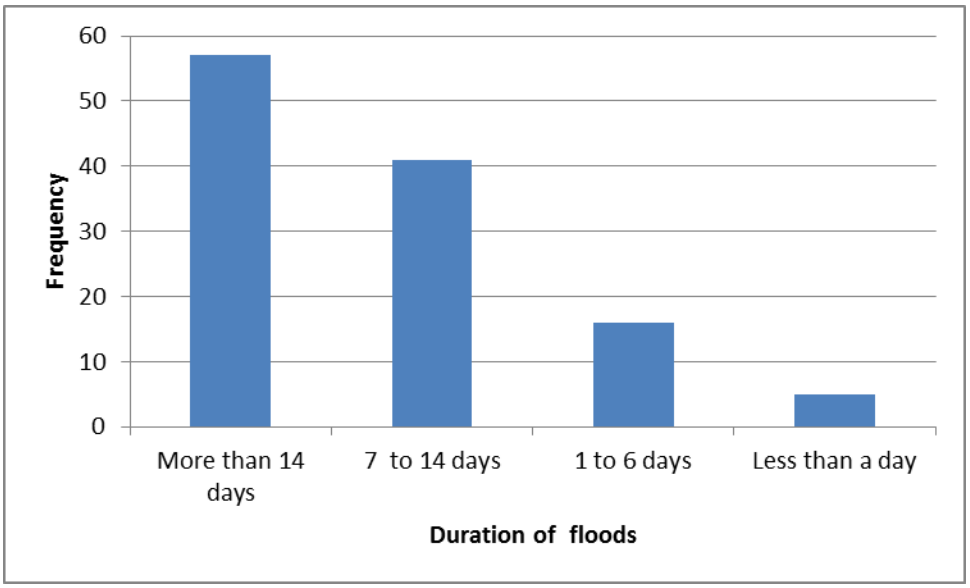


Figure 5.4: Duration of floods 2003-2013.



The figures show that flood events occurred mostly twice in a year and the floodwaters lasted at least 14 days after the events. Chi-square test results shown in tables 5.0, 5.1 and 5.2 did not provide enough evidence to reject the null hypothesis that, "there is no relationship between frequency and duration of floods" leading to the conclusion that frequency of flood events do not influence duration of floodwaters.

Table 5.0: Frequency of floods between 2003-2013.

Table 5.0 below shows test statistics for flood frequency 2003-2013

	Observed N	Expected N	Residual
Thrice a year	12	29.8	-17.8
Twice a year	92	29.8	62.3
Once a year	10	29.8	-19.8
Not yearly	5	29.8	-24.8
Total	119		

Source: Researcher (2014)

Table 5.1 Duration of floods between 2003-2013.

Table 5.1 below shows test statistics for flood duration 2003-2013

	Observed N	Expected N	Residual
More than 14 days	57	29.8	27.3
7to 14 days	41	29.8	11.3
1 to 6 days	16	29.8	-24.8
Less than a day	5	29.8	-13.8
Total	119		

Source: Researcher (2014)

Table 5.2 Test Statistics

	Frequency of floods	Duration of flood
Chi-Square(a)	174.546	56.160
Df	3	3
Asymp. Sig.	.000	.000

0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 29.8.

The duration of flood waters was probably influenced by location of the house or other asset from the river bank. For example evidence from data showed that households that live close to the river channel experienced floodwaters for at least 7 days while those who lived in raised areas experienced floodwaters for less than one day. Observations showed that type of soil, lack of floodwater drainage systems and settling in the valleys maybe other factors that influence floodwater duration.

5.3 Flood-Induced Effects on Rural households in Lower Kano Plains.

Table 5.3: Ever lost agricultural asset

Table 5.3 indicates whether the household have ever lost any time of agricultural assets

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	119	100.0	100.0	100.0

From the findings, 100% of the households in Lower Kano Plains had once lost one or more types of agricultural asset due to floods

Table 5.4: Type of agricultural asset lost as a result of floods

The table below shows the type of agricultural assets lost by the households due to floods.

	Fluencies		
	Yes	**No**	**Total**
Crops	**119**	**0**	**119**
Farmland	**119**	**0**	**119**
Livestock	**66**	**53**	**119**

Source: Researcher (2014)

Investigation of agricultural losses was important because agriculture is a major source of livelihood in the study area. Destruction of agricultural assets therefore means loss of sources of livelihoods and food insecurity resulting into poverty.

The study revealed that 100% of interviewed households have ever lost agricultural land and crops while 66% had lost livestock.

100% loss of agricultural land and crops indicates that damage of sources of livelihoods is very high in the study area. This is because crop cultivation is the major source of livelihood for the households in Kano Plains.

Agricultural lands are lost when occupied with flood waters rendering them useless. This inhibits the households from farming until their farms can dry. Period of loss of agricultural land is determined by the duration of flood. If flood waters take longer duration to recede, the households also take longer time before they can begin their farming activities.

Households that live closer to the river are the most affected. Their land stays under water for a longer period of time limiting their ability to cultivate. Households' interview showed that those who live very close to the river banks take months before the flood waters can recede from their farms.

Even after the floodwaters recede, most households cannot immediately start cultivating because the farms are often filled with mud rendering them useless at the time. Flood effects on agricultural land affect the households planting seasons resulting into food insecurity and loss of sources of income causing poverty in the long run.

Every year a number of livestock are lost. In a few occasion livestock such as calf and goats are drowned in floods. During flooding period, livestock lack food because grass is usually covered with water leading to inadequate food for the livestock. They also get infected with disease due to overcrowding at the evacuation centers and living cold conditions. After floods, the grass is usually infected with worms and due to lack of food, livestock feed on the worm infested grass. All these effects combined lead to the death of livestock. Most of the livestock die after floods due to flood related diseases.

Plate 4: Sugarcane plantation that was destroyed by 2013 floods

Source researcher (2014)

Plate 5: Agricultural land still covered with 2013 flood water

Source: Researcher (2014)

Table 5.5 Estimated number of households that experienced worst effects in a single year between 2008-2013

	Livestock		housing		crops	
YEAR OF FLOOD	Frequency	Percent	Frequency	Percent	Frequency	Percent
2013	21	31.8	50	47.6	66	55.5
2012	13	19.7	39	37.14	27	22.7
2011	11	16.7	4	3.8	11	9.2
2010	9	13.6	3	2.86	8	6.7
2008	8	12.1	2	1.90	5	4.2
2009	4	6.1	7	6.67	2	1.7
Total	66	100	105	100	119	100.0

Source: Researcher (2014)

Table 5.5 above indicates the worst years of destructions of crops and houses, and death of livestock incurred by the households. It indicates that flood induced losses of crops, livestock and houses increases yearly. The Livestock and crop losses show a continuous increase from the year 2010 to 2013.In 2009 there was a decrease in losses of crops and livestock as compared to 2008.The worst destructions of houses occurred 2013 47.6%), 2012 (37.14.%) and 2009 (6.67%).

The increasing trend of floods was confirmed from Plista Achieng a village elder who has lived in the area for eighty five years. She says since 2003 to date the biggest flood was in 2013.It caused death of people especially children, migration, destruction of properties, loss of livestock, farms and agricultural products. She said before the floods used to occupy only some parts of Ogenya sub location but these days it occupies the whole area.

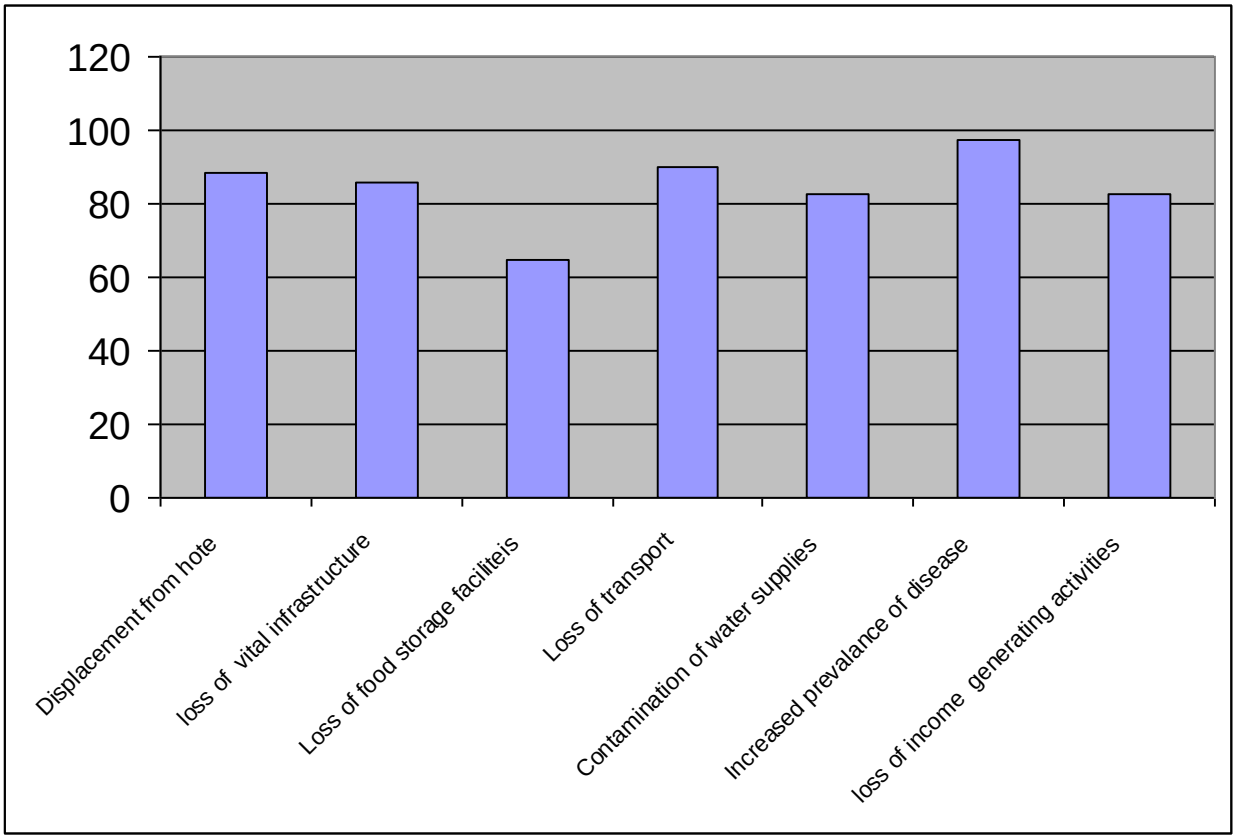
She gave the history of the flood in the area as have started in 1961 which started as rain and only filled rivers and gardens. In 1962 it caused migration of people and the government provided relief. The whole area was flooded with flood water rising faster .People migrated to

Kibogori, Ahero and Wirabuor.This flood had the highest death rate. People died of diseases, congestion at the evacuation centers and lack of food. She said there was no flooding until 1998 after which they have been experiencing floods to date.

From the household interviews, the study established an estimated cost of crops, live stock and houses losses between the year 2008 to 2013.An estimated coast of shillings 818,500 of livestock was recorded for only sixty six households that had lost their livestock as are a result of flood.997, 500 shillings was recorded for only seventy seven houses that were destroyed by floods and 1,005,000shilling worth of crops loss was recorded.

Figure 5.5: Flood induced effects incurred between 2003 to 2013

Figure 5.5 below show flood induced effects from 2003-2013 occurred by the households.



Source: Researcher (2014)

The study shows that from the year 2003 to 2013, 88.2% of the respondents had been displacement from their homes as a result of flood, 85.7% lost vital infrastructure such as toilets,64.7% lost food storage facilities and 89.9% lost transport and communication facilities.

The study further reveals that 82.4% experienced water contamination and 97.5% increased prevalence of diseases.82.4 % had lost their income generating activities.

Displacement from homes

People who were displaced from their homes moved to the evacuation center which was Ogenya primary school in the study area. People were displaced as a result of homes, or water logging of their houses making them very cold to stay in.The displaced households later moved back to their homes after floods. Those whose houses were completely destroyed by floods moved to the market centers to rent houses. This group could not move back to their homes because they did not have sufficient funds to build new homes or rebuild their homes. Some households moved to stay with their relatives who were not displaced.

Majority of those displaced from their homes were living in the lower part of the area while majority of those who were not displaced lived in the raised parts of the study area.

Plate 6: Ogenya primary school which is evacuation center for flood victims

Source: Researcher (2014)

Destruction of food storage facilities

Food storage facilities such as granaries are sometimes washed away by floods. Those affected are always forced to rebuild or get an alternative storage facility. Lack of or inadequate food storage facilities lead to exposure of crops in poor conditions hence causing their destructions. This can result in food insecurity in the future.

The households indicated that even though they lost their food storage facilities, it did not affect them a lot because they barely reap enough crops to store. Floods always destroy their crops before harvesting hence there was nothing or very little to store.

Plate 7: destroyed granary

Source: Researcher (2014)

Destruction of transport and communication infrastructure

Transport and communication is essential for the social and economic activities of the society. Loss of transport facilities means no or limited movement hence limited economic activities leading to reduced income.

Roads are usually covered by flood waters while most bridges are washed away leading to inaccessibility. Boats remain the only means of transport which only evacuates people to safer places.

Loss of transport also leads to limited access to the markets causing food insecurity. Food inaccessibility is also contributed by reduced access to income that also comes as a result of limited movements.

Inaccessibility of roads also limits accessibility to schools. Many children are forced to discontinue their education during floods because they cannot walk through the flood.

Contamination of water supplies

Water is an essential commodity for the functioning of households and also human body. Water contamination limits its use hence affecting essential needs such as cooking and drinking. Contaminated water also affected the health of the households increasing morbidity rates.

Households that experienced contamination of water supplies were those that used boreholes. Those who had hand water pumps were not affected because they are secured from contamination. Bore holes were affected when flood waters washed away human waste from the toilets and other waste substances and mixed with water from the boreholes. Those who move to the evacuation centers have access to clean water because there is hand water pump at the evacuation centre. After they move back to their homes they are forced to use contaminated water due to lack of clean water sources. This results into water borne diseases in the households.

Plate 8: Borehole water source that get contaminated during floods

Source: Researcher (2014)

Those who use pumped water do not suffer from water contamination during floods.

Plate 9: hand water pump

Source: Researcher (2014)

Increased prevalence of diseases

The study indicates 91.6% of the households had suffered from increased prevalence's of disease. From this study the diseases that affect people are malaria, cholera, fever and bilharzia, typhoid and diarrhea. Water logging provides a breeding ground for mosquitoes thereby increasing malaria prevalence. Cholera is caused by contamination of water supplies. Congestion at the evacuation centers also contributes to cholera outbreak. Bilharzia is caused by movement through the flood water. The exposure to cold conditions and poor environment causes fever especially among children.

Increased prevalence of disease is also caused by congestion at the evacuation centers. This lead to spread of diseases. Flood related morbidity data was collected from three hospitals in the study

area from the year 2011 to 2013.The data was from the months of April to May and August to September when flood related diseases are high. Not all hospitals provided all the records for all the months therefore the data provided is less than the actual flood related morbidity in the area.

Table 5.6 flood related morbidity data.

Table 5.6 shows flood related morbidity data in Ogenya sub-location

Flood related diseases	Number of patients recorded
Malaria	7,093
Diarrhea	1,182
Typhoid	1,041
Pneumonia	516
Snake bites	83
Dysentery	73
Bilharzia	5
Total	10,042

Source: medical records (2011-2013)

The results show that malaria is the highly recorded disease during flood period with the least recorded being bilharzias. Snake bite records did not include snake cases that were treated from home. Snake bites occur when people walk in flood waters. Pneumonia could be caused by cold conditions that occur during the floods. Poor cold sleeping places and lack of warm bedding at the evacuation centers could contribute to pneumonia infections. This could also result from cold conditions of the houses that result from water logging.

Loss of income generating activities

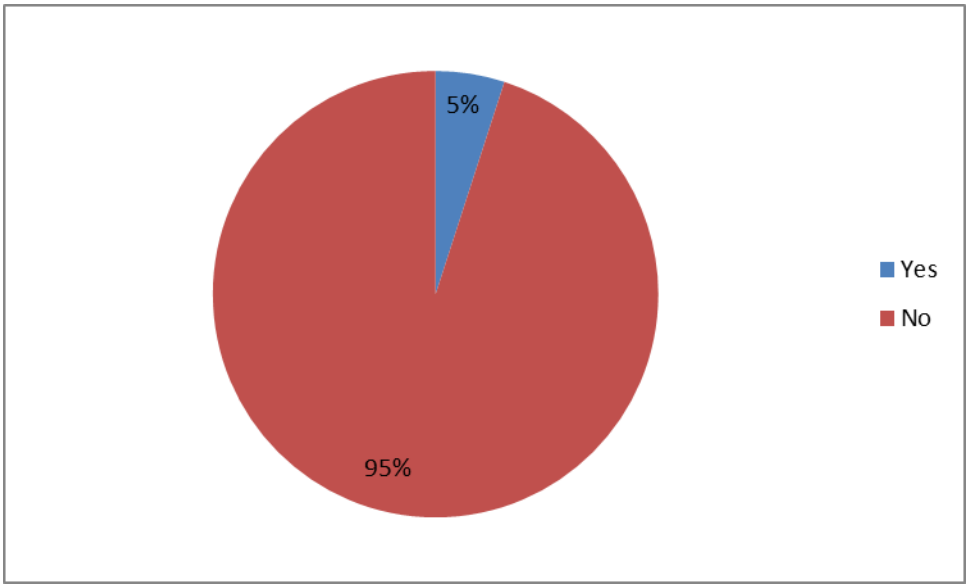
The study indicates that 88.2% had lost their income generating activities. Loss of income generating activities results from flood induced losses and destructions. Displacement form homes and loss of transport as a result of flood contributes to loss of income generating activities. Loss of income generating activities reduces access to income which in turn reduces the purchasing power.

Flood related mortality rates

Loss of family members as a result of flood

The study was interested in knowing the flood related mortality rate. The results are shown in figure 5.6 below

Figure 5.6 Loss of a family member as a result of flood



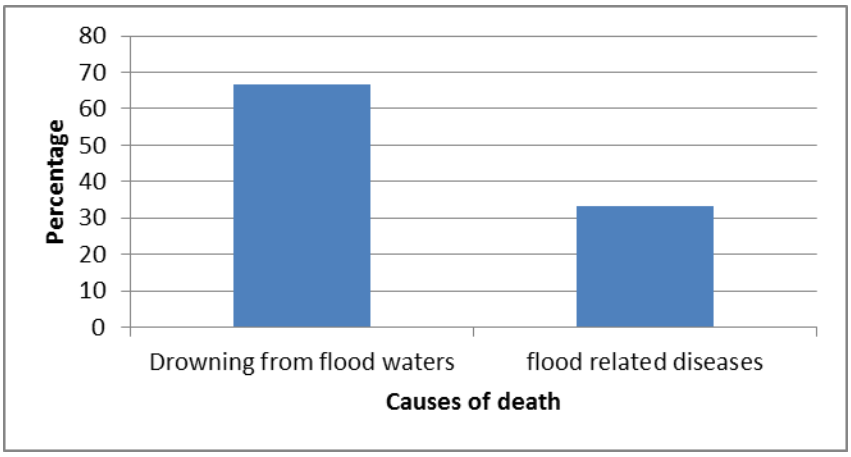
The results showed that only 5% of the households had lost their family members as a result of flood. This showed that the flood related mortality rates are low in the area. The low mortality rate was attributed to the drugs and other health assistances that were given by the governmental and nongovernmental organizations. Although morbidity rates were high, patients received treatments and recovered from various diseases reducing the chances of mortality. Treatments were given at the evacuation centers while those who were very sick were taken to the nearby health facilities. It was important to investigate flood related mortality rates because mortality influences poverty levels in a society especially if the family entirely depended on the deceased for income. If mortality rates are high poverty is likely to be on the rise.

From the findings those who died were under 18 and over 64 of age. With the most affected being under 18.Other age brackets were not affected because they were old enough to survive the floods. Age of the deceased was used to determine the age group that dies mostly from flood

related effects. Age group determines whether the deceased was a bread winner or not. The very young and old people may be dependent on other family members unlike the middle age that are more likely to be bread winners.

The results from figure 5.7 below shows that majority of flood related mortalities resulted from drowning (66.7%) while 33.3% died as a result of flood related diseases. The households interviews showed that those who drowned were children. Two were sick at the time of flood while one was epileptic resulting into their drowning. The other two children drowned while playing. The 33.3% died as a result of malaria.

Figure 5. 7 Flood-related cause of death



From the findings the major cause of death is droning which occur among children.

Table 5.7 Was the deceased a bread winner?

Table 5.7 below shows whether the deceased was a bread winner.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	6	5.0	100.0	100.0
Missing	System	113	95.0		
Total		119	100.0		

Source: Researcher (2014)

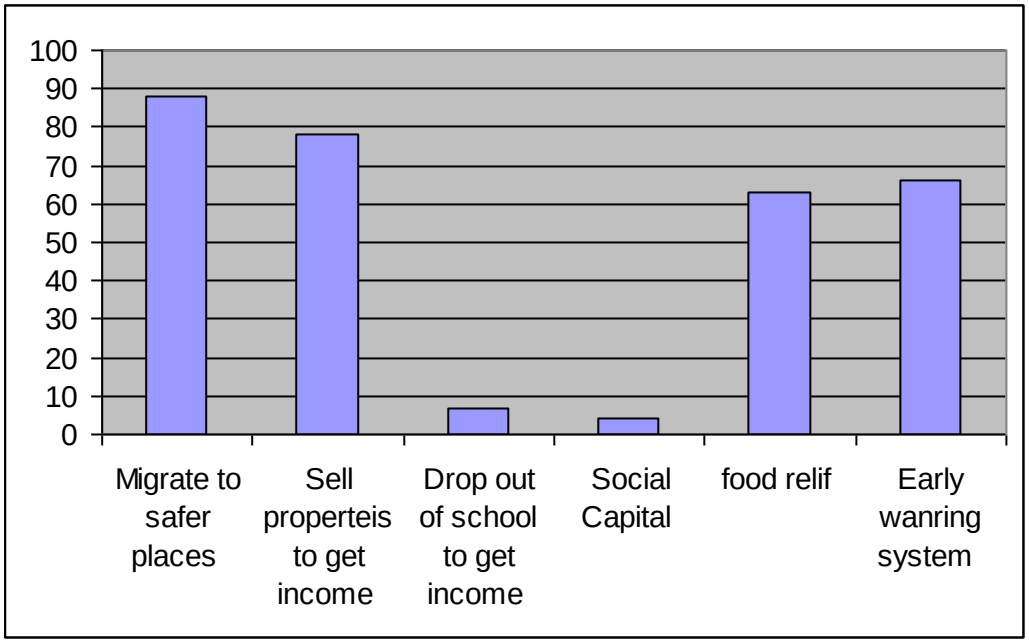
Effect of mortality rate on household poverty can be determined by whether the deceased was a bread winner or not. If the deceased was a bread winner then the household could be left without income source.

The study further revealed that none of the deceased was a breadwinner.100% of the interviewed households indicated that they did not depend on the deceased for their living. The study there reveals that flood related mortality rates in the area have no effect on household poverty

5.4 Flood coping mechanisms used by the households

Figure 5.8 Flood coping mechanisms used by the households in reducing the effects of flood

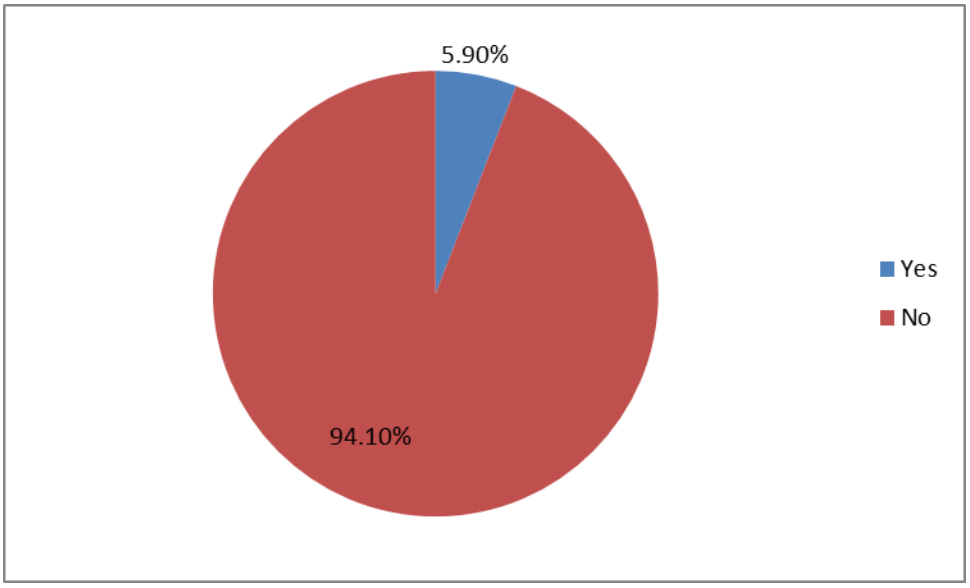
Figure 5.8 below show different flood coping mechanisms used by the households.



The study revealed that various coping mechanism are applied by the households. Migration to safer places was the most commonly used coping mechanism. (88.2%) showed that they migrate to safer places. (78.2%) sell their properties to earn income, (66.2%) receive early warning systems while (66%) indicated that they receive food relief. Drop out of school to earn income and social capital were the least applied coping strategies used by the households.

Figure 5.9 Effectiveness of coping mechanisms in reducing flood induced effects

Figure 5.9 shows whether the coping mechanism used were effective in reducing flood induced effects.



The household interview showed that majority (94.1%) did not find the coping mechanisms they use to be effective in reducing flood induced effects.

A chi-square test was then used to analyze the hypothesis that stated 'there is no difference in effects flood events flood and coping mechanisms used by the rural households. A cross tabulation analysis showed in table 5.8 was first carried out on flood induced effects and flood coping mechanisms. Then chi-square test was carried on the cross tabulated results. There was no adequate evidence to reject the null hypothesis.

Table 5.8 cross tabulated table of flood coping mechanisms and flood related effects

Flood coping mechanisms

Effects of floods	Migration to safer places	Sell of properties to earn income	School drop out to earn income	Social capital	Flood relief	Early warning systems
Displacement from homes	92	84	6	5	67	6
Loss of food storage facilities	69	60	6	4	48	69
Loss of transport	93	87	7	5	64	50
Contamination of water	87	77	8	4	62	72
Increased prevalence of diseases	92	103	7	6	74	74
Loss of income generating sources	85	78	6	4	64	76

Source: Researcher (2014)

A chi- square analysis was used to test the effectiveness of the coping mechanisms.

$$\Sigma = \frac{(O-E)^2}{E}$$

$$E=\frac{\text{Row total x Column total}}{\text{Grand total}}$$

$$df=(c-1)\,(r-1)$$

Calculated chi-square is 0.21 at 0.05 significance level. The critical value is 25.The results shows that there is no difference in effects of flood events and flood coping mechanisms used by the households in the study area. Therefore the flood coping mechanisms used by the households are not effective in reducing flood induced effects experienced by the rural households in Kano Plains.

Migration to safer places do not reduce flood induced effects it only help the households to be safe from flood waters. At the migration centers there are high spread of diseases due to congestion. They also suffer from food insecurity because they mainly depend on food aid, relatives and well-wishers for their food. In the study area majority of the households migrate to Ogenya primary school with few classrooms and toilets to support the displaced persons. Records from the school showed that in 2013 the total number of those who migrated were 710 .370 adults and 340 children of the age twelve years and below. Only five classrooms were used for accommodation for the population. There were seven latrines and one bathroom. There was only one kitchen to be used by the women. Because the classes are used by pupils during the day, the households are forced to spend the whole day outside until the classes are over. This exposed them to the cold condition outside.

Focused group discussion also revealed that there is a lot of immorality at the evacuation center. They said that men from different sub-location come and give women in the evacuation centre money and food in exchange of sex. Women sleep in separate class rooms from their husbands and most times men go back to look after their homes, at this time, women indulge in sexual activities with other men in exchange of food and money. Mr. Charles Director of Red Cross confirmed that they give condoms at the centers to prevent spread of sexually transmitted diseases.

After the floods majority of the households returned to their homes except for those whose houses were completely destroyed and do not have sufficient funds to immediately build new houses. These households related to market centers to rent houses. Unlike living in their homes, paying for houses strains their finances more especially after the flood losses

The research also indicate that majority of the population (78.2%) sold their properties to earn income even though it was not effective in reducing flood induced effects. Properties were sold to get income to enable the households recover from the losses. Still this was not effective because they sold their properties at a loss. The need for finances after floods is urgent and no one at the time can also afford to buy goods at a higher prices. The money only helps with immediate needs hence is not able to provide long term sustainability. Households are sometimes forced to sell their only valuable assets at a throw away price. This puts them at a risk of losing their assets leaving them in long time poverty.

Only (6.7%) of the households showed that their children dropped out of school to earn income and support the family due to flood induced losses and destructions of their income earning assets. Those who dropped were first affected by loss of roads hence inaccessibility to school. Staying out of school for a longer time pushed some into income generating activities like fishing and riding 'bodaboda'

Nelson Onyango Abuor Chief of the area confirms that majority of the pupils drop out of school and to fish. This follows the destruction of their properties hence the need to help the family.

Even though flood relief is provided by governmental and nongovernmental organizations, the results revealed that it was not effective in reducing flood induced effects. This was confirmed by the household interviews that indicated that food relief are insufficient and cannot meet their daily required food intake. Food relief is not given on a daily basis so it is not effective. The relief therefore does not solve the problem of food insecurity caused by floods. It is only short term solutions that do not even provide adequate food at the moment.

Early warning systems are effective in reducing flood induced effects by making people to safer places before the flood disaster. The households indicated that they receive flood early warning through their radios but they never put them to practice. They did not have trust on the flood early warnings. Sometimes the flood early warnings come true sometimes they never happen as broadcasted. They always wait to see if it happens.

Those who trusted the early warning systems, still never moved to safer places before the floods because they did not have a place to move to.

Table 5.9 Full recovery from effects of flood event before the next flood.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	119	100.0	100.0	100.0

Source: Researcher (2014)

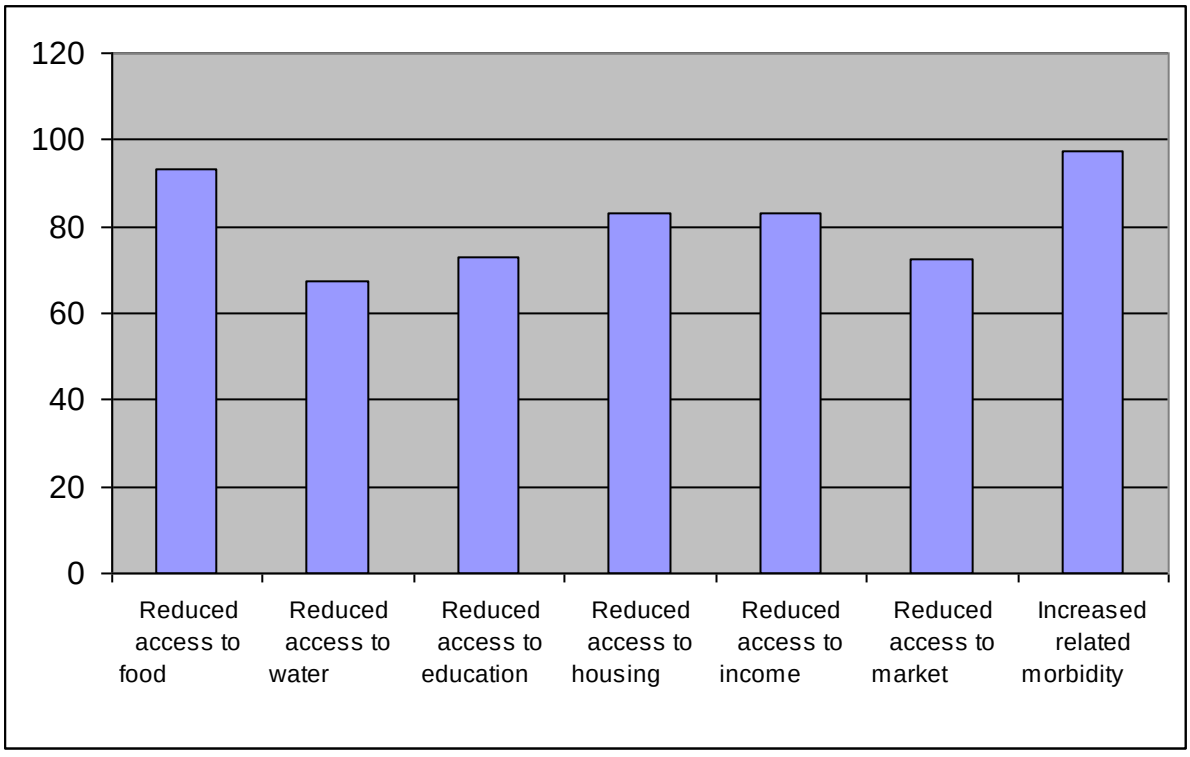
From the research findings, flood victims do not fully recover from the flood effects before the next flood. This is indicated by 100% of the respondents. This indicates that the victims are

always pushed back by flood effects therefore inhibiting their development. Floods are frequent and do not allow for recovery. As shown early, floods happen up to three times a year. This shows that floods are very frequent. The recovery period is short and even as they try to recovery, another flood hits before full recovery is made. Insufficient funds households also slow down or inhibits the recovery process in the households.

5.5 Impact of floods on rural household poverty

The study sought to establish the impact of floods on rural household poverty. A cross tabulation analysis provided a table [5.10] of flood effects and impact of flood on poverty indices. A chi-square test was used to test the hypothesis that stated 'there is no difference in the effect of floods events and impact of flood on poverty indices' at 95% confidence level.

Figure 5. 10 Impact of floods on rural household poverty in lower Kano Plains using selected poverty indices



Source: Researcher (2014)

Increased flood related morbidity rate was the most experienced 97.5% .Reduced access to food was also experienced by majority of the households 93.3%.Other poverty indices like reduced access to water, housing ,income and water were also highly experienced in Kano Plains.

Table 5.10 Cross tabulation of flood effects and impact of floods on poverty indices

Impacts of flood on poverty indices

Effects of effects on rural households	Reduced access to food	Reduced access to water	Reduced access to education	Reduced access to housing	Reduced access to income	Reduced access to markets	Increased related morbidity
displacement from homes	80	59	62	72	71	59	80
loss of food storage	75	51	62	68	65	58	75
loss of transport and communication	99	69	81	87	90	77	101
contamination of water supplies	92	65	71	84	78	68	92
increased prevalence of diseases	102	71	83	77	68	80	101
loss of income generating activities	80	70	78	90	92	86	68

Source: Researcher (2014)

The calculated value of chi-square is 199.23 while the critical value is 23.87.

From the chi-square test results, alternative hypothesis was adopted. Floods cause rural household poverty in Lower Kano Plains.

Access to food, water, housing, education, income and morbidity are some of the poverty indicators and inaccessibility to the stated poverty indicators by the households result to poverty. Reduced access to food results from destructions of crops and agricultural land and transport by floods. Crops are usually destroyed while still in the farm thereby limiting agricultural yields. Majority of the households indicated that they experience floods twice a year. The frequency of the floods means that majority of the households experience crop destructions almost twice a year. This is supported by the results from focused group discussion which indicated that floods wipe away all crops each year they cultivate. The floods destroy crops while still in the farms

and even those that are stored are sometimes destroyed. Mary Achieng claims that the last time she harvested was 2007 ever since, she has never harvested crops from her farm. Every year they cultivate the farms but floods destroyed all the crops. Regardless of the damages they keep on planting hopping that one day they will make a good harvest.

Reduced access to food is also caused by destruction of farms by flood waters. From focused group interview Siprose Atieno confirmed that flood waters stay in their farms for a long period of time, sometimes more than two month before receding. Those who have their farms close to rivers banks are the most affected because the flood waters take more time to recede. Some of the farms were still logged with 2013 December floods to date. Some households only cultivate small portion of land at their homes just for consumption which do not produce enough to feed the households.

Destructions of agricultural assets by floods cause food insecurity in the households because majority of them depend on their farms the major main source of food and income. After destructions of crops and farms, household get cereals from farmers from Kitale, Sirare, Busia and Nandi because they are unable to produce from their own crops. Most of the households cannot afford to purchase enough of the cereals due of lack of sufficient income as a result of flood induced losses.

Inaccessibility of the roads affects the accessibility to the market reducing the physical accessibility to food leading food insecurity. Lack of firewood that results from flood induced wet conditions affects food consumption in the households. Households are unable to cook because the fire woods are always wet during floods.

Loss of sources of income generating activities such as farming, fishing and selling of various commodities in the market reduces the accessibility to income. Reduced access to income puts a strain on the household's purchasing power. Some of the households are not able to meet their basic need resulting to household poverty. Reduced access to income also causes food insecurity in the households.

Reduced access to income also reduces the household's ability to fully recover from the flood destructions before the next flood. Because of this, most households are trapped in cyclic poverty.

Some households are not able to rebuild their houses because of insufficient income exposing them to poor living conditions.

Reduced access to income is also caused by loss of transport which leads to limited mobility. People are not able to move to their places of work because all the roads are always submerged by flood waters while bridges are washed away.

Increased morbidity rates also affect accessibility to income. People are not able to work because of various sicknesses that make them weak rendering them unproductive at the time.

Flood water comes with fish up to the door steps and everyone can easily get fish. At this time fishermen cannot earn income from fish because everyone can get access to it and they cannot also sell them to other towns due to inaccessible roads. The fish swept from the rivers die after few days due to poor environmental conditioned they are exposed to hence fishermen lose their sources of income after the floods because reduced fish catch.

Lack of income affects the households' purchasing power limiting their ability to move to the market. Reduced accessibility to market also affects income. People are not able to move to the market for various business activities resulting into reduced income in the households. Insufficient income in turn affects the poverty levels. Not only do the loss of infrastructure and income effect accessibility to markets but also loss of markets. Markets remain flooded for a period of time affecting the business activities.

Contamination of water supplies with floods reduces the accessibility to water. Water is contaminated when waste in pit latrines are washed away by floods waters boreholes and rivers.

Contamination of water supplies results into increased morbidity rates. Water borne diseases such as cholera and diarrhoea affect many household during floods. Contamination of water supplies causes diseases which affects man power resulting into reduced income hence poverty.

Morbidity rates during floods are also attributed to other factors such as congestion at the evacuation centers, exposure to cold, walking on flood water and snakebites. The evacuation centre is small to accommodate the number of displaced persons exposing the population into easy spread of diseases. Children are the most affected especially with coughs. Exposure to cold

conditions has caused pneumonia. Many people complained of suffering from foot infections and joint pain due to frequent walking in flood waters.

There are cases of snake bites reported during floods. Snake bites take place in flood waters during movements. There have not been cases of deaths resulting from the snake bites because victims always receive treatment either from the local doctors or from the hospitals.

Focused group discussions revealed that there is a high immorality rate at the evacuation centre. Men from different sub-location come and give women in the evacuation centre money and food in exchange of sex. Women sleep separately in class rooms from men. Most of the nights men go back to look after their homes, at this time, women indulge in sexual activities with other men. Interview from the area chief in 2013 confirmed the findings from the focused group interviews; the chief had to cut short the stay /camping of flood victims in Ogenya primary evacuation centre and Ombaka in Kakola sub-location due to immorality.

Increased flood related morbidity rates reduce the ability of the individuals to obtain their income and affects school attendance . Households are not able to carry out their income generating activities when they are sick. Children are also not able to go to school due to sicknesses hence affecting accessibility to education.

Accessibility to education is also affected by loss of infrastructure. From the households' interviews, it was confirmed that the older children walk to school but the young ones stay at home because they are not able to move through the flood waters. Those who moved to the evacuation centre were not affected because the evacuation centre is a school. Principal from Ogenya primary confirmed that even though the pupils are less affected by their attendance to school, their ability to concentrate in class is reduced. The school host flood victims hence destructions to the pupils.

Reduce accessibility to housing is caused by destruction of the houses and water logging in the houses making the victims to move from their homes to safer places. Flood victims are not able to stay in their home for weeks or months until the flood have reduced. Some stay in poor housing conditions because they are not able to fully repair their houses.Interview with the school head showed that the displaced persons were forced to leave classrooms at 6.am and

return at 6:30 pm. They spend most of their day outside in the cold. This is because the classes are used by the children during the day reducing the accessibility to housing.

Plate 10: A house completely destroyed by 2013 flood

Source: Researcher (2014)

All these effects of floods mentioned lead to rural households poverty. These are poverty indicators and most of the households suffer from them. With the frequency and duration of floods, the households remain in poverty for a longer period of time. Because floods occur yearly and residents are not able to recovery from the effects of past floods events before the next flood, they remain trapped in a cyclic poverty.

Table 5.11: Effect of floods on poverty levels

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Increase	119	100.0	100.0	100.0

To support the findings from the statistical analysis, the study asked the household to give their views on the effects of floods on the poverty levels in the study area. The results revealed that 100% stated that floods have increased poverty levels in the area.

Floods have increased poverty levels because of frequent destruction s by floods and inability to make full recovery from the flood effects. A lot of income is spent in recovery than in development. The households are forced to divert the little income they have to recover from the losses rather than to make progress. Sometimes they are forced to sell their assets at cheaper prices to meet their immediate needs. This pushes them into long term poverty. They never recover their assets after selling them.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.0 Introduction.

This chapter consists of summary, conclusions, and a recommendation derived from the findings of the study. The first section provides a summary of the major findings of the study with regards to the objectives of the study. Section two discusses the conclusions based on the findings of the study. The last section provides recommendations to government and for further studies.

6.1 Summary

The frequency of floods has been increasing over years in Kano plains and due to this factor, flood destructions have too been increasing. Annual destructions include agricultural assets, houses, infrastructure and income generating activities. More income is therefore diverted to recovery rather than development.

Agriculture is the major source of livelihoods for the rural households in Kano plains. Frequent destruction of crops and agricultural land do not only cause food insecurity but also reduces income in the households. Not only are destructions experienced but also loss of lives, spread of diseases and school drop outs. Although diseases are usually high during the flood period, flood victims always get medical attention hence very few deaths are recorded. School dropout is also limited but young pupil do stay for long at home before going to school until flood waters have reduced. Many people are also displaced from their homes and are forced to move to the evacuation centres or stay with the relatives.

Even though the households use different flood copping mechanism, the mechanisms are not effective in reducing the effects of floods. Selling of properties to get income put them into poverty because they sell their properties at cheaper prices to get income for immediate use and in long run, they are left with few or no asset to generate income. Migration to safer places also comes with problems like congestion, insufficient food and spread of diseases.

The households agree to receiving early warning systems but they are not effective because they never put them into practice. They complain of not having a place to move to before the floods and unreliability of the flood warnings.

Flood reduces accessibility to food, water, housing, education and income posing a strain on the households.100% of the population had experienced loss of crops and agricultural land exposing them to food insecurity.

6.2 Conclusion

Rural household poverty is prevalent in Lower Kano plains and flood has been considered to be the major cause. Due to frequent economic losses caused by floods, the residents are trapped in cyclic poverty with no escape route. The households cannot fully recover from the effects of floods due to limited income and frequent destructions. Instead, their development process is always pushed back each year.

Various Organisations have put in effort to reduce flood induced effects, despite their struggles, the households still remain in poverty. The assistance provided by the organisations is for short term benefit and cannot help in eradicating the long term flood induced effects.

The households suffer from flood impacts because little has been done to see them out of the situation. Every year the households migrate to evacuation centres with various organisations trying to curb the yearly problems at the centres like food insecurity and diseases. Why shouldn't a solution be provided to prevent the relocations? Food insecurity after flood event is as a result of destruction of crops by floods. Food relief are given to flood victims which are barely enough to feed them. A permanent solution to deal with flood induced food insecurity will be best option. Solutions to flood induced poverty are better than amendment of the loses

Flood events are part of nature and will continue to exist. We cannot prevent flood occurrences but we can control or prevent the vulnerability of the households to flood events. This can be divided in two ways; keeping floods away from people and keeping people away from floods. Keeping floods away from people has a long term benefit to the community but can also be a long term project because it involves technological investments that require more finances.

Before funds are put in place to keep the floods away, the households should not be left to suffer from the impacts of floods. They can be kept away from the flood induced effects. For many years different organizations have tried to keep the households away from floods but the households still suffer a lot from flood effects because they are relocated during flood events. Until effective floods risk management and flood preparedness are put in place, keeping the households away from floods will not positive effect on the households. This method will not prevent all the economic losses but will reduce community vulnerability to the flood risk.

Short term solutions are recommended as the government try to work on the permanent solutions of flood management. A permanent solution though expensive in terms of financial cost, it will be cheaper than the total cost of annual losses. .

6.3 Recommendations

Planners and policy makers seeking to reduce poverty in the Kano Plains should understand that flood is the major cause of poverty in the area and give a holistic approach to the solution.

Government

Flood forecasting models should be worked out, verified and early warnings responses made effective to the households. Response to flood early warning by the households requires government support. Assistance in relocating the households before floods will reduce the vulnerability to flood effects than relocating them during flood events when destructions are already taking place

The government should encourage the households to grow faster maturing crops before flood events by providing seeds. This will help minimize food insecurity after floods and loss of income source. Provision of alternative sources of income will prevent overreliance on agriculture which is the main cause of poverty after flood.

Government to provide better house construction materials that cannot be destroyed by the floods.

Flood water should be controlled through building of dykes, levees and construction of reservoirs. Construction of reservoirs is the most recommended flood control method because it will help the households in irrigation activities during the drought season.

6.4 Suggestions for further studies

i) The findings were gathered from a small sample, a replica study with large sample size should be undertaken.
ii) A study should be carried out to determine the impacts of drought on rural households poverty in the area.
iii) A study should be conducted on preventing floods induced poverty on the rural household.
iv) During the study, spread of Sexually transmitted diseases in the evacuation centers was a factor that was raised. A study should be conducted to validate this.

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APPENDICES

Appendix I: Questionnaire

My name is Belinda Atieno Omungu. I am a master's student at the University of Nairobi and am doing a study entitled "Impact of Flood Disasters on Household Poverty in the Kano Plains, Kisumu County". In order to make my study successful, I need your participation and support. Please, kindly answer the following questions as accurately as possible. Your individual responses will be treated with strict confidentiality and will be used only for purposes of this study.

PART I: GENERAL INFORMATION

1. Name:---------- TEL NO: ----------
2. Gender: Male [ ] Female [ ]
3. Age: under 18 [ ] 18-35 [ ] 36-49 [ ] 50-64[ ] Over 64 [ ]
4. What is your highest level of education? Primary[ ] secondary[ ] tertiary[ ]

No formal education [ ]

5. Number of wives: ---------- Number of children: ----------
6. Type of housing: Walls :Mud[ ] stone [ ] Bricks [ ] Timber[ ]

   other [ ]Specify ----------

Roofing: Grass [ ] iron sheet[ ] tiles [ ] other [ ] specify----------

7. When did you start living here?----------
8. What do you do for a living?

Crop cultivation [ ] Specify which crops ----------

Fishing [ ] specify where you fish (river,lake or pond) ----------

Livestock raising[ ] specify which breeds ----------

other [ ] specify----------

PART II: FREQUENCY, SEVERITY, AND MAGNITUDE OF FLOODS BETWEEN 2003-2013

1 How do you rate the following characteristics of flood for the past

10 years; very high=4, high=3, moderate=2, low=1

	4	3	2	1
frequency	Thrice a year	Twice a year	Once a year	Not yearly
duration	More than 14 days	7 to 14 days	1 to 6 days	Less than a day

PART III: FLOOD-INDUCED EFFECTS ON RESIDENT HOUSEHOLDS

Effects of Kano Floods

1. Have you ever lost agricultural assets as a result of floods?

Yes[ ] No[ ]

2. If yes, what kind of agricultural assets?

Crops [ ]

Livestock [ ]

Agricultural land [ ]

Others [ ] specify ----------

3. Between 2003 and 2013, what is the estimated highest quantity and monetary value loss you have incurred in a single flood?

Crops: Year of flood ----------Types ---------- Acreage --------- Value: ---------

Livestock: Year of flood ----------Types ---------- Number ---------- Value: --------

Houses: Year of flood ---------- Number ---------- Value: ---------

4. Apart from the losses mentioned in (3) above, what other effects have your community ever incurred due to floods between 2003 and 2013?

Displacement from home [ ]

Loss of vital infrastructures such as housing, [ ]

Loss of food storage [ ]

Loss of transport and communications [ ]

Contamination of water supplies [ ]

Increased prevalence of disease-carrying vectors and incidence of disease [ ]

Income generating activities [ ]

Local economy [ ] specify ----------

Other [ ] specify ----------

PART IV: FLOOD RELATED MORBIDITY AND MORTALITY

1. List diseases which are prevalent in the Kano Plains during flood periods ----------
   ---
   ---

2. Have you ever lost a family member as a result of flood?

   Yes [ ] No [ ]

   If yes, how many? ----------

3. What was the age of the diseased?

Under 18 [ ] 18-35 [ ] 36-49 [ ] 50-64[ ] Over 64 [ ]

What was flood-related cause of death above?

Drowning from flood waters [ ] Explain ----------

Flood-related diseases [ ] state disease ----------

Post-flood trauma [ ] Explain ----------

Others [ ] specify [ ] Specify ----------

4. Was the diseased a bread winner?

   Yes [ ] No [ ]

   If yes, what's your source of livelihood now? ……

PART V: IMPACTS OF FLOODS ON POVERTY (LINKING FLOOD DISASTERS AND POVERTY)

1. Between 2003 and 2013, how have flood events affected your household's access to following?

	Reduced access	No effect	Incread access	Give reason for your opion
Poverty indicators				
Access to food				
Access to water				
Access to health				
Access to education				
Access to housing				
Access to income				
Access to information				
Access to market				
Morbidity rates				
Mortality rates				

2. Overall, in your opinion, how have flood events affected poverty levels in your community? Give reasons for your answer. ----------

---

PART VI: FLOOD COPING MECHANISMS AND RESILIENCE (FIGHTING BACK POVERTY)

1. What mechanisms does your household use to cope with the flood events and their effects?

Migrate to safer places [ ]

Selling of properties to get income [ ]

Drop out of school to earn income [ ]

Social capital [ ]

Merry go-rounds [ ]

Flood relief from government/agencies [ ]

Early warning system [ ]

Others [ ] Specify ----------

2. Do you think the coping mechanisms you have been using have helped to reduce effects of floods?

Yes [ ] No [ ] Explain your answer ----------

---

3. Do you ever fully recover from effects of a flood event before the next flood?

Yes [ ] No [ ] Explain your answer ----------

---

4. If the answer in (3) above is yes, how long on average does it take to fully recover from the flood-induced losses? ----------

5. What do you think should be done to accelerate recovery from flood-induced losses? ---------

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END. THANK YOU FOR YOUR TIME

Appendix II: Interview Guide for Elders

1. Name of elder ---------- TEL NO. ----------

2. Since when have lived in this area? ----------

3. What has been the trend of the flooding in this area since 2003 to date?

Which year did you have the biggest flood?----------

How did this flood affect the local community?----------

---

4. How did the community cope with the floods in the past?----------
   ---

5. Overall how have flooding event in this area affected poverty levels?----------

6. In your opinion what should be done to mitigate or eliminate flood-induced poverty in this area?----------

Appendix III: Interview schedule for Humanitarian Agencies

1. Which year did you start providing aid to flood victims in this area?----------

   What kind of aid do you provide?----------

   Who are your target beneficiaries?----------

2. In your opinion, do you think aid could be used to address flood-induced poverty?

Explain ----------

3. In your opinion what could be the best approaches to addressing flood-induced poverty?

4. Any other comments on the link between flood events and poverty? ----------
   ----

Government administration.

Name----------Tel No----------

1. What is the government policy with respect to flooding in the Kano plains?----------
   ----

2. Does the existing government policy address issues of flood-induced poverty?----------
   ----

Explain----------

3. Has the existing policy towards flood induced poverty worked?----------

Explain----------

4. What policy direction will inform flood induced poverty in future?----------
   ---
   ---

5. Any other comments on the link between flood disasters and poverty?----------
   ---

Appendix IV: Focus Group Interviews

1. History of flood events 2003-2013
2. Effects (negative and positive) of floods
3. Impacts floods on poverty in the household
4. Methods used to address flood-induced poverty
5. Any other comments