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A COMPARATIVE STUDY OF RESILIENCE TO FLOOD DISASTERS: A CASE OF KANO IN KISUMU COUNTY AND BUDALANGI IN BUSIA COUNTY

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A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT FOR THE AWARD OF THE DEGREE OF MASTERS OF ARTS IN SOCIOLOGY (ADVANCED DISASTER MANAGEMENT) OF THE UNIVERSITY OF NAIROBI.

DECLARATION

I Sarah A. Otieno hereby declare that this proposal is my original work and has not been presented for a degree to any other University. All secondary sources of information have been fully and correctly acknowledged.

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(C50/62813/2010)

We confirm that the candidate under our supervision has carried out this project.

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DEDICATION

This project is dedicated to my parents, Mr. Jason Otieno and Mrs. Mary Otieno. This degree reflects their hard work just as much as it does mine. Without them I would not have been able to achieve this goal-thank you.

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Table of Contents

List of tables

List of figures

LIST OF ABBREVIATIONS AND ACRONYMS

ADB	African Development Bank
ADPC	Asian Disaster Preparedness Center
AFD	Agence Francaise de Development
ALRMP	Arid Lands Resource Management Project
ASAL	Arid and Semi Arid Land
CAP	Community Action Plan
CBS	Central Bureau of Statistics
CCP	Community Contingency Plan
CDF	Community Development Fund
CMDRR	Community Managed Disaster Risk Reduction
CORDAID	Catholic Organization for Relief and Development Aid
CRF	Community Response Fund
DFO	Dartmouth Flood Observatory
DRR	Disaster Risk Reduction
EWI	Early Warning Information
FAO	Food and Agriculture organization
FEMA	Federal Emergency Management Agency
FGDs	Focused Group Discussions
GDP	Gross Domestic Product
GoK	Government of Kenya
HFA	Hyogo Framework for Action
IPCC	Intergovernmental Panel on Climate Change
ICPAC	Intergovernmental Climate Prediction and Application Center
IRIN	Integrated Regional Information Networks
KII	Key Informant Interviews
KMD	Kenya Metrological Department
KRCS	Kenya Red Cross Society
MDRC	Multiface Development and Research Centre
NADIMA	National Policy on Disaster Management

NCDM	National Committee for Disaster Management
NGO	Non-Governmental Organization
NWC	National Water Cooperation
SAARC	South Asian Association for Regional Cooperation
SSA	Sub Saharan Africa
SHGs	Self Help Groups
UN	United Nations
UNICEF	United Nations Child Fund
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
UNISDR	United Nations International Strategy for Disaster Reduction
UNOCHA	United Nations Office for Coordination of Humanitarian Affairs
USD	United States Dollars
WHO	World Health Organization
WKCDD&FMP	Western Kenya Community Driven and Development Flood Mitigation Project
WMO	World Metrological Organization

ABSTRACT

This study discusses resilience to flood disaster in sub-locations in Kano: Ayweyo, Magina, Kochogo Central, Kochogo South, Kakola Ombaka, Kabonyo, Ahero Irrigation scheme and Kore and in sub-locations in Budalangi: Mudembi, Rwambwa, Budalangi, Siginga, Mundere, Magombe West, Rukala, Lugale and Mabinju. The two study areas have in the recent past experienced frequent flooding which negatively impact on main livelihood activities, which in this case is agriculture. The main objective of this research was to assess factors affecting flood resilience in Kano and Budalangi floodplains. To accomplish this, the specific objectives of the study were: To establish factors that contribute to communities' states of vulnerability to floods; to identify coping mechanisms employed by the communities; to analyze community managed disaster risk reduction systems in place and finally to identify gaps that exist between the phases of preparedness and mitigation on one hand, response and recovery on the other.

The sampling frame comprised of household population in Kano and Budalangi. Using a sample size of 152 and 154 households in Kano and Budalangi, stratified sampling was used to select representative samples with respect to each population size in each sub-location then simple random sampling was used to select households. The study used interview schedules, focused group discussions, key informant interview guides and direct observation. The study established that socio-economic factors such as gender, age, marital status, size of household, level of education, length of residency, sources of income and level of income contributed to states of vulnerability to flood disasters. The study revealed that factors such as type of shelter, acreage of land owned, number of health facilities, water supply and number of boreholes, electricity supply, communication and transport network in the study areas increased communities' vulnerability to flood disaster.

The study revealed that communities in the two study areas employed similar coping strategies, which were grouped into four categories: Economic, technological, social and cultural coping strategies. The study established that economic coping strategies employed were erosive in nature as they have negative long-term effects on households' livelihood sustainability and that social and cultural coping strategies were most effective. An analysis of Community Managed

Disaster Risk Reduction system in the two study areas revealed that both communities actively participated in activities that reduced flood risks.

The study also revealed that lack of financial and human resources, lack of advance warning inadequate data, lack of implementation of policies, short term disaster response were among gaps that existed in the phases of flood disaster management in Kano and Budalangi.

The findings of the study demonstrate that there is need for a comprehensive flood management policy and implementation of the disaster management policy on whole. The study makes a contribution to vulnerability and human adjustment theories, which state that households and communities are not only vulnerable to flooding due to, socio-economic, political and environmental factors but also due to the choices they make.

CHAPTER ONE: BACKGROUND OF THE STUDY AND STATEMENT OF THE PROBLEM

1.1 Background to the Study

Lately there has been a critical increment of floods all over the world, both in developed and developing nations due climate change. The recurrence, as well as the seriousness of floods has expanded to such a degree, particularly in developing nations, that 100-year floods are becoming yearly events (Alho et al., 2008; ISDR 2004; Klijn 2009; Shamaoma, Kerle and Alkema 2006; Wisner et al, 2004).

To date, floods are the most common hazards with the highest death toll. The long-term intermediate impact is affecting communities resulting to disease and starvation (Pilon 2004; Watts 2007; Wisner et al., 2004). Economic misfortunes because of floods are higher than other hazards (Pilon 2004; Wisner et al, 2004). Poor groups are more at risk because their livelihoods are vulnerable due to limited access to services and infrastructure (Garatwa and Bollin 2002; ISDR 2009b; Pilon 2004; Wisner et al., 2004).

It is along these lines that governments need to be more proactive in decreasing flood threat instead of being more reactive by offering post-catastrophe response and recovery (ISDR 2007; Pilon 2004). ISDR (2004, 2007) assert that the initial move towards a proactive model is to conduct a flood risk assessment to recognize the vital disaster reduction policies required to scale down the threat.

Studies demonstrate that floods are the most widely recognized natural hazards worldwide owing to the boundless topographical allocation of river plains and coastal zones (Van Oosterom, Zlatanova and Fendel, 2005). For instance, flooding was witnessed in USA after the 2005 hurricane Katrina which unleashed ubiquitous and immense havoc culminating in displacement of more than 250,000 individuals, loss of lives surpassing 1800 and overall damages/costs of about $ 125 billion, In China for instance, around 78,000 km range, which represents 7.8 % of the whole farmland, was influenced yearly throughout the period 1950-1990. Pakistan has seen vast flood damages in the Lai Nullah Basin flood in 2001, which

immersed Rawalpindi City, with loss of 74 lives, influencing around 400,000 individuals, and destroying 3,535 houses. Estimates demonstrate a loss of more than USD 0.25 billion to infrastructure.

In Fiji a great flood in 1993 brought on damages adding up to $ 100 million, 23 lives were lost, and more than 120,000 individuals suffered losses thereby, ruinously impacting the national GDP and the government's advancement strategies and programs. Assets reserved for capital improvement works were immediately diverted for help and recovery.

Kenya is no special case; rate of flooding occurs yearly in many parts of the nation for instance, between May 1997 and February 1998, Kenya experienced remarkable substantial precipitation because of El Nino culminating in human and animal fatalities, devastation of yields, and infrastructure prompting to significant national monetary misfortune (Wilson et al., 1999). This is reflected in on the table 1.1 below showing regions and flood victims from recent floods in Kenya.

Table1.1: Areas affected and the number of people affected by floods across Kenya

Year	**Region Affected (provinces)**	**Number of People Affected**	
		Displaced	**Fatalities**
2009	Nyanza (Kisumu town)	150 families	5
2008	Nyanza, North Eastern, Rift Valley, Coast	12,000	5
2007	Western, Nyanza	20,610	9
2006	Nyanza, Western, Coast and Eastern	723,000	66
2005	Western, Nyanza, Eastern, Northeastern	35,000 including 25,000 refugees in Daadab camp	20
2004	Widespread	2,500	50
2003	Western, Eastern	1,000,000	77
2002	Western, Nyanza, Eastern, Coastal	150,000	14
2001	Nairobi	Missing Data	4
1997-98	Widespread	1,5000.000	53

Source: Government of Kenya (2007); Dartmouth Flood Observatory (2009)

1.2 Statement of the Problem

Floods are starting to develop as the most predominant climatic disasters in Kenya, with the prevalence rates standing at 27% and affecting 5% of the population (GoK, 2007). Floods related fatalities constitute 60% of catastrophe casualties in Kenya (UNEP, 2009). Among the areas that experience floods every year are Budalangi, Kano, and parts of Nyanza such as Rachuonyo, Migori and also in Tana River District, Coast Province. Besides the evident loss of homesteads and the displacement of people and animals, floods also have other effects such as loss of crops, diseases outbreaks such as malaria, cholera and dysentery (Gadain *et al.,* 2006: 165). This result into further loss of lives, decreased livelihoods, decreased food security and increased poverty. In addition, the absence of a flood management policy in Kenya makes it difficult to adjust to the antagonistic impacts of floods. (Karanja et al., 2001 and Gadain et al., 2006) suggests this strategy hole in Kenya.

The country does not have organized institutional structures to relieve the negative effects of floods. Absence of advance flood warning leaves communities vulnerable, without lead-time in taking preventative measures. Without such strategy and enactment system, flood risk management in Kenya has remained to a great extent conflicting, awkward and receptive instead of adopting a more proactive strategy (GoK, 2007, Karanja et al., 2001). This was apparent amid the 1997/98 El Niño surges.

The western region of Kenya is one of the territories most influenced by floods. Rivers Nzoia and Nyando encounter enormous floods, affecting Budalangi and Kano plains respectively (which are the focus areas of this study). Flood hazards contribute to the existence of social insecurities and vulnerabilities of helplessness of poor women, children, elderly and persons with disabilities within the community as observed in both Kano and Budalangi areas (KRCS, 2012).

The Kenya Census 2009 indicated an increase in population in both Kano plains and Budalangi. According to KRCS, (2013) and Humanitarian News and Analysis (2013), the rapid increase of population in Kano and Budalangi has led to encroachment of flood plains, leading to massive deforestation, and exploitation of natural resources resulting to increased

community vulnerability to floods (WMO and GoK, 2004). Reports by KRCS, (2013) indicate a huge difference in relief distribution in the two areas. , Budalangi receives more relief than Kano plains since the population affected by floods in Budalangi is greater than that in Kano plains. This emerging difference, despite similar vulnerability, needs to be interrogated further.

On the other hand, it is also noted that, even in the event of free land allocation, the community in Budalangi flood plains has resisted to move to safer grounds (the allocated areas) hence, they continue to reside on their ancestral land, usually the flood prone areas (Oteng'i, 2003) whereas members of Kano flood plains have resettled in the safer grounds the allocated areas and are cultivating the flood prone areas. Could the resistance in Budalangi be attributed to the fact that the community values their ancestral land and is attached to these spaces (KRCS, 2013) or are there other factors that contribute to their resistance? How do such cultural practices play a significant role in their vulnerability on one hand and also result to their resilience to floods on the other hand?

This study focuses on the factors contributing to the persistent vulnerability to flooding in Kano Plains and Budalangi, and more important, to unpack the resilience of the community to withstand and live with floods.

1.3 Research Questions

The following research questions will guide the study:

1. What factors contribute to states of flood vulnerability?
2. What coping mechanisms does the community employ during floods?
3. What Community Managed Disaster Risk Reduction systems are in place?
4. What are the gaps that exist between the phases of preparedness and mitigation on one hand, response and recovery on the other?

1.4 Study Objectives

1.4.1 General Objective

The general objective of the study is to assess the factors affecting flood resilience in Kano Plains and Budalangi areas.

1.4.2 Specific objectives

1. To establish factors that contributes to states of flood vulnerability.
2. To identify coping mechanisms employed by the community during floods.
3. To analyze Community Managed Disaster Risk Reduction systems in place.
4. To identify the gaps that exists between the phases of preparedness and mitigation on one hand, response and recovery on the other.

1.5 Scope and Limitations

This study was carried out in Kano plains and Budalangi in Kisumu and Busia Counties respectively. The study established the factors that contribute to states of flood vulnerability by specifically looking at elements at risk, levels of exposure and levels of susceptibility. The study was restricted to identifying elements at risk located in floodplain areas such as; persons, family structure, economic activities, buildings (schools, churches, dispensaries), infrastructure (roads, bridges, communication network, electricity, water, drainage channels), farms located in the flood prone areas of Kano plains and Budalangi. As regards to exposure, the study looked at the location of various elements at risk, their proximity to the river, their closeness to inundation areas and flood characteristics like duration and erosion. On susceptibility, the study measured the impact of floods on individual elements at risk.

The study was also be limited to identify coping mechanisms employed by the communities during floods mechanisms which embraced general information on flood hazard occurring in and around the study community, threatening the livelihood of the population; such as structural and non- structural measures, physical and economic/material resources of the community such as human resources, skills and practice, productive resources, financial resources, location, infrastructure and buildings; technological/ structural strategies; social and organizational capacities such as relations among the local community, organizational abilities,

support mechanisms and social coherence, decision-making process and management capacity; social and organizational vulnerabilities such as lack of organizational abilities, support mechanisms and social coherence, decision-making processes and management capacity; motivations and attitudes such as community's beliefs and values, level of education and awareness, level of self- reliance and relief.

On Community Managed Disaster Risk Reduction (CMDRR), the study focused on; community capacity, contingency and development plans, resources. When identifying the phases of disaster management, on preparedness, the study was restricted to identifying levels of awareness such as (education of warning signs' strategies for protected and fruitful departure, medical aid measures, preparing, stockpiling crisis supplies), on mitigation the study focused on policy guidelines, availability of dykes), on response the study looked at emergency services such as: search and rescue, first aid, emergency medical assistance, provision of temporary shelter, food and water, on recovery the study was restricted to addressing actions that involve arrival of emergency teams, medical help, resources and facilities.

1.6 Definition of Terms

It is vital to be acquainted with and comprehend the terms and wording utilized as a part of disaster risk management in perspective of the way that this study shapes part of a progression of procedures towards the diminishment of hazard. The definitions and phrasing given by the International Strategy to Disaster Reduction (ISDR) are the most broadly utilized, however different definitions and wordings are additionally included for a more far reaching review. Specific accentuation will be put on common risks, as floods fall by this classification.

Capacity - Alludes to individual and aggregate qualities and assets that can be improved, prepared and got to, to permit people and groups to shape their future by decreasing disaster threats.

Disaster – Is a serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses that exceed the ability of the affected community or society to cope, using its own resources (ISDR 2009a).

Disaster Risk - The potential calamity misfortunes in lives, wellbeing status, occupations, resources and administrations, which could jump out at a specific group or a general public over some predetermined future era.

Disaster Risk Management – Is the deliberate procedure of utilizing managerial orders, associations, and operational aptitudes and abilities to actualize systems, strategies and enhanced adapting limits with a specific end goal to reduce the antagonistic effects of perils and the likelihood of calamity.

Disaster Risk Reduction - The idea and routine of diminishing fiasco chances through methodical endeavors to investigate and deal with the causal elements of fiascos, including through decreased introduction to perils, reduced helplessness of individuals and property, shrewd administration of land and the earth, and enhanced readiness for antagonistic occasions.

Early Warning- The arrangement of limits expected to create and scatter auspicious and important cautioning data to empower people, groups and associations undermined by a peril to get ready and to act fittingly and so as to decrease the likelihood of damage or misfortune.

Flood – Is a general and brief state of halfway or finish immersion of at least two sections of land of ordinarily dry land zone or of at least two properties from flood of inland or tidal waters, uncommon or quick aggregation or spillover of surface waters from any source or mudflow; or crumple or subsidence of land along shore of a lake or comparative waterway as an aftereffect of disintegration or undermining brought about by waves or streams of water surpassing foreseen repeating levels that outcome in a surge.

Flood prone areas - The regions along a waterway inclined to flooding and can be separated into various zones, specifically the floodplain and floodway. No advancement ought to occur in the floodway and just basic foundation, for example, scaffolds ought to be permitted inside (ISDR 2004; Wright 2008).

Hazard – A risk is characterized by the ISDR (2009a: 17) as a hazardous wonder, substance, human movement or condition that may bring about death toll, harm or other wellbeing impacts, property harm, loss of vocations and administrations, social and financial interruption, or ecological harm.

Mitigation- The reducing or constraint of the antagonistic effects of risks and related fiascos (UNISDR, 2007)

Preparedness – The learning and limits created by governments, proficient reaction and recuperation associations, groups and people to successfully expect, react to, and recoup from, the effects of likely, unavoidable or current risk occasions or conditions (UNISDR, 2007)

Recovery – alludes to the rebuilding, and change where proper, of offices, vocations and living states of debacle influenced groups, including endeavors to diminish calamity chance variables. (UNISDR, 2007)

Resilience – Is the limit of a framework to bear any annoyance, for example, surges, keep up noteworthy levels of effectiveness in its social, practical, natural and physical part.

Response – alludes to the arrangement of crisis administrations and open help amid or promptly after a fiasco, with a specific end goal to spare lives, decreases wellbeing impacts guarantee open security and meet the essential subsistence needs of the general population influenced (UNISDR, 2009).

Risk – hazard is the likelihood that destructive outcomes or misfortune can happen because of connections amongst normal and anthropogenically actuated dangers (ISDR 2010a). Hazard can likewise be characterized as an element of risk, powerlessness and adapting limit (Baas et al. 2008; Botha & Louw 2004; Boudreau 2009; Hossini 2008)

Vulnerability – Is the potential for misfortune and includes a blend of elements that decide how much a man's life or job is put at hazard by a specific occasion (Burton and Cutter, 2008).

1.7 Organization of the Study

The study has five chapters. Chapter one the introduction has subheadings; background to the study, problem statement, purpose and objectives of the study, research questions, significance, and definition of terms. Chapter two is the literature review. This chapter reviewed flood hazard, types of floods, floods and its impacts on the community, flood menace globally and its impacts in Kenya, vulnerability, coping strategies, disaster management phases and community managed disaster risk reduction. A theoretical framework and conceptual framework appear at the end of this chapter. Chapter three presents the research design, the sampling procedure and sample size determination, research instruments, data collection procedure and analysis and operationalization of study variables. Chapter four presents the data analysis, interpretation, and presentation of the findings. Chapter five presents the summary of the results, the discussions of the findings, conclusions and recommendations of the study.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter consists of review of related literature used to support the discussion of the study. It elaborates the definitions of flood hazard, flood menace globally, flood disasters and its impacts in Kenya, coping mechanisms, community management in disaster risk reduction and disaster management phases, conceptual framework and theories explaining flooding. We begin the discussion with a description of what flood hazard is.

2.2 Flood Hazard

Usually, ordinary floods are likely to happen and are normally received in numerous parts of the world as they supply rich soil, water and a mode for transport, yet flooding at a sudden scale and with exceptional recurrence causes harm to life, loss of livelihoods and destruction of the environment. Over the previous decades, the series of floods has been changing all over the world, turning out to be more regular, extreme and eccentric for societies, especially as issues of improvement and neediness have driven more individuals to live in zones exposed to flooding (IPCC, 2007).

In sub Saharan Africa (SSA), floods standout as the most serious climatic incidents that antagonistically influence the society and by expansion the family units. The climatic incidents regularly have serious financial effects, for example, lack of food, water, and other fundamental essential items, and additionally long prolonged food insecurity (IPPC, 2001). In this locale, human powerlessness to floods is high because of high neediness levels, high populous development rates, and inadequate influence on the importance of wetlands and politically prompted wiles and impedance (IPPC, 2001). Studies demonstrate that flood risks in less developed countries can successfully wipe out many years of ventures and foundation, truly devastating monetary advance, subsequently bringing about spread of pestilences, mortality and deprivation. Dominant mortality connected with flood incidents occur in the midst of the most helpless population of the general public, who are; the elderly individuals, ladies, youngsters and incapacitated people (WMO, 2005).

2.3 Flood Menace Globally

Developed nations have not been saved either by flood fiasco. In Netherlands for instance, floods brought about ruin and made decimation the instruction segment and farming area in 18thNovember 1421, when water from the North Sea cleared through 72 towns and executed 10,000 individuals youngsters comprehensive (Dennison and Keim, 2009). While the most initial record of floods in London dated 1099, is found in the Anglo-Saxon Chronicle in which the ocean floods sprang up to an abnormal state and did monstrous annihilation (Bodmin, 2005) as of late in 2008 Koshi River in Nepal broke its dikes and wreaked ruin in eight Village Development Centers of Sunari (Dennison and Keim, 2009). This specific disaster influenced 67schools of the areas. Walls of 15 schools collapsed causing damage to the school furniture and facilities. After the displacement of the flood-hit people, 23 thousand School going students were deprived of education.

One of the most exceedingly terrible floods experienced in the most recent century happened in mid 1970s in Bangladesh where more than 250,000people suffocated and 52,000 square kilometers of region of the nation was covered by water (UNDP and ADPC, 2002). In Bihar in India, there is no evidence that all the thousands of school-age children who lost their villages went back to school. Up to 40 per cent of the children could have dropped out of school (IRIN News, 2005). Floods and droughts frequently affect Cambodia, in Southern Asia. A total of 1, 866 schools, which form 21 percent of the schools, are located in flood prone areas. The schools normally close for up to one and half months following floods (UNDP and ADPC, 2002).

2.4 Flood Disaster and Its Impact in Kenya

In Kenya, floods mostly affect North Eastern, Western, Nyanza Provinces and Tana River Districts. Several areas in Nyando District like Kano Plains, Lower Nyakach, Parts of Kisumu, Lower Rachuonyo, Homabay and parts of Migori Districts in Nyanza Province (UNICEF, 2009a). Even though the Education sector consumes about 30 percent of public expenditure to retain children in learning centers, still 1.8 million children are out of school as a result of flood menace. In 2008 Kenya Red Cross Society reported that the El Nino caused severe floods in North Eastern Kenya that refugee camps were turned into islands (KRCS, 2008). A

study by Western Region Christian Community Services (2003) also revealed that flooding in Budalangi posed a lot of financial strain to the nation and especially on development of school infrastructure. From this havoc it was estimated that about 750 people were still living in camps due to floods brought about by heavy rainfall the previous year. The onset of long rains in October 2009 was reported to have displaced more than 400 families in Coast Province (The Standard Team, 2009 October 30th). Several areas in Nyando District like Kano Plains, Lower Nyakach, Parts of Kisumu, Lower Rachuonyo, Homabay and parts of Migori Districts in Nyanza Province have been noted to suffer the effects of floods every year. In Migori for instance, 3 people were killed and 80 families moved to higher grounds in 2005. At that moment usable toilets were limited and health facilities were unreachable causing learners to suffer illnesses, hence unable to attend school even after schools resumed learning. In Kisumu, floods displaced 453 people, 550 children reported to be at risk of suffering from malaria and waterborne diseases (KRCS, 2005).

The impacts have severe socio-economic and political implications. Some of these impacts include the following:

(a) Economic Impacts
(b) Public health and sanitation
(c) Infrastructure damage
(d) Loss of livelihoods
(e) Agricultural losses
(f) Environmental degradation

2.5 Vulnerability

Given the recognition that vulnerability is relevant across various outcomes and levels, a general definition sees vulnerability as the risk that a "system", such as a household, region or country, would be negatively affected by "specific perturbations that impinge on the system" or to the probability of a "system" undergoing a negative change due to a perturbation (Gallopin, 2006:294).

2.5.1 Factors that contribute to vulnerability

Numerous elements contribute to vulnerability. These factors act to undermine capacity for self- protection, blocks or diminish access to social protection, delays or complicate recovery or expose some groups to greater or more frequent hazards than other groups. They include rapid population growth, poverty and hunger, poor health, low levels of education, gender inequality, fragile and hazardous locations, and lack of access to resources and services, including knowledge and technological means, disintegration of social patterns (social vulnerability). Other causes include; lack of access to information and knowledge, lack of public awareness, limited access to political power and representation (political vulnerability) (Aysan, 1993).

2.5.1.1 Flood vulnerability in Kano and Budalangi

Floodplains in western Kenya are bound to attract large populations in future given their multiple benefits and population pressure. Western Kenya is high populated and a sudden rise of the number of people inhabiting floodplains would increase those that becoming vulnerable to floods due to overcrowding in the risky areas. Considering the land carrying capacity, the growth of rural population and poor state of existing infrastructure, future development planning must focus on various strategies cutting across key economic sectors and forms of livelihoods in the region (WMO and GoK 2004). WMO (2004) depicts three major anthropogenic factors that contribute to increased flood disaster in the Nyando river basin.

1. Intensive financial utilization of the surge fields for agribusiness and animals cultivating because of populace weight.
2. Deteriorating framework has come about to absence of orderly and routine upkeep of dykes' causes' disintegration of banks, bringing about breaks of dykes.
3. Uncontrolled and unregulated human movement, particularly extensive scale deforestation and development causes ecological debasement, for example, expanded surge top release, diminishment of surge conveying limit of the waterways because of siltation, and moving of stream courses have come about to natural corruption.

Mukana (2013), states that factors that contribute to vulnerability in Budalangi include:

1. Population weight, both upstream and downstream.

2. Environmental corruption, which incorporates silting in the riverbed and winds.
3. Infrastructure improvement, especially the dykes that were built somewhere around 1961 and 1982 from earth works. Their life expectancy has passed and they can no longer withstand the solid streams from River Nzoia.
4. Silt stacking in the waterway.
5. Communities in the surge plain are not taking an interest in mediations that are set up for surge control.
6. Geographical morphology of Budalangi in that it is found at the mouth of River Nzoia, which is swamp.

2.6 Coping Mechanisms to Flooding

In connection to flood hazards, coping is the way in which individuals and associations act, utilizing existing assets inside a scope of desires of a circumstance to accomplish different closures (Blaike, et al., 1994). Douglas (1985), (as referred to in Blaike, et al., 1994), when individuals know an event may happen later on, they regularly set up methods for adapting to it. Twigg (2004) groups the ways of dealing with stress into four general classifications:

(a) Economic/material: This includes economic diversification such as having more than one source of income, even having large families can be seen as part of economic coping strategy because it give household additional labor; saving and credit schemes are often an important component of coping strategies.

(b) Technological: This coping strategy includes modification to the physical and built environment. It focuses on the way the housing is adapted to repeated floods. Common adaptation include building houses in silts so that flood water can pass underneath, building them on plinth or platforms of mud or concrete so that they can remain above sea levels, and building escape areas under or on top of roofs.

(c) Social/Organizational: This adapting methodology is identified with the advancement of informal communities. It involves the capacity to approach the assets. Systems can be inside the family unit between more distant family individuals (living close or far), inside

neighborhoods and with more extensive gatherings that have a common personality. Help can come in numerous structures, for example, budgetary help, passionate support, and safe house in critical moment or physical help of any sort

(d) Cultural adapting methodology incorporates hazard recognitions and religious perspectives, which are as often as possible associated.

2.6.1. Factors that Influence Coping Mechanisms

Twigg (2004) explains that the choice of skills and resources to be applied varies according to the nature of the hazard threat, the capacities available to deal with it, and to a variety of community and individual priorities that can change during the course of disaster. According to Blaikie *et al.,* (1994), the resources the people have, which can be tangible or intangible and the magnitude of flooding that the community has to cope with, influence a community's coping mechanism. Tangible resources include those assets that have value when sold and people can mobilize these resources to cope or build the losses while intangible resources are those assets with no physical existence, this focus on social structure and people's well being (Blaikie *et al.,* 1994; Haque, 1997). A study on coping on erosion in Bangladesh by Haque (1997), found that socio-economic structural components of the community influence the type of copying measure of the community. Some socio-economic indicators such as households' income, household size and its occupational type like the laborers engage in pottering and services workers engage in rendering services in restaurants were used to access socio-economic structures of the society.

2.7 Disaster Management Phases

Disaster risk management aims to avoid, lessen the adverse effects of hazards through activities and measures for prevention, mitigation and preparedness (UNISDR, 2004). This can be done through flood proofing which include any effort a property owner may take to reduce flood damages. Some flood proofing techniques include:

2.7.1 Elevation

This strategy lifts a structure with the goal that floodwaters are more averse to bring about harm. These measures endeavor to re-coordinate surge water far from building and incorporate measures, for example, raising ground levels. It is a powerful perpetual surge sealing method when disintegration is not a worry.

2.7.2 Relocation

This is a surge sealing other option to height that is likewise basic in beach front ranges. In this method, the building might be moved to either another area less undermined by flooding on the current property or to another site. Migration will rely on upon: accessibility of another area, financial aspects, government state and neighborhood controls, the building auxiliary soundness, and whether there are extensions or different impediments, for example, electrical cables, along the proposed transportation course.

2.7.3 Demolition

Sometimes, annihilation of the structure might be a sensible course. In many zones, expulsion of garbage taking after destruction is required to maintain a strategic distance from the dangers skimming trash can bring about.

2.7.4 Other methods

Contractual workers experienced in surge sealing have created intriguing innovations to finish height ventures. For instance, a technique for rakish heap driving may take out the need to briefly move a structure to be lifted amid heap situation. A contractual worker can utilize inflatable packs to lift structures being hoisted in territories where site conditions confine the position of lifting bars under the home.

The response phase incorporates the assembly of the essential emergency services and first responders in the disaster area (Twigg, 2004). This is probably going to incorporate a first group of emergency services, for example, firefighters, police, volunteers and NGOs

Recovery stage is to reestablish the influenced region to its past state. It varies from the reaction stage in its concentration; recuperation endeavors are worried with issues and choices

that must be made after prompt needs are tended to. Recuperation endeavors are basically worried with activities that include modifying crushed property, re-business, and the repair of other basic foundation. An imperative part of viable recuperation endeavors is "exploiting the open door" for the usage of mitigative measures that may some way or another be disagreeable. Residents of the influenced region will probably acknowledge more mitigative changes when a late calamity is in new memory.

Rehabilitation stage is a period when individuals start to come back to work, repair infrastructure, damaged structures and basic necessities important to help the group to bounce back to normalcy.

Table 2.1 below demonstrates the sum of money spent on damages and alleviation arrangement in Kano Plains and Budalangi as a consequence of enduring flooding on Rivers Nyando and Nzoia separately every year. Crises help operations cost the administration an expected Kshs 100 million every year.

Table 2.1: Annual government spending on flood relief and rehabilitation

Catchments	**Affected**		**Costs in millions (Kshs)**	
	Floodplains	**Victims**	**Damages**	**Relief and Rehabilitation**
Nzoia	Budalangi	12,000	46	63
Nyando	Kano	5,000	49	37
Total		**17,000**	**95**	**100**

Source: WMO and GoK (2004)

The Kenya Red Cross Society (KRCS) participates in asset assembly to encourage crisis alleviation operations through making surge advances. Taking after the October-November 2006 surge catastrophe, a surge advance for over a large portion of a billion Kenya Shillings was made to help 300,000 surge casualties over a time of three months. KRCS through its Western Region Office assumed an urgent part in the coordination and strategic support to the administration and other helpful alleviation laborers. This included transportation and conveyance of depended things (nourishment and water and non sustenance things, for example, medicinal supplies, apparel and mosquito nets) gave by the administration, giver

offices, private segment associations and well wishers. Table 2.2 compresses the quantity of alleviation recipients in Budalangi and Kano fields taking after the 2006 flooding.

Table 2.2: Relief beneficiaries in Kano and Budalangi during the 2006 floods

Catchment	Affected			Relief Beneficiaries	
	Districts	**Population affected**	**Displaced**	**Persons**	**Households**
Nzoia	Budalangi	15,888	2,648	13,560	2,260
Nyando	Kano	6,720	1,120	3,360	560
Total		**22,608**	**3,768**	**16,920**	**2,820**

Kenya Red Cross Society (2006)

The recreation stage includes the physical reordering of the group and the physical environment. Amid this period individuals rebuild houses and community facilities, and farming comes back to ordinary. The real time traverse is generally extremely hard to characterize. It might begin genuinely early and may keep going for a long time.

2.8 Disaster Risk Reduction (DRR)

As of late, the bearing of worldwide advancement has moved from destitution diminishment to catastrophe hazard lessening. By reviewing economical improvement through a viewpoint of calamity hazard decrease, people worldwide are embracing a more proactive approach that promote long haul advancement arranging and additionally crisis intercessions when required (CRS, 2013).

This move is pertinent in Horn of Africa. In this area, environmental change and an increasing number of natural and man-made disasters have prompted to a broad loss of lives, jobs and property and a dominant part of groups in the Horn of Africa need adequate methods for dealing with stress, making them profoundly powerless against dangers (CRS, 2013).

Different wordings in Disaster Risk Reduction (DRR) have surfaced as of late on various DRR ideas. DRR is a system and instrument that decides the level of hazard and portrays measures to expand limits and lessen danger on the component at risk to evade disaster (Cordaid, 2011). DRR is an improvement approach that moves groups from receptive reaction to proactive

activity by helping occupants to embrace preventive measures to better climate brought on calamities (CRS, 2013). There are two main approaches of DRR at the community level:

1. Community Managed Disaster Risk Reduction (CMDRR)
2. Community Based Disaster Risk Reduction (CBDRR)

This project focuses on Community Managed Disaster Risk Reduction (CMDRR) in Kano plains and Budalangi.

2.8.1 Community Managed Disaster Risk Reduction (CMDRR)

Community Managed Disaster Risk Reduction is a process in which communities are actively engaged in the identification, analysis, monitoring and evaluation of the risks, with the aim of reducing people's disaster risk and enhancing their capacities to reduce disaster risks. It places the communities at the heart of decision-making processes and in the management of disaster risk reduction measures (Cordaid, 2011). This is also in line with the Constitution of Kenya 2010 article 174(c) that gives powers of self-governance to the people and enhances the participation of the people in the exercise of powers of the state and making decisions affecting them. Article 184 (1) (c), further requires that mechanisms "for participation by residents" be included in national legislation to urban areas and cities governance and management.

2.9 Theoretical Framework

This study has adapted vulnerability theory and human adjustment theory and describes how the two theories will be used to guide the study and all the more critically how they will assist in analysis of the results obtained from the field.

2.9.1 Vulnerability theory

This theory is progressively obtaining credit (Parthasarathy, 2009). The idea of vulnerability has exponentially been viewed as essential to the comprehension of the human-environment nexus (Rygel et al., 2006; Turner et al., 2004), which is an essential concern toward this study. The vulnerability perspective looks for comprehension of the coupled human-environment

framework and is predicated on the thought that vulnerability dwells in the condition and operation of the coupled human-environment framework, including the reaction limits and framework criticisms to the peril experienced (Turner et al., 2004).

Vulnerability theory in this study has adopted two points of view: Human ecology perspective and political ecology perspective.

2.9.1.1 Human Ecology Perspective

From this point of view, disasters happen when the buffering capacity of society is overpowered by natural events. The main contribution of this early work was its priority on environmental variation as a causal force affecting social change and vulnerability. Empirical evidence on livelihood and adapting techniques are outcome of this study. Eakin, 2005 pays attention on family unit reactions to floods or other natural hazards where, in the face declining privileges, households react by initiating brief insurance- like mechanisms, through transfer of gainful resources and through desperation and distress relocation.

2.9.1.2 Political ecology perspective

Political ecology perspective was chosen since it coordinates with human ecological perspective. From this point of view, (Van-Riet, 2009:197) argues that the further one is from access to power and assets, the more vulnerable he/she gets to be. This is exacerbated by dynamic pressure that is exerted on that particular social system. He clarifies that the advancement of vulnerability happens in three stages. The initial step is the root cause, which include: constrained access to power, structures, assets, and financial and political frameworks. In the present research, "root causes" would be restricted assets that the people in Kano and Budalangi are left with after floods have drained their assets. The second step is the dynamic pressures which include: absence of local institutions, training, appropriate skills local investments, local markets, press freedom, and moral guidelines in public life. Other forces include rapid urbanization, rapid population growth, deforestation and a decline in productivity. In the case of Kano and Budalangi, local people lack local investments, training, appropriate skills (numerous are semi-ignorant agriculturists), from which they would have otherwise drawn resources from to confront the perturbation in their system. Other macro

forces include rapid population growth, deforestation. The third step is unsafe conditions, which include: fragile physical environment (dangerous locations, unprotected buildings and infrastructure), fragile local economy (livelihoods at risk, low income levels), vulnerable society (special group risk, lack of local institutions) and public actions (lack of disaster preparedness and prevalence of endemic disease). In the case of Kano and Budalangi, the communities find themselves within fragile physical environment and fragile local economy as a result of having lost their assets.

2.9.2 Theory of Human Adjustment

Theory of Human Adjustment was selected because it integrates vulnerability theory. Vulnerability theory does not inform us on what choices the affected communities make to enable them adjust to perturbation.

This theory focuses on social behavior in post disaster settings and is established within the sociological and anthropological disciplines; Risk Analysis employs a wide range of quantitative methods to analyze the full spectrum of events that threaten society and is especially popular with biomedical and engineering experts; and Natural Hazards Research (NHR) is led mostly by geographers who work closely with policy makers to understand the interactions between physical and social environments that produce hazard risk and vulnerability.

The present study is an extension of NHR and combines insights from the several subfields of human ecology, political economy, social constructivism and political ecology that now lie within it. (Kates, 1971; White, 1963) examine choices made by people living in hazardous areas and the variations in human behavior between techno-social stages, specific hazards, specific classes of decisions, decision makers and between individuals within a specific group of managerial decision makers. NHR now incorporates both these behavioral and social structural perspectives which are sometimes categorized under the school of political ecology (mentioned in 2.10.1.2 above) although others object to that term as an umbrella concept because it privileges the political rather than a broader set of human system processes that includes politics but also involves personality, culture, society, communication, etc. Important

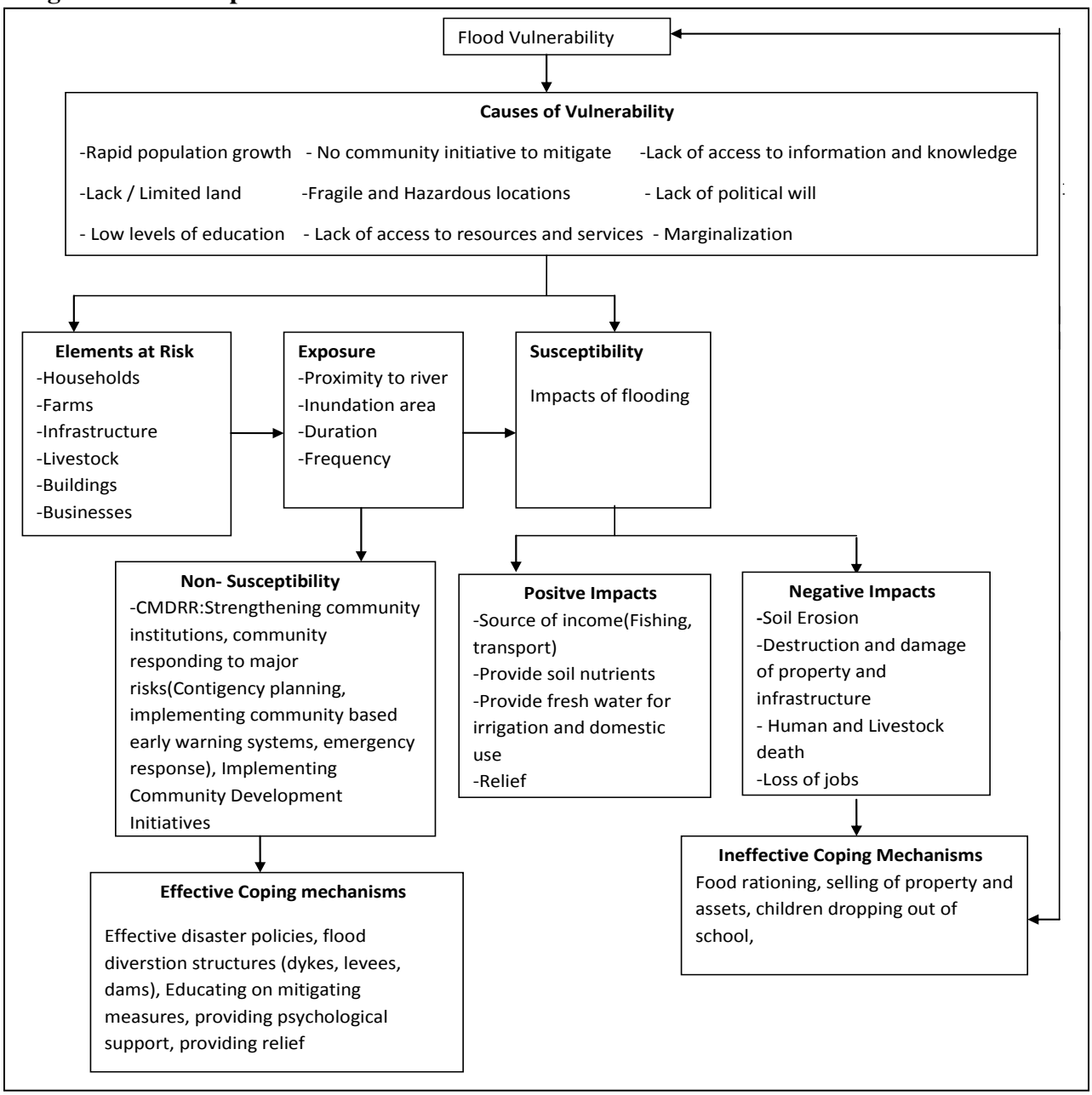
new features have been added to this broad theoretical base that illuminates the contextuality of responses to risk (Mitchell, 1989) and social adaptive capacities (Pelling, 2002a).

2.9.3 Conclusion

The above theories were selected for this study as they were deemed the most appropriate in the eventual analysis and understanding of the results obtained. Vulnerability theory allows us to understand how the capacity of the society is overwhelmed by natural events and their access to power and resources.

The human adjustment theory demonstrates that people make choices that increase their vulnerability to hazards such as residing in fragile and hazardous locations because they are marginalised and lack financial resources therefore have little room for choosing where to live, they are culturally attached to their ancestral land which are prone to disasters and are not willing to relocate to safe locations and lack of awareness and power relations.

Figure 2.1: Conceptual Framework



Source: Author 2015

2.9.4 Conceptual Framework.

The applied structure depicts the general idea of the study. As showed over, the three primary parts examined in this study are weakness, ways of dealing with stress and fiasco administration. Each of the three segments has an alternate part and causality on each other.

The system represents that surge defenselessness is brought on by fast populace development, need or constrained land, low levels of training, absence of group activity to relieve surges, living in delicate and dangerous areas, absence of access to assets and administrations, absence of data and information, minimization and absence of political will.

Components at hazard that are most defenseless against flooding include: Households, ranches, framework, animals, building, organizations, recreational offices which are uncovered due to their nearness to the waterway, immersion range, term and recurrence of surges expanding their vulnerability to effects of flooding which could have both negative and positive effects. The negative effects incorporate soil disintegration, demolition and harm of property and framework, demise of human and domesticated animals, monetary effects, for example, loss of business. Presentation of components at hazard can likewise result to non-helplessness through group investment in surge chance lessening by taking part in relief exercises, imparting thoughts to different groups on the most proficient method to oversee surges, group engagement with the administration and expanded mindfulness. Through this, the group will have the capacity to utilize and adjust successful adapting methodologies, for example, actualizing catastrophe approaches, setting up basic and non-auxiliary moderation measures. Effects of surges could likewise result to inadequate adapting procedures, which are erosive in nature expanding surge helplessness of family units and the group on the loose.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents research design, study site description and choice of selection, study population, sample size, sampling procedure, methods of data collection and research instruments, validity and reliability of the study, data analysis procedure and ethical consideration.

3.2 Research Design

This study adopted cross sectional survey design, as it sought to establish and describe a prevailing phenomenon. The design was suitable for this study given the extensive data on factors that contribute to states of vulnerability to flooding, coping strategies employed, community participation in managing floods and gaps that exist in the phases of preparedness and mitigation on one hand and response and recovery on the other hand. The data collected was also used to determine whether there was an association between the variables considered in the study and to what extent.

The study adopted both qualitative and quantitative techniques of data collection in order to deeply understand the research problem and also to ensure that any bias inherent in particular data sources, investigator, and method could easily be neutralized by combining both quantitative and qualitative research methods. Quantitative technique was used to collect and analyze hard data (numeric data) while qualitative technique was used to collect non-numeric data, which gave more information on the study objectives and hence strengthened the quantitative data collected.

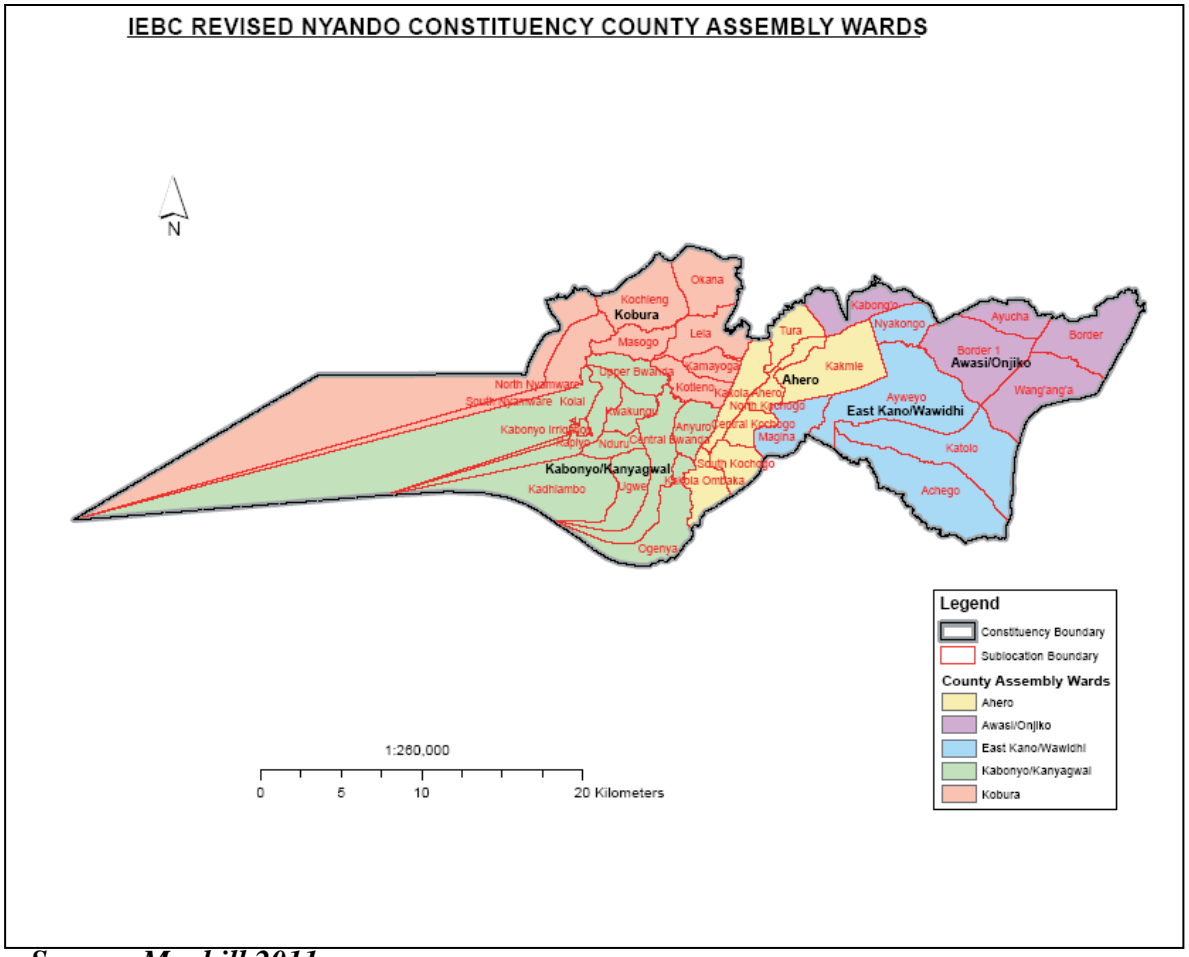
The study targeted households, the community and key informants within the study areas of Kano plains and Budalangi. The study methods included in-depth interviews, focus group discussions, and key informant interviews. Direct observation was also be used in the study to check behavior and socio-economic status of the respondents in this study.

3.3 Study Site and Choice Criteria

Kano and Budalangi flood plains were purposively chosen settings for this study because flood occurrence trends in both Kano plains and Budalangi is progressively turning into a noteworthy concern to the nation's financial advancement due to the considerable monetary and money related misfortunes brought about to react to regular flood calamities (Otiende, 2009). Therefore, the researcher-assessed factors affecting both communities' flood resilience by comparing their vulnerability status, coping mechanisms employed, community participation in managing flood risks and hazards and how they prepare, respond and recover from the adverse effects of flooding. Most literature on Kano and Budalangi have concentrated on loss and damage from flooding, flood disaster on environmental change, the livelihood of the communities, community perception and response to flood risks, challenge of settlement (See Onywere S. *et al.*, 2011; Opondo, O. D, 2013; Opere A, 2004; Ocholla M. S 2010). Much has not been done in the area of community resilience to flooding in Kano and Budalangi especially on community's effort to manage disaster risks and their dependency on relief.

The Kano plain area lies on the Eastern margin of the Winam Gulf of Lake Victoria, and includes Kisumu Township. It is predominantly grassland most of which is intensively cultivated. The main crops cultivated in this area are cereal crops that include maize, sorghum and rice, followed by pulses (beans, green grams, cowpeas and groundnut), cotton and tuber crops (cassava and sweet potato). Sugarcane is cultivated mainly in the northern upstream areas of the Kano Plain, which are closer to the sugarcane refineries. The most common cropping pattern is the cultivation of upland crops under rain-fed conditions, where maize and sorghum are generally intercropped with several kinds of pulses, cotton plants and cassava. Rice is grown in the flood prone areas where irrigation facilities have been developed. The root crops, such as sweet potato and cassava, are cultivated in almost all of the area as a reserve food crop, which provides food in the case of a shortage of the main food crops due to damage as a result of either flooding or prolonged drought. The population in Kano plains engages in fishing, which is one of their major livelihood activities (WMO, 2009; GoK, 2009).

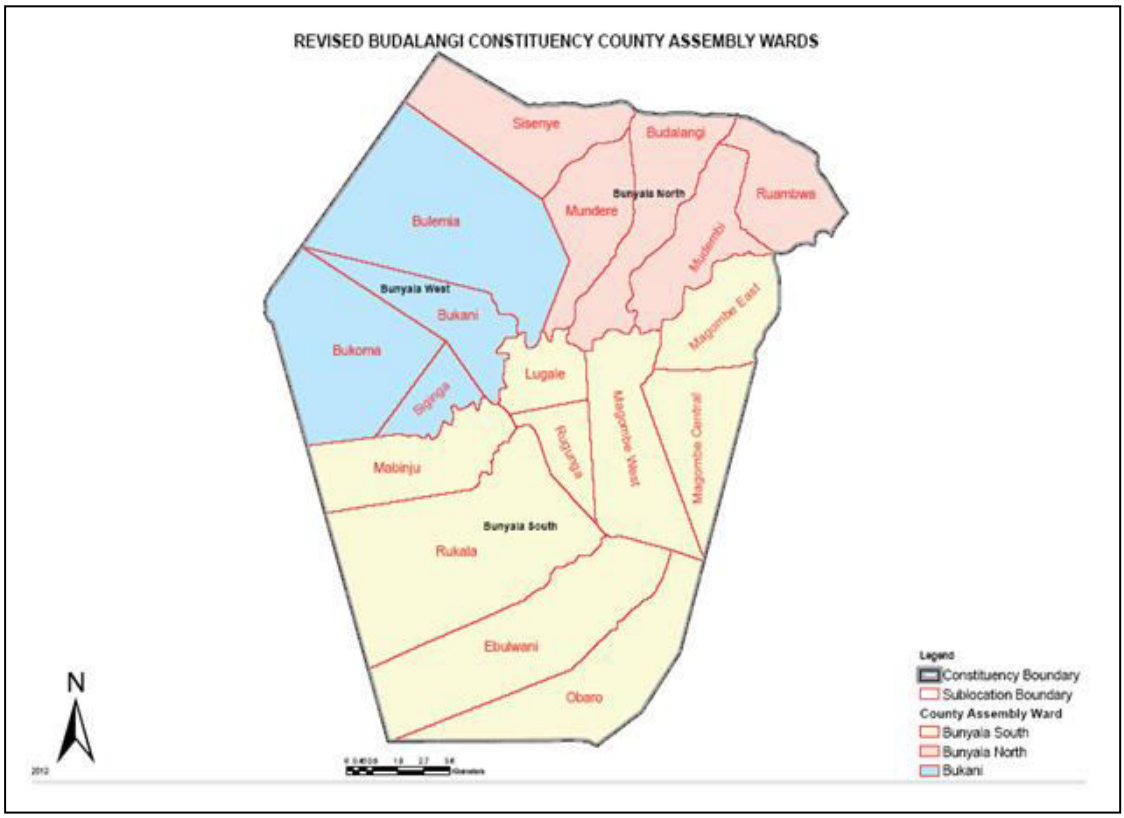
Figure 3.1: Map showing areas of study in Kano plains



Source: Maphill 2011

The Budalangi floodplain, lies at the lower reaches of Nzoia River. The Nzoia River derives its water from the Nzoia River catchment. Budalangi flood plains are located in new Bunyala district of Western province of Kenya. The floodplain topography is fairly flat. The soil type of the flood plain is dominantly black cotton soil with heavy alluvial deposition within the river channel. Pockets of shallow murrum soil (course textured) are also evident (NWCPC, 2008). The population here is engaged in farming of crops such as maize, sugarcane, cassava, beans, keeping livestock and cross border trading. Just like Kano plains, Lake Victoria has a big influence on the population in Budalangi with the predominantly able bodied men in fishing activities. (WMO; GoK, 2009).

Figure 3.2 : Map showing areas of study in Budalangi flood plains



Source: Maphill 2011

The researcher observed in Kano and Budalangi, all roads were seasonal/ murrum and the type of transport used is "bodaboda" also know as motorcycle, communication is via mobile phones and radio. Residents in the two study areas eat ugali and fish. The markets are located in Ahero town and Port Victoria. Most houses are semi-permanent and grass thatched with most houses in Budalangi. Every homestead in Kano had a latrine while in Budalangi only a few homesteads had latrines; sport facilities are located on school grounds. The researcher also observed churches signifying that most residents are Christians.

The visible vulnerabilities observed were most homes in Kakola Ombaka in Kano and Lugale and Mabinju sub-locations in Budalangi were located near Rivers Nyando and Nzoia respectively.

3.4 Study Population

The study population comprised of two main tribes, the Luo and the Luhya communities from Kano and Budalangi flood plains respectively. As a result, the languages spoken are dholuo by the Luo community in Kano plains and Abaluhya by the Luhya community in Budalangi. The Luhya community has different dialects, which are Samia, Khayo, Kimarachi and Kinyala. According to the Kenya National Bureau of Statistics (2010), Kano has a total population of 141,037 with 30,439 households whereas Budalangi has a total population of 66,723 with 15,245 households. In this study the target population comprised of households and selected key informants such as the Local and Government officials.

3.5 Sample Size

The study obtained a total household population of 6425 as sample frame from the 8 selected sub-locations in Kano plains and a total household population of 7427 as the sample frame from 9 sub-locations in Budalangi flood for interview based on the Kenya Open Data (2014) and Kenya National Bureau of Statistics (2009).

To determine the sample size, Slovins sampling method (Guildford and Fruchter, 1973) was adopted. The mathematical formula used stated: $n = N/1+N(\alpha)^2$.

Where:

n=sample size,

N=sample frame

α = represented the margin of error of 0.08 with confidence level of 92%.

3.5.1 Sample size for Kano

To determine the sample size for Kano plains, the researcher employed the formula:

$n = N/1+N(\alpha)^2$. Where:

$$n = \frac{6425}{1+ 6425\ (0.08)^2}$$

$$n = 153$$

Therefore the sample size for Kano plains household survey was 153. The determined sample size of 153 households was proportionally distributed as indicated in table 3.1 below. Stratified and Proportional sampling methods were then used to identify individual study participants. These techniques were used to assure representation on the relative size of the data.

3.5.1.1 Sample size for each sub-location in Kano plains

1. Ayweyo – 1129x153÷6425 = 27
2. Magina - 564x153÷6425 = 13
3. Kochogo Central – 297x153÷6425 = 7
4. Kochogo South – 802x153÷6425 = 19
5. Kakola Ombaka – 710x153÷6425 =17
6. Kabonyo – 532x153÷6425 = 13
7. Ahero irrigation scheme – 945x153÷6425 = 23
8. Kore – 1446x153÷6425 = 34

Table 3.1: Summary of stratified and proportional sampling

Location	Strata (sub-location)	Total population	Total household population	Sample size	Sample share % for household population
Wawidhi	Ayweyo Magina	5236 2738	1129 564	27 13	26%
Kochogo	Kochogo Central Kochogo South	1534 3862	297 802	7 19	17%
Kakola	Kakola Ombaka	3370	710	17	11%
Kawino	Kabonyo	2529	532	13	9%
Ombeyi	Ahero irrigation scheme Kore	4424 6551	945 1446	22 34	37%
Total		**30,244**	**6425**	**152**	**100%**

Source: Kenya Open data (2014)

3.5.2 Sample size for Budalangi

To determine the sample size for Budalangi flood plains, the researcher employed the formula:

$n = N/1+N(\alpha)^2$**.** Where:

$$n = \frac{N}{1+ N(\alpha)^2}$$

n=sample size,

N=sample frame (7455)

α = represents the margin of error of 0.08 with confidence level of 92%.

To determine the sample size for Budalangi by substituting 7455 and 0.08 into the formula:

$$n = \frac{7455}{1+ 7455(0.08)^2}$$

$n = 152$

Therefore the sample size for Budalangi household survey was 152. The determined sample size of 152 households was proportionally distributed as indicated in the table 3.2 below. Stratified and Proportional Sampling Methods were used to identify individual study participants. These techniques were used to assure representation on the relative size of the data.

3.5.2.1 Sample size for each sub-location in Budalangi

1. Budalangi – 1247x152÷7455= 26
2. Mudembi – 936x152÷7455=19
3. Siginga – 779x152÷7455=16
4. Mundere – 339x152÷7455=7
5. Rwambwa– 1135x152÷7455=23
6. Rukala– 680x152÷7455=14
7. Lugale -520x 152÷7455=11
8. Mabinju- 756x152÷7455=16
9. Magombe West- 1063x153÷7455=22

Table 3.2: Sample of stratified and proportional sampling in Budalangi

Location	Strata (Sub-Location)	Total population	Total Number of households Per sub location	Sample size	Sample share % for household population
Bunyala East	Budalangi Mudembi Rwambwa	5608 4113 5022	1247 936 1135	26 19 23	44%
Bunyala West	Siginga	3531	779	16	10%
Bunyala North	Mundere	1665	339	7	5%
Bunyala Central	Magombe West	4344	1063	22	14%
Bunyala South	Rukala	3071	680	14	9%
Khajula	Lugale Mabinju	2333 3225	520 756	11 16	18%
Total		***37,256***	***7455***	***154***	***100%***

Source: Kenya Open data (2014)

3.6 Sampling Procedure

Given the large size of Kano plains and Budalangi, the researcher used multi-stage sampling to select the areas of study. Kano plain was purposively selected for this study because it lies on a flood prone location. The researcher used purposive sampling to select 5 frequently flooded and worst hit locations out of the available 6 locations in Kano plains which are: Wawidhi, Kochogo, Kakola, Kawino North and Ombeyi. The researcher again used purposive sampling to select 8 sub-locations: Magina, Ayweyo, Kakola Ombaka, Kabonyo Irrigation, Kochogo central, Kochogo South, Ahero irrigation scheme and Kore.

These sub-locations were selected based on information by the Kenya Metrological Department (2012/2013) on the extent and frequency of flooding. Stratified sampling was used to select representative samples with respect to each population size in each sub-location. The researcher then proceeded to use simple random sampling to pick homesteads within the sub-locations. The reason the researcher picked simple random sampling for this study was because of the make-up of the homes and their assumed homogeneity hence the rationale to pick one house from the homestead, which was done through simple random sampling. The target at the household level was heads households within the homestead were interviewed.

The researcher purposively selected Budalangi as the other area of study. Just like Kano, the researcher used purposive sampling to select the 6 most flood prone locations which in this case were all the locations: Bunyala East, Bunyala West, Bunyala Central Bunyala South, Khajula and Bunyala North locations based on information by the Kenya Metrological Department (2012/2013) on the extent and frequency of flooding. The researcher then used purposive sampling to select 9 sub-locations from the above mentioned locations which were: Budalangi, Mudembi Mundere, Siginga, Rwambwa, Rukala, Lugale, Mabinju and Magombe West out of 17 sub-locations. Stratified sampling was used to select representative samples with respect to each population size in each sub-location. The researcher then used simple random sampling to select the households beginning at the most central part of each sub-location and village elders guided this. The target at the household level was heads of the household.

3.7 Unit Analysis and Observation

The unit of analysis was the heads of households who helped the researcher understand communities' resilience to flooding in both Kano plains and Budalangi. subsequently, the unit of observation comprised of government institutions, public and private organizations, community projects, persons, groups and events.

3.8 Sources of Data

The study used Primary and Secondary data. Primary data was collected through direct communication with respondents; focus group discussion and interviews as well as non-participant observation as the methods of data collection. Structured interview schedules with closed and open-ended questions, focus group discussion guide and observation checklist were the tools used in collecting data from respondents. Primary data aided the researcher with knowledge on factors contributing to states of flood vulnerability in the two areas, the information provided insights on how the communities cope with flooding and the role of government and other stakeholders in helping mitigate flooding in the two areas and their effectiveness on their efficiency in managing flood disaster hence achieving sustainable development. Secondary data was obtained through Internet sources, article, books, and

journals. This data was also classified as quantitative data and key informant interviews were used to collect in-depth information.

3.9 Data Collection Methods and Research Instruments

Two types of data were collected; primary and secondary data. Primary data was obtained from household surveys, FGDs, Key informants' interviews and direct observation. Primary data was collected using an interview schedule. In this study, the data was collected from heads of households. Secondary data was obtained through Internet sources, article, books, and journals. This study employed the following methods:

a. Household Survey

Simple random sampling was used to get respondents from households within the homestead where one house was randomly selected. The reason why the researcher chose to use simple random sampling was to give every individual in the target population an equal chance of being part of the sample.

The researcher interviewed heads of households and the process was done face to face with the use of questionnaires and interview schedules as tools for data collection and sought to capture household demographic data, socio-economic characteristics, factors that contribute to states of vulnerability of the household, household coping mechanisms employed. A total sample of 306 respondents was drawn from a total household of 15,275 from both Kano plains and Budalangi with each region having 152 and 154 respondents respectively.

b. Key informants' interviews

The researcher used purposive sampling to select the key informants. Data was collected from 25 respondents, 7 local administration officers (chiefs) and County officials, 4 representatives from NGOs operating in the research areas, 2 Ministry of Health officials, 2 officials from the Metrological Department, 2 officials from the department of water and irrigation, 6 teachers, 2 officials from the Ministry of Agriculture and 2 local NGOs all from Kano and Budalangi. Purposive sampling was used to enable the researcher to collect information from a wide range of people including: community leaders, professionals or residents who had first hand

knowledge about the communities and also provide the researcher with their expertise, knowledge and understanding and provide insights on the nature of problems caused by floods and give recommendations for solutions.

The researcher used an interview guide to conduct in-depth interviews to gather information on expert and community opinion about vulnerability of flood prone communities, experiences from the study communities and coping strategies adopted by the flood prone communities, community managed disaster risk reduction systems in place as well as gaps that exist in the disaster management phases. Interviews were recorded and additional notes were also taken. Recording was done to ensure accuracy of data collected.

c. Focus group discussion (FGD)

The choice of FGD was appropriate because it enabled the researcher to garner more information on the way specific groups of people within the community think about flooding in their areas. The FGDs generated discussions on the specific research questions such as vulnerability to flooding, coping mechanisms employed, community-managed disaster risk reduction and gaps that exist in the phases of disaster management. The discussions were held with community based civil society groups such as women groups, youth groups, a mixture of both women and men to determine whether different perspectives on the issues being discussed emerged. Each focus group comprised of 6-12 members who were purposively selected by the researcher. Participants of FGDs were selected with the help of local administration officials, who were the sub-chiefs of various sub-locations in the two study areas by looking at their educational background, socio-economic status, sex and age.

d. Direct observation

The researcher used direct observation to collect primary data. During field research, observed phenomenon was recorded using an observation checklist. The researcher was able to capture some information through photography. The researcher captured types of housing, types of roads, markets, schools and health centers, sources of water, types of transportation and daily activities such as farming as well visible vulnerabilities such as proximity of homes to the rivers.

This technique of data collection was important because it saved time, it was less expensive, and the researcher did not depend on the respondent to give information.

Table 3.3: Summary of methods used in the study for Kano

Research Methods	**Research tools**	**Household**	**Sample Size**	**Sampling Method**
Household Survey	-Interview schedule -Questionnaire	6,495	152	Simple random sampling
Key informants' Interviews	-Interview guide		**13** 4 local administration officers 1 Emergency Response Team 1 Ministry of Health Officer 1 Ministry of Agriculture officer 1 water and Irrigation department officer 1 Metrological Department officer 3 Teachers 1 Local NGO official	Purposive sampling
Focused Group Discussion (FGD)	-Interview guide		**3** FGD comprised of women groups, youth groups, and a mixture of men, women and youth	Purposive Sampling
Direct Observation	-Observation schedule			

Source: Researcher 2015

Table 3.4: Summary of methods used in the study for Budalangi

Research Methods	Research tools	Household	Sample Size	Sampling Method
Household Survey	-Interview schedule -Questionnaire	7,455	154	Simple random sampling
Key informants' Interviews	-Interview guide		**13** 4 local administration officers 1 Emergency Response Team 1 Ministry of Health Officer 1 Ministry of Agriculture officer 1 water and irrigation department officer 1 Metrological Department officer 3 Teachers 1 Local NGO official	Purposive Sampling
Focused Group Discussion (FGD)	-Interview Guide		**3** FGD comprised of women groups, youth groups and a mixture of women, men and youth.	Purposive sampling
Direct Observation	-Observation schedule			

Source: Researcher 2015

3.10 Validity and Reliability

A pretest of the survey was carried out with 20 subjects 10 subjects were drawn from Kano plains the other 10 were drawn from Budalangi and data collection tools were structured around the responses from the pilot study. A professional translator was used to translate the instruments from English to dholuo and Kinyala before the interviews. The instruments were then be pretested and modified for more clarity and accuracy. Validity was also enhanced through triangulation because of the use of multiple data collection methods. Questionnaires were used to collect valid information from the study. Questions were pretested for the content validity and reliability of the study.

3.11 Data Analysis

Both qualitative and quantitative techniques were utilized in the processing, analyzing and presentation of data. Quantitative data was used to generate information for household data, which also provided qualitative information. Qualitative information was obtained through Focus Group Discussions and key informants interviews. This information was used to compliment the household survey (questionnaire). Descriptive analysis was also used to analyze data gotten from the observation checklist of the researcher. The researcher used SPSS to compute descriptive statistics. Descriptive and Inferential data analysis was also used to analyze continuous and categorical data which have been presented in text, frequency tables and graphs using percentage and distribution, frequencies. Results obtained were organized according to the main sections of data with an intention of highlighting and achieving the objectives of the study.

3.12 Ethical Consideration

Permission to carry out the research was sought from relevant authorities in Kano and Budalangi. The target respondents were given adequate explanation on the purpose of the research. All respondents were taken through the required informed consent procedures and this was done at the point of recruitment and the start of each interview/discussion.

CHAPTER FOUR: PRESENTATION OF DATA AND ANALYSIS

4.1 Introduction

This section is organized as follows: first, factors that contribute to vulnerability will be presented after which, factors that increase vulnerability will be discussed. The findings relating to the coping strategies employed by respondents will then be presented. This will be followed by a discussions on community managed disaster risk reduction systems and gaps that exist in the phases of preparedness and mitigation on one hand and response and recovery on the other hand. The conventional way is usually to present demographic characteristics of the respondents before the study findings are presented and discussed. But since in this case the demographic factors are actually findings related to factors that contribute to states of vulnerability, these demographic factors will be presented as findings. This is discussed in section 4.2 below. We however begin with the response rate obtained in the study.

4.2 Demographic characteristics of respondents

4.2.1 Gender

Gender is a basic segment in each part of the financial, social and daily lives of individuals and societies. This study sought to establish the gender of household heads in Kano and Budalangi. Gender has been identified as a factor of vulnerability in this study because as a primary factor social organization, it shapes the social worlds within which natural events occur (Fothergill's, 1996). Gender of the respondents is presented in table 4.1 below:

Table 4.1: Distribution of respondents by gender

Gender of respondents in Kano	**Frequency**	**Percent**
Female	68	45%
Male	84	55%
Total	**152**	**100%**
Gender of respondents in Budalangi	**Frequency**	**Percent**
Female	59	38%
Male	95	62%
Total	**154**	**100%**

Source: Field survey 2015

The majority of the respondents were male in both Kano and Budalangi who accounted for 56% and 62% respectively. Female respondents in Kano and Budalangi accounted for 44% and 38% respectively. However, this finding is contrary to the Kenya National Population Census (2009) reported that the national average for female and male in Kano is 52% and 48% respectively while in Budalangi the national average for female and male is 53% and 47% respectively.

It is expected that the rate of vulnerability of women in the study areas will be high because women are poorer than men due to their inability to access resources, disproportionately employed in unpaid, underpaid and non-formal sectors of economies, traditional expectations and home-based responsibilities that limit women's mobility also limit their opportunities for political involvement, education, access to information, markets, and a myriad of other resources, the lack of which reinforces the cycle of their vulnerability (Anderson, 1994; Enarson, 2000) support this argument.

Furthermore, due to culture, women's roles increase their economic burden and domestic responsibilities putting them at risk during flooding. The results are similar to a study done by (Hussein *et al.,* 2006) who observed that women are disproportionately affected by floods as a result of economic and social dislocation of households, as they often have to cope with social and emotional upheavals resulting from flood effects, including death, disease, and food shortages, in the absence of men.

It is often assumed that both men and women experience the impact of disasters in the same way and face similar types of risks. However, disasters tend to have a disproportionately higher adverse impact on women than men, although males can also be negatively impacted by socio-cultural expectations such as performing dangerous search and rescue roles (Enarson *et al.,* 1998).

4.2.2 Age

Information about age of respondents is important because it is argued that age corresponds with various components connected with one's probability of withstanding a disaster. For

example, age in many ways influences socioeconomic status, access to resources, assumed responsibility for disaster preparedness and response activities, levels of social integration or isolation and cognitive development, physical ability and mobility. It is important to note that age alone does not make a person vulnerable instead age interacts with many other factors that increase vulnerability of some members of a population, particularly the very young and the old (Peek, 2013). The findings of this variable are presented in table 4.2 below:

Table 4.2: Distribution of respondents by age

Age of respondents in Kano	Frequency	Percent	Age of respondents in Budalangi	Frequency	Percent
<20 years	15	9.9%	<20 years	4	2.6%
20-29 years	37	24.3%	20-29	24	15.6%
30-39 years	37	24.3%	30-39	53	34.4%
40-49 years	30	19.7%	40-49	39	25.3%
50+ years	33	21.7%	50+	34	22.1%
Total	**152**	**100%**	**Total**	**154**	**100%**

Source: Field survey 2015

The grouping of data (demographic age sets) was made so as to make the data more meaningful. The unit of analysis was adult heads of households who were 18 to over 50 years. In Kano plains, adult respondents aged 18- 20 years was 15(10%). The age bracket of 20-29 and 30 -39 categories accounted for 37 (24%) of the respondents. The age bracket of 40-49 accounted for 31(20%). The oldest age bracket was 50 and above years which accounted for 32(21%) of the respondents. While in Budalangi, just like Kano plains, the lowest age bracket was 18 to 20 years with a respondent of 4(2.6%), The age brackets of 20-29 and 30 -39 years had a respondent of 24(16%) and 53(34%) respectively. The age bracket of 40-49 had 39(25%) of respondent. The oldest age bracket of respondents was 34(22%) of the respondents.

These findings indicate that majority of the respondents in Kano and Budalangi were in the younger and middle-aged groups. This finding supports Kenya Population and Housing Census (2009), which found that population size decreased as age increased and there were few people who were aged 40 years and above. It is evident that respondents in the older category 40 years and above are more vulnerable to flooding. The elderly age are more vulnerable to floods because they are more likely to be physically challenged, have reduced

mobility, reduced strength and be of poor health thus restricting their ability to cope with the floods. They would also have little financial resources and are would more likely be dependent on others for their survival. Conversely, it is plausible that the elderly are attached to their ancestral land and as such, would be less likely to freely abandon their land for safer grounds. Studies indicate that elderly persons living alone are likely to be more vulnerable to disasters and many older people have special needs that require the assistance of others (Eidson *et al*., 1990; Schmidlin and King 1995; Morrow 1999; Peek-Asa *et al,*. 2003; White et al. 2006; McGuire *et al.,* 2007; Rosenkoetter *et al*., 2007).

The findings of this study are supported by a study conducted among flood victims in Malaysia, which found that households in which the head family member is 50 years old and above were the most vulnerable groups in the event of disasters (Ngai *et al.*, 1996). At the other end of the age spectrum, suffice to say, the vulnerability of children is self-evident especially those who lack adequate family support (Sapir, 1993). Children are more vulnerable because they are more likely more than others to be more to be dependent on adult caregivers during disasters. Because they are developing psychologically, children are also highly vulnerable to environmental and technological hazards (Rogge, 2003). They are also vulnerable to outbreak of diseases associated with disasters such as cholera and are at a high risk of injuries and death.

4.2.3 Marital

Marital status is important in the understanding of vulnerability. Marital status can determine access to resources in the household that one may use to cope with disaster (Waite and Gallagher, 2000). The marital status distribution is presented in table 4.3 below:

Table 4.3: Distribution of respondents by marital status

Marital status of respondents in Kano	Frequency	Percentage	Marital status of respondents in Budalangi	Frequency	Percentage
Single	21	13.8%	Single	7	4.5%
Married	94	61.8%	Married	94	61.0%
Separated	7	4.6%	Separated	13	8.4%
Widowed	30	19.7%	Widowed	40	26.0%
Total	**152**	**100%**	**Total**	**154**	**100%**

Source: Field survey, 2015

The study established that a majority of the respondents (96 comprising of 62% of the total population) in Kano and a majority of respondents (96 comprising of 61%) in Budalangi were married and living with their spouses. The study also found that none of the respondents was divorced. However, 7(5%) and 13(8%) of the respondents were separated from their spouses in Kano and Budalangi, respectively. Respondents who were single/unmarried were 21(14%) and 7(5%) in Kano plains and Budalangi, respectively, while respondents who were widowed in Kano were 30 (20%) compared to 40(26%) in Budalangi.

The findings above are consistent with findings of the Kenya National Bureau of Statistics (2009), which found that majority of the population in Kano 81% compared to 75% of the population in Budalangi were married and living with their spouses. The same report also indicated that 0.4% of the population in Kano compared to 1.3% of the population in Budalangi was separated while none of the respondents was divorced. According to the same report those who were widowed represented 14.2% in Kano compared to 23.2% in Budalangi and those who were single/unmarried in Kano represented 4.1% compared to0.5% in Budalangi.

These findings support combined data conducted by Kenya National Bureau of Statistics (2009) which, found that those who were married in Kano and Budalangi were the majority compared to those who were not married (Single/unmarried, widowed and separated).

As observed, the findings revealed that a considerable number of respondents who did not have spouses (Single/unmarried, separated and widowed) in the two study sites were fewer and

more likely to be vulnerable to flooding compared to respondents who were married/had spouses. Chen (1998), argued that widow headed households tend to have less productive assets and fewer savings than widowers, and are less likely to have pension income and often depend heavily on the economic support of their sons. Single mothers are more vulnerable compared to households in which both spouses are present because they lack an income earning partner and are likely to be maintaining more dependants at the same time (Chant, 2008). Consequently, they are often overrepresented among the poor (Koc, 1998).

Additionally, single/unmarried female headed households are also vulnerable to flood impacts because they tend to be poorer relative to single male headed households and often lack the necessary resources to respond and recover from disasters and also do not have a partner to look up to for help (Rabalao, 2010; Blank, 1997; Furstenberg, 1990; Garfunkel and McLanahan, 1986; U.S. Bureau of the Census, 2001, 2012; White and Rogers, 2000). They are also vulnerable to sexual exploitation and domestic violence in camps and evacuation centers resulting to transmission of Sexually Transmitted Infections (STIs) and HIV/AIDS.

Households with both spouses were found to be less vulnerable to flooding because they are perceived to be financially and psychologically placed hence are able to respond to flood risks in a better mental and emotional state than their single counterparts (SERA Project, 2000; Yamano & Jayne, 2002; Nyakundi, 2003).

4.2.4 Household size

The information about household size is important in understanding household economic conditions (Lanjouw and Ravallion, 1994; Szekely, 1998; Anyanwu, 1997, 1998a, 2005, 2010, 2012; and Gang, Sen and Yun, 2004). In rural areas, the larger the household, the poorer it is, the smaller the household, the more economically viable the entity is. Household size is presented in table 4.4 below:

Table 4.4: Distribution of Number of people in household

Number of people in a households in Kano	Frequency	Percentage	Number of people in households in Budalangi	Frequency	Percentage
1-3 people	39	25.7%	1-3 people	21	13.6%
4-6 people	78	51.3%	4-6 people	82	53.2%
7-10 people	32	21.1%	7-10 people	48	31.2%
Above 10 people	3	2.0%	Above 10 people	3	1.9%
Total	**152**	**100%**	**Total**	**154**	**100%**

Source: Field survey 2015

The size of the surveyed households was dominated by households with 4-6 members who represented 52% in Kano and 53% in Budalangi. The mean household size in both study areas was five (5) persons. This finding is supported by a research conducted by Kenya Open Data (2014); found that the mean size of household in Kano and Budalangi was 5 persons. Followed by 7-10 members 39(25.7%) in Kano and 48 (31.2%) in Budalangi. Only three (3) households in both Kano and Budalangi had above 10 members, representing only a mere 2% of the total population. .

By definition, a small household comprises of at least the married couple and three children- a total of 5 persons (Kenya Integrated Household Budget Survey 2005/2006). Anything above five is considered as a large household. These households can therefore be considered as households that are vulnerable to flood disasters.

The findings of the study found that 74% of respondents in Kano compared to 86% of respondents in Budalangi had larger households with more than five individuals. Such households would ordinarily have more children in it, thus have a high dependency ratio and experience more expenditure than those with smaller numbers. This finding is consistent with a study conducted in Budalangi Onywere *et al* (2011), who found that majority of the households in Budalangi had 5-10 family members. Those with more household members are therefore more likely to be poorer, thus increasing their vulnerability to flood impacts compared to households with few members. This finding is consistent with literature by (Lanjouw and Ravallion, 1994; Szekely, 1998; Anyanwu, 1997, 1998a, 2005, 2010, 2012; and

Gang, Sen and Yun, 2004), who found evidence that large households are associated with poverty; lack well developed social security systems and low securities increasing fertility rates which result to large households.

By contrast, households with fewer members 52(17%) were perceived to be less vulnerable to flooding because they have the capacity and ability to cope with floods, as they would have more resources at their disposal to fend off the effects of floods. This finding concurs with a study conducted in rural Orissa (Cutter *et al.,* 2003). In that study it was observed that households with few members were less vulnerable to hazards. Families with small numbers of dependents often have finances to outsource care for dependents.

The larger the household size, the lower the social status and the higher the number of people who would be affected (Cutter *et al.,* 2003). Therefore, household size was found to be a factor that contributes to vulnerability.

4.2.5 Level of education

Education status of the sample population was evaluated using literacy rates of heads of households. The level of education in this study was important as it looks at the heads of households' information on their resilience and response to flood disasters. It also helps in determining the level of awareness of their vulnerability to flooding which then reflects on the coping mechanisms they will employ (Sen, 2003; Anyanwu, 2005, 2010, 2011). The level of education distribution is presented on table 4.5 below:

Table 4.5: Distribution of respondents by level of education

Level of education in Kano	**Frequency**	**Percent**	**Level of education in Budalangi**	**Frequency**	**Percent**
No schooling	9	5.9%	No schooling	19	12.3%
Primary school	65	42.8%	Primary school	60	39.0%
Secondary school	59	38.8%	Secondary school	58	37.7%
College/University	19	12.5%	College/University	17	11.0%
Total	**152**	**100%**	**Total**	**154**	**100**

Source: Field survey

The study revealed that the majority of household heads in Kano plains had primary level of education, which stood at 43% of the sample population. Similarly, majority of respondents in Budalangi had primary level of education at 39% of the sample population. Secondary education was the second highest level of education attained by heads of households interviewed in Kano and Budalangi flood plains standing at 39% and 38%, respectively. Respondents who had attained College/ University education in Kano stood at 13% compared to 11% in Budalangi. Of respondents who had no schooling in Kano plains constitute 6% compared to 12% in Budalangi. The findings are consistent with (Kenya National Bureau of Statistics (KNBS) 2010).

The study also found that when the data was combined it revealed that 28 respondents (9%) had no formal education. This could be attributed to the fact that they were poor and were thus unable to afford education (Bastos *et al.,* 2009). 125 respondents (representing 41% of the sample population) had attained primary education; similarly, this could be attributed to the poverty levels. 117 respondents (representing 38% of the sample population) had attained secondary education while only 36 (12%) respondents had college/university education. Studies (Slovis *et al*., 2004; Ligon *et al.,* 2003;) show that households with heads who have a higher educational level are less vulnerable to disasters therefore tend to be more resilient to hazards, than those with lesser education.

Results of the survey found that half of the respondents (153) respondents, (representing 50% of the sample population) had no schooling or had attained primary education. Those with secondary level of schooling were 143 (50%). No schooling and primary level of schooling were considered as inadequate educational level necessary for one to cope with flooding. Secondary and college/university level of schooling were considered as adequate level of schooling. The study findings therefore show that more than half of the respondents had low education in the two study locations.

It is expected that heads of households with lower educational level to be more vulnerable because low education levels have been associated with lack of well remunerated employment and therefore less social power and fewer economic resources and physical capacity to

anticipate, survive and recover from efforts of massive floods (ISDR, 2004:42). They are also expected to be less aware about their circumstances or over issues relating to how to cope with disasters such as flooding.

4.2.6 Length of residency

Length of residency in a hazardous location is important to this study as it informs on the capacity of households to endure, adapt, adjust to and mitigates flood threats to reduce vulnerability (Morrow, 1999). Length of residency distribution is presented on table 4.6 below:

Table 4.6: Distribution of respondents by length of residency

Length of residency in Kano	Frequency	Percent	Length of residency in Budalangi	Frequency	Percent
<1 year	7	4.6%	<1 year	0	0%
1-5 years	21	13.8%	1-5 years	10	6.5%
5-10 years	22	14.5%	5-10 years	16	10.4%
> 10 years	102	67.1%	10> years	128	83.1%
Total	**152**	**100%**	**Total**	**154**	**100%**

Source: Field Survey, 2015

The study found 67% and 83% of the respondents in Kano plains and Budalangi respectively, have been living in the area for more than 10 years. Respondents who lived 5-10 years in Kano plains were 22 (15%) while in Budalangi 16(10%) were found to have lived 5-10 years. Respondents who lived in the community between 1-5 years in Kano plains were 21(14%) while in Budalangi were 10(6.5%). Respondents, who resided in Kano for less than 1 year, were 7(4.6%) while in Budalangi there were no respondents who lived less than 1 year.

A study conducted in West Africa observed that households that lived longer in the flood prone locations put in place adoptive measures such as seasonal safety nets that involve cash transfers, either unconditionally, or in exchange for work or training during the period of the year when their reserves of money and food are lowest reducing their vulnerability to flood impacts (E.U, 2012). Various researchers have come to a similar conclusion that certain categories of people, such as recent migrants, are at a greater risk throughout the disaster process (Morrow, 1999).

It is therefore expected that households in the study areas who had resided in the flood prone locations for more than 10 years 75% would be less vulnerable to flood impacts because they have a wider social network and have adopted and learnt to cope with floods, and also know safe evacuation routes and safe grounds to relocate compared to households who have lived in the flood prone areas short time.

4.2.7 Source of Income

Source of income is an important factor in determining the resilience of a population to disasters. People may continue living in disaster prone areas simply because they may not have adequate resources to enable them access land on safer grounds (Yamal, B. 2007). Thus, focusing on the income levels of the respondents will enlighten on one's vulnerability to flooding. In coming with the data below, respondents were asked to indicate their various sources of income as multiple responses. The distribution of sources of income is presented on tables 4.7, 4.8 and 4.9 below:

4.2.7.1 Agricultural sources of income

Studies indicate agricultural 80% of the population in Kenya depends on agricultural activities as the main sources of income (Olila, 2014). Agricultural sources in this study included: Cash crop and subsistence farming, livestock keeping and fishing. The distribution of the agricultural sources of income is presented on table 4.7 below: -

Table 4.7: Distribution of Agricultural sources of income

Households that depend on agriculture as main source of income in Kano	**Respondents in Kano**	
	Frequency	**Percentage**
Yes	95	63%
No	57	37%
Total	**152**	**100%**
Households that depend on agriculture as main source of income in Budalangi	**Respondents in Budalangi**	
	Frequency	**Percentage**
Yes	102	66%
No	52	34%
Total	**154**	**100%**

Source: Field survey 2015

The study found that a majority in Kano and Budalangi flood plains was engaged in agricultural activities as their main sources of income representing 63% and 67% respectively. The study noted that 37% of respondents in Kano compared to 33% of respondents in Budalangi did not rely on agricultural activities as their main sources of income. This finding supports a study conducted on "Understanding Extreme Climate Events for Economic Development in Kenya (Huho *et al.,* 2014), which, found that 80% of the Kenyan population depend on agriculture as their main livelihood source.

Households that rely on agriculture as their main source of income is likely to be more vulnerable to flooding because floods do not only destroy their livelihood sources but also severely undermine the resilience of people living in flood prone locations (KRCS, 2012). In addition, studies indicate that most households in the rural setting are poor and depend on agriculture for their livelihood and are smallholder farmers (World Bank, 2007). In light of facts such as these, flooding exacerbates poverty levels especially where agriculture was minimal. Farmers experience massive livestock mortality, low livestock and crop production, increased crop and livestock prices.

4.2.7.2 Non-agricultural sources of income

Households in rural areas also engage in diversified non-agricultural activities to increase their income and try to cope on flood impacts on their main sources of food and income (Akinyoade *et al.,* 2014). Non-agricultural activities employed by households in Kano and Budalangi to earn extra income included: (charcoal burning, sand harvesting, weaving and basketry, brick making, timber/firewood harvesting and sale, hairdressing, boat transport, motor bike and bicycle transport etc.). The distribution of non-agricultural sources of income is presented on table 4.8 below:

Table 4.8: Distribution of Non-agricultural sources of income

Households that depend on non-agriculture as main source of income in Kano	**Respondents in Kano**	
	Frequency	**Percentage**
Yes	89	59%
No	63	41%
Total	**152**	**100%**
Households that depend on non-agriculture as main source of income in Budalangi	**Respondents in Budalangi**	
	Frequency	**Percentage**
Yes	76	49%
No	78	51%
Total	**154**	**100%**

Source: Field survey 2015

Results of the survey also revealed that 59% of the respondents in Kano compared to 49% of respondents in Budalangi engaged in non-agricultural activities to earn extra income whose main source of income was agriculture also engaged in non-farm activities such as (charcoal burning, sand harvesting, weaving and basketry, brick making, timber/firewood harvesting and sale, hairdressing, boat transport, motor bike and bicycle transport etc.) to earn extra income. Respondents who did not engage in non-farm activities represented 41% of the sample population in Kano compared to 51% of the sample population in Budalangi. The findings further revealed that households that relied on agriculture as their main source of income also engaged in non-agricultural activities to earn extra income. Such households were found to be less vulnerable to flooding. Studies indicate that non-agricultural activities are increasingly becoming the central focus of attention in rural development policy, due to its positive contribution to poverty reduction and food security (Reardon 1998; Ellis 1998; Lanjouw and Lanjouw 2001; Davis 2003).

4.2.7.3 Formal employment

Formal employment was another source of income for households in Kano and Budalangi. The study defined formal employment. The distribution of respondents who were employed is presented on table 4.9 below:

Table 4.9: Distribution of Formal employment

Households whose income is from formal employment in Kano	**Respondents in Kano**	
	Frequency	**Percentage**
Yes	30	20%
No	122	80%
Total	**152**	**100%**
Households whose income is from formal employment in Budalangi	**Respondents in Budalangi**	
	Frequency	**Percentage**
Yes	20	13%
No	134	87%
Total	**154**	**100%**

Source: Field survey 2015

Results of the survey also revealed that a small proportion of the respondents 19% of the sample population in Kano compared to a small proportion of the respondents 13% of the sample population were employed either by government, non-governmental institutions or private sectors while majority of the respondents 81% of the sample population in Kano compared to 87% of the sample population in Budalangi did not get their income from formal employment. From this finding, it is evident that formal jobs are getting scarce while the number of potential workers continues to increase in the informal sector throughout the country (Nyakaana, 1997). Therefore, it is important to note that these households also engage in agricultural activities and non-agricultural activities for financial security.

4.2.8 Level of Income

Income represents the ability of people to pay for services and resources (Zein, 2010). It is argued that communities or people with low-income are usually the primary victims of natural disasters, because they are more likely to be located in vulnerable locations due to lack of resources (Blaikie et al, 1994: 9). The distribution on estimated average monthly income presented on table 4.10 below:

Table 4.10: Distribution of Estimated monthly income of respondents

Estimated monthly income Kano	Frequency	Percent	Estimated monthly income Budalangi	Frequency	Percent
1000-5000	73	48%	1000-5000	70	45.5%
6000-10,000	37	24.3%	6000-10,000	44	28%
> 10,000	42	27.6%	>10,000	40	26%
Total	**152**	**100%**	**Total**	**154**	**100%**

Source: Field survey, 2015

Results of the survey indicated that in Kano, majority of the respondents 73(48%) earned an average estimate between 1000-5000 Kshs per month while in Budalangi 70(45.5%) of the respondents earned an average estimate between 1000-5000 Kshs per month. In Kano respondents who earned an average estimate of 6000-10,000 Kshs were 37(24.3%) while in Budalangi 44(28%) earned the same. Respondents who earned above 10,000 Kshs in Kano were 42(27.6%) while in Budalangi were 40(26%). From the table above, it is noted that in both Kano and Budalangi, most respondents earned an estimated average monthly income that ranged between 1000-5000 Kshs. Respondents who earned an average estimate between 6000-10,000 Kshs in Kano plains were37 (24.3%) while Budalangi were 44(28%) and respondents who earned 10,000 Kshs and above in Kano were 42(28%) while in Budalangi were 40(26%).

Results of the survey found that a majority of the respondents 48% in Kano compared to 46% of respondents in Budalangi earned an estimated average monthly income of about Kshs. 1000-10,000. This finding is consistent with a study by World Bank (2010), which, found that Kenya is a low-income country whose population 38.8 million had, an average monthly income of about Kshs. 10,000. Those who earned an estimated average monthly income of about Kshs. 1000-10,000 were considered poor and therefore lack the necessary resources to cope with floods. The study findings therefore show that more than half of the respondents have inadequate resources increasing their vulnerability to flooding.

Heads of households with lower income level are more vulnerable because they are more often perceived poor therefore they choose to live in the flood prone locations and are bound to the locations without options, they live in poorly constructed and maintained homes which are

easily destroyed or damaged in the event of a natural hazard (Pastor *et al*.,2006). They cannot afford the cost of repair, reconstruction, or relocation and it may take years to recover from the aftermath of the disaster Low-income households are more vulnerable to natural disasters (Vaughan, 1995).

Religion was not tabulated as 300 respondents were Christians, 2 were Muslims and 4 practiced traditional religion therefore, since majority of the respondents were Christians, no significant correlation would come out of any analysis.

4.3 OTHER FACTORS THAT CONTRIBUTE TO STATES OF FLOOD VULNERBAILITY

The study undertook a Vulnerability Assessment to identify other factors that increase states of vulnerability besides the demographic factors mentioned in 4.2 above in Kano and Budalangi. The study assessed types of infrastructure, types of structures including critical facilities that lie within flood hazard locations. The critical facilities assessed in this study include: Health facilities, sources of water supply and electricity supply. Types of infrastructure assed in this study include: Communication and transport and communication networks in Kano and Budalangi.

4.3.1 Type of shelter

Type of shelter and quality are important determinants of household flood vulnerability. A house in its most general sense is a human build dwelling with enclosing walls, a floor and a roof. As measures of flood vulnerability, the nature of building material and the overall amenities associated with house add to its quality. Housing quality determines whether the house would withstand or not withstand the massive power of floodwaters. Studies indicate that housing quality is closely tied to personal wealth and that poor people often live in more poorly constructed houses that are especially vulnerable to disasters (Eidson *et al.,* 1990; Morrow 1999; Peek-Asa *et al.,* 2003; Daley *et al.,* 2005; De Souza 2004; Tierney 2006). This

study sought to find out the number of types of shelter in a homestead. This study categorized type of shelter into three including:

i. Permanent shelter
ii. Semi-permanent shelter
iii. Grass thatched houses

Number of types of shelter in Kano and Budalangi are presented on table 4.3.1 below:

Table 4.3.1: Distribution of number of types of shelter in Kano and Budalangi

Number of permanent shelter in Kano	**Respondents in Kano**		**Number of permanent shelter in Budalangi**	**Respondents in Budalangi**	
	Frequency	**Percentage**		**Frequency**	**Percentage**
None	85	56%	None	70	45.5%
1-2	66	43%	1-2	82	53.2%
More than 3	1	1%	More than 3	2	1.2%
Total	**152**		**Total**	**154**	**100%**
No. of semi-permanent houses in Kano	**Respondents in Kano**		**No. of semi-permanent houses in Budalangi**	**Respondents in Budalangi**	
	Frequency	**Percentage**		**Frequency**	**Percentage**
None	41	27%	None	33	21.4%
1-2	95	62.5%	1-2	110	71%
More than 3	16	11%	More than 3	11	7.1%
Total	**152**	**100%**	**Total**	**154**	**100%**
No. of grass thatched shelter in Kano	**Respondents in Kano**		**No. of grass thatched shelter in Budalangi**	**Respondents in Budalangi**	
	Frequency	**Percentage**		**Frequency**	**Percentage**
None	0	0%	None	0	0%
1-2	117	77%	1-2	85	55%
More than 3	35	23%	More than 3	69	45%
Total	**152**	**100%**	**Total**	**154**	**100%**

Source: Field survey, 2015 (Multiple responses)

The above findings revealed that a majority 56% of respondents in Kano compared to 45% of respondents in Budalangi did not have permanent houses. It was noted that 43% of respondents in Kano compared to 53% of respondents in Budalangi had 1-2 permanent houses while an equal percentage 1% of respondents in Kano and Budalangi had more than 3 permanent houses.

Additionally, the findings revealed that respondents who had 1-2 semi-permanent houses within their homesteads constituted 62% of the sample population in Kano compared to 71% of the sample population in Budalangi. While 11% of respondents in Kano compared to 7% of respondents in Budalangi had semi-permanent houses within their homesteads.

Furthermore, the study established that a majority 77%of the respondents in Kano compared to 55% of respondents in Budalangi had between 1-2 grass thatched houses within their homesteads while 23% of respondents in Kano compared to 45% of respondents in Budalangi had more than 3 grass thatched houses within their homesteads. This echoes the findings noted by Nethengwe (2007: 126-130), who found that households in a grass thatched houses were perceived to be more vulnerable to floods than households in a stone house (permanent house), whose housing structure represents high coping capacity and more resilience to flood hazards.

Figure 4.1: Grass thatched house in Lugale sub-location in Budalangi

Source: Field survey 2015

4.3.2 Acreage of land under agriculture

This study sought to find out how acreage of land owned under agriculture increases households' vulnerability to flooding. Acreage of land under agriculture owned by respondents is presented on table 4.3.2 below:

Table 4.3.2: Distribution of acreage of land under agriculture in Kano and Budalangi

Acreage of land under agriculture owned by households in Kano	**Respondents in Kano**	
	Frequency	**Percentage**
Less than one to 2 acres	84	55%
2-4 acres	50	33%
More than 4 acres	18	12%
Total	**152**	**100%**
Acreage of land under agriculture owned by households in Budalangi	**Respondents in Budalangi**	
	Frequency	**Percentage**
Less than one to 2 acres	87	56.4%
2-4 acres	59	38.3%
More than 4 acres	8	5.1%
Total	**154**	**100%**

Source: Field survey 2015

The assessment established that in Kano, a majority of the respondents 55% of the sample population owned less than 1 to 2 acres of land. The study also found that, 33% of respondents owned 2-4 acres of land while 12% of respondents owned more than 4 acres of land. Respondents in Kano reported that they practiced both subsistence and cash crop farming. Subsistence crops included: Maize, sorghum, pulses and tuber crops. They also raise livestock within these portions of lands. The study established that overstocking of livestock far in excess of the carrying capacity of the land was found to be a factor that increased flood hazard increasing their vulnerability.

Similarly, the assessment established that in Budalangi a majority of respondents 56% of the sample population owned less than 1 to 2 acres of land. This study supports a study conducted by Opondo (2013), who found that land holdings are generally small typically between 1-2 acres. The assessment also established that 38% of respondents owned 2-4 acres of land while 5% of respondents owned more than 4 acres of land under agriculture. Respondents reported

that, crop production was mainly for household consumption. They also kept livestock as a source of income and food and for cultural functions such as payment of dowry and sacrifices.

The findings in Kano and Budalangi as indicated on (section 4.2.4 above), were similar as majority of households in the two study areas had more than 5 family members most of whom live on and cultivate less than 1 to 2 acres of land. Majority of the households are headed by males, which imply a male dominated land ownership. The women, apart from those widowed, were found to have no rights to land therefore couldn't access credit where land can be used as collateral increasing their vulnerability.

From the findings above, it is evident that a majority of respondents owned less than one to two acres of land in the two study areas. This compares well with Jayne *et al* (2012), who found that over half of Kenya's rural population owned less than 1-2 acres of land under agriculture. This could also be attributed by the fact that over the past 50 years, evidence shows that rural population growth has out stripped the growth in arable land (CBS, 1997).

It is therefore assumed that, households with small land holdings for agriculture were likely to be vulnerable to flooding because as discussed in (section 4.9 above), they diversified their livelihood options. This finding supports (Toni *et al.,* 2008), who found that the perceived marginalized households used a range of livelihood options to reduce vulnerability. However, on the other end of the spectrum, households with larger farm size have been found to increase adaptive capacity hence reduces vulnerability (Reidsma *et al.*, 2009). It is important to note that being resource endowed does not necessarily mean that a household is less vulnerable to flooding.

4.3.3 Number of health facilities in Kano and Budalangi

The assessment sought to establish the number of health facilities in Kano and Budalangi and how they increase states of vulnerability to flood disaster. Current statistics indicate that Kano has 22 health facilities while Budalangi has 14 health facilities.

However through observation, the researcher identified 6 health care facilities in Kano namely: Ahero sub-district hospital and Ahero medical centre located in Ahero irrigation scheme sub-location, Magina dispensary located in Magina sub- location, Bunde dispensary and Kadinda health care located in Kochogo south sub-location while in Budalangi, the researcher identified 7 health care facilities namely: Budalangi dispensary and Maduwa dispensary in Budalangi sub-location, Rukala dispensary in Rukala sub-location, Sirimba dispensary in Rwambwa sub-location, Mukhobla health care in Magombe sub-location, Mabinju medical care and Victoria Medical health centre in Mabinju sub-location and Port Victoria sub-district hospital. Key informants' interviews with health officers in Kano and Budalangi established that on whole, Kano had 10 dispensaries compared to Budalangi, which had 6 dispensaries. One Key informant from Kano stated:

"This area has other health facilities. For instance, there are 8 health centers and there used to be 2 nursing homes. One of the two nursing homes Boya nursing home was closed and does not serve the locals anymore."- *Health officer Kakola sub-location*

The researcher observed in Kano the health care facilities were sparsely distributed however, respondents interviewed reported that there were private clinics within their sub-locations that were fairly distributed. Discussions with FGDs indicated that most of the health care facilities are not well equipped and do not have the capacity to take in many patients in cases where there is an outbreak of water borne diseases.

"The community in this area gets medical care from Bunde dispensary which also acts as an evacuation center becasue it never gets flooded and it is well equipped to handle water borne diseases and refer server cases to Ahero sub-district hospital or to Kisumu.." – A respondent from Kochogo South in Kano

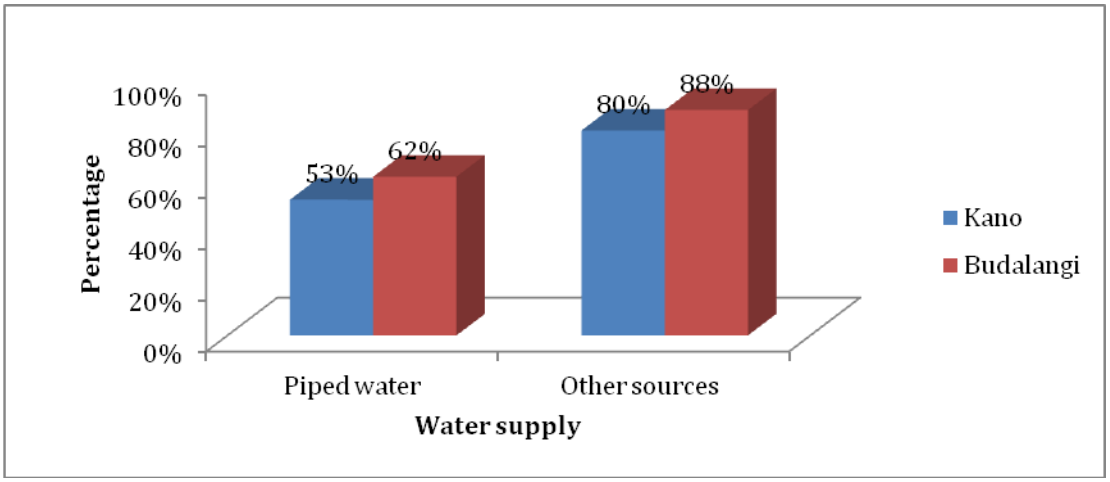
Upon comparison of the study established that health care facilities in Budalangi were sparsely distributed increasing their vulnerability to flooding because the health care facilities are far and during flooding they are unable to access health care in time because of the roads become impassable during the flooding period Discussions. Some of the health care facilities are not well equipped to handle serious emergency cases and do not have inpatient facilities. They also

do not have enough personnel, equipment and medicine making them susceptible to flood risks inceasing their vulnerability. This finding supports (Omuto, 2013), who found that lack of effective public health more so in the rural parts of Kenya has increased peopl'e vulnerability to extreme climatic events such as floods and droughts. Studies indicate that access to emergency and basic health care is becoming more inaccessible for the poor (Montgomery, 2009, Christian Aid, undated).

4.3.4 Water supply

Disasters threaten the extent of coverage and quality of water supply, including both loss of drinking water and the loss of water for domestic use and emergency response. The study assessed the vulnerability of water sources to flood impacts in Kano and Budalangi. Sources of water supply are presented in figure 4.8 below:

Figure 4.2: Water supply in Kano and Budalangi



Source: Field survey 2015

The findings of the study revealed that the main source of water supply in Kano and Budalangi is from other sources of water (free sources of water) which include (streams, rivers, springs, ponds, water pans and wells) where 80% of respondents in Kano compared to 88% of respondents in Budalangi have access and use this source of water. As was observed, residents rely on the free sources of water for domestic use such as cooking, drinking, and cleaning. These sources of water are unprotected therefore get contaminated by flood resulting to water borne diseases such as typhoid, cholera, dysentery, amoeba and spread of malaria.

It is expected that people who rely on free sources of water are more vulnerable since the most serious consequence of flooding is large-scale contamination of these sources of water. In such situation, water borne illnesses, usually associated with poor hygiene and sanitation can affect a large population (WHO, 1998).

The study found that 53% of respondents in Kano compared to 62% respondents of respondents in Budalangi reported that the locations they lived in were supplied with piped water. The study also found similarities in Kano and Budalangi of respondents who relied on piped water. They reported that when flooding occurs, piped water becomes scarce therefore they turn to other sources of water supply, which are usually unsafe. The assessment sought to establish the number of boreholes in communities in Kano and Budalangi. Table 4.3.3 below presents the number of boreholes in the two study areas:

Table 4.3.3: Distribution of number of boreholes in Kano and Budalangi

Number of boreholes	**Responses in Kano**		**Number of boreholes**	**Responses in Budalangi**	
	Frequency	**Percentage**		**Frequency**	**Percentage**
0-2	49	32%	0-2	32	21%
3-4	87	57%	3-4	85	55%
5 and above	16	11%	5 and above	37	24%
Total	**152**	**100%**	**Total**	**154**	**100%**

Source: Field survey 2015

The findings of the assessment established that 32% of respondents in Kano compared to 21% of respondents in Budalangi reported that they had 0-2 boreholes in the areas they lived in. Respondents who reported that they had 3-4 boreholes in the areas represented 57% of the sample population in Kano compared to 55% of the sample population in Budalangi. A small proportion 16% of respondents in Kano compared to 24% of respondents in Budalangi reported that the areas they lived in had 5 and more boreholes.

Figure 4.3: Borehole in a village in Kochogo South sub-location in Kano

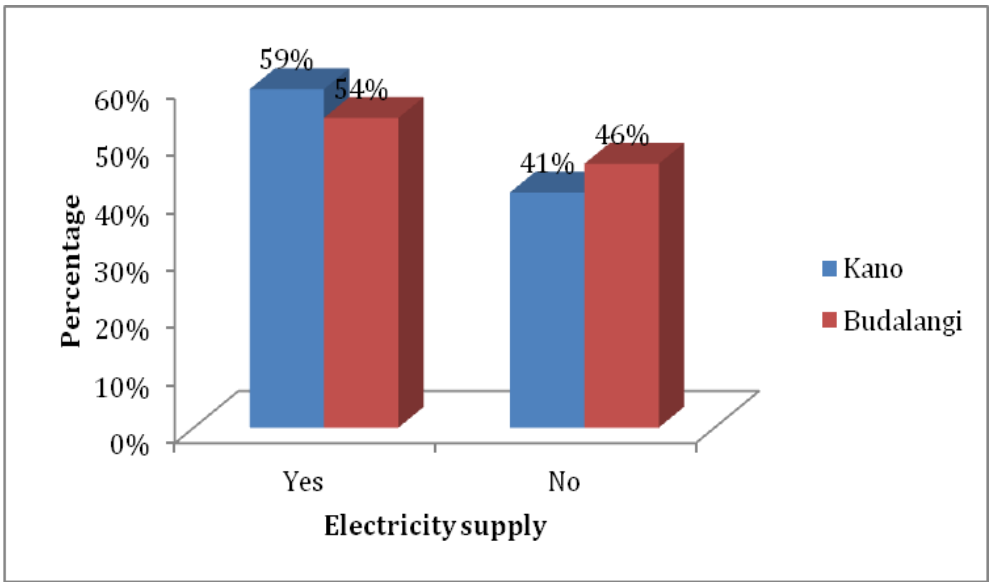
Source: Field survey 2015

Further discussions with FGDs in Kano and Budalangi established that access to clean piped water was generally a major problem and further diminished during flood season increasing their vulnerability to flooding.

4.3.5 Electricity supply in Kano and Budalangi

In rural Kenya, electricity supply is the third source of energy after fuel, wood and petroleum products. Through the VCA tool, the study sought to assess the vulnerability of electricity supply in Kano and Budalangi is presented in table Figure 4.4 below:

Figure 4.4: Electricity supply in Kano and Budalangi



Source: Field survey 2015

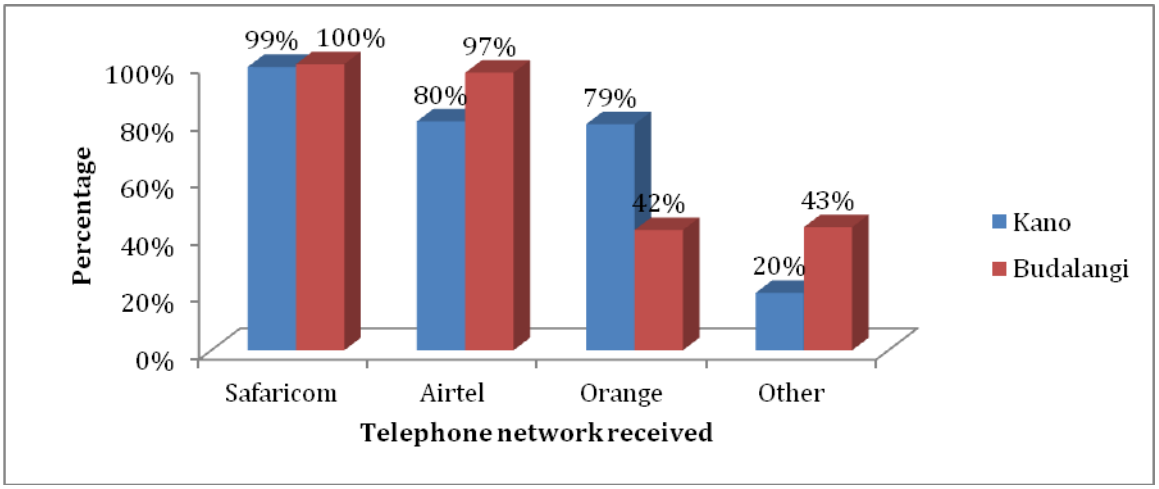
The assessment established that 59% of respondents in Kano compared to 54% of respondents in Budalangi reported that the communities are supplied by electricity whereas 41% of respondents in Kano compared to 46% of respondents in Budalangi reported that their locations were not supplied with electricity.

Combined data revealed that 57% of the sample population in Kano and Budalangi reported that their communities are supplied with electricity while 43% reported that the locations they live in are not supplied with electricity. It is important to note that however a majority of the respondents lived in areas supplied with electricity, some of them did not have electricity supply connected to their homes. This could be explained by the fact that, most people lack resources to cover capital and operating cost for generation, transmission and distribution of electricity. Moreover, high connection costs coupled with low consumption of electricity and low incomes among rural households are further obstacles of electrification of these households (Abdullah *et al.,* undated).

4.3.6 Communicaton network

Vulnerability to disasters can also be understood in terms of functionality related to communication. The assessment of this study sought to establish how communication infrastruction increases vulnerability to flooding in Kano and Budalangi. The distribution of telephone and radio networks recieved are presented in figure 4.5 below:

Figure 4.5: Telephone networks received in Kano and Budalangi



Source: Field survey 2015

It is evident from figure 6 above that household in the two study areas rely on mobile phones for communication. The study found that a majority of the respondents 99% of the sample population in Kano compared to a majority 100% of the sample populations in Budalangi reported that they received Safaricom network and it was the most used because it is reliable and stable. This finding supports report that Safaricom network is the largest telephone operator in Kenya (Hodjes et al 2014). Additionally, the network offers M-pesa services through its wide network agents and it's widely used to transfer money.

Airtel was the second most received telephone network in the two study areas with 80% of respondents in Kano and 97% of respondents in Budalangi. Airtel network is the second largest network received across Kenya with 7.6 million subscribers (Parrin, 2014). Just like Safaricom's M-pesa system, Airtel Kenya has established Airtel Money also used to transfer money.

Respondents in Kano who used Orange network (Telkom Kenya) represented 79% compared to respondents in Budalangi who represented 42%. According to Parrin (2014), Orange is the third most received and used network in Kenya with 3.4 million subscribers.

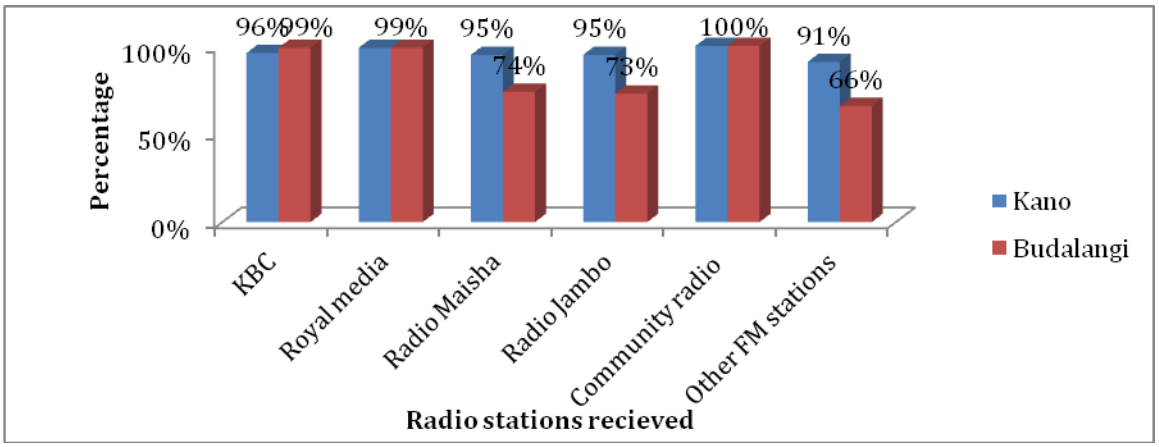
'Other' networks received in Kano included YU while in Budalangi, aside from receiving YU network, other parts received telephone networks from Uganda such as Airtel Uganda, MTN and UTL. It was noted that 20% of respondents in Kano compared to 43% of respondents in Budalangi received 'other' telephone networks while 80% of the respondents did not receive YU network in Kano compared to 57% respondents in Budalangi.

The study found similarities in the two study areas. Respondents reported that mobile networks were not affected during flooding. All the 6 FGDs in Kano and Budalangi supported this finding. They mentioned that the main effective mode of communication was mobile phones and when floods occur, they are not affected. This finding is contrary to Townsend *et al* (2005), who found that disasters result to disruption in supporting network infrastructure and network congestion increasing vulnerability of the affected population.

4.3.6.1 Radio networks

The vulnerability assessment sought which radio stations were received in Kano and Budalangi. Radio is an important means of early warning because using the local language to disseminate information gives more opportunities to many illiterate people to understand what is happening regarding natural hazards in their areas and find out what to do or where to go (FAO, Undated). The distribution of radio stations received is presented in figure 4.6 below:

Figure 4.6: Radio networks received in Kano and Budalangi



Source: Field survey 2015

The findings indicate that 96% of respondents in Kano compared to 99% of respondents in Budalangi received KBC radio station. An equal percentage of respondents 99% in Kano and Budalangi received royal media radio stations. Royal Media station received in Kano is Ramogi FM while in Budalangi is Mulembe FM. Both radio stations disseminate early flood warning.

Respondents who reported that they received radio Maisha radio station represented 95% in Kano compared to 74% of respondents in Budalangi. Respondents who received radio Jambo in Kano represented 95% compared to respondents in Budalangi who represented 73%.

An equal percentage of 100% of respondents in Kano and Budalangi received community radio. Community radio stations in Kano include Nam Lolwe and radio Lake Victoria that is both broadcasted in dhloluo while in Budalangi; respondents received Bulala FM, which is broadcasted in Kinyala. The community radio stations disseminate flood warning information. However, at the time of the survey, the study found that Bulala FM was not operating; this increased the community's vulnerability tremendously. Respondents who received other FM stations in Kano represented 91% compared to respondents in Budalangi who represented 66%. The assessment established that in Budalangi reported that Bulala FM the community radio station that disseminates early warning was not operating at the time of the research increasing vulnerability of households.

A discussion with participants in FGDs with the youth in Kano reported that they listened to FM stations such as Kiss, Capital, and Nation FM purely for entertainment. They stressed that the FM stations did not disseminate flood alerts and early warning. Comparatively, FGDs with the youth in Budalangi reported that they listened to royal media radio stations more. Furthermore, the participants in Kano reported that those who could access Internet via phone, could access information about flooding in Budalangi and vice versa. This finding is consistent with a study (Omuto, 2013), which found that lack of access to a reliable communication network has increased the risk and vulnerability of the population to extreme climatic events since the affected populations cannot be mobilized rapidly.

4.3.7 Transport and Road Network

Transport and road networks are vulnerable to natural disasters such as floods; earthquakes and forest fires, which can cause immense damage to the infrastructure resulting in adversely affected travel on the degraded network. Typically after the occurrence of an event some places become less accessible e.g. following a bridge collapse due to an earthquake in Kobe (Chang *et al.,* 2001).

Through observation, the researcher noted that the main type of transport in sub-locations in Kano and Budalangi was "bodaboda" (motorcycle) which were easily available, cheaper and could access areas with no roads whereas motor vehicles were in the main centers of Ahero town in Kano and Port Victoria in Budalangi.

The researcher also observed that the road network in Kano and Budalangi was seasonal / earth type of road which were observed to be rapidly deteriorating after the floods subsided. Regular flooding in the study areas left many roads in deplorable states and impassable during rainy seasons affecting accessibility during emergencies increasing vulnerability of the affected populations. The researcher observed that roads that were impassable due to flooding included: Ahero-Magina road; Ahero -Bunde-Obumba road. Roads that were destroyed due to floods included: Boya-Oren road. This finding is consistent with flood assessment conducted by KRCS (2010). The roads that were observed to be impassible in Budalangi due to flooding included: Rukala-Mabinju-Lugale road; Rwambwa- Mudembi road; Rwambwa-Magombe road.

There was only one all weather/ tarmacked road that connects Ahero-Kisumu road, Ahero-Awasi and Ahero- Katitto and Ahero-Kisii/Homabay roads. While in Budalangi, the main all weather/ tarmacked road connects Port-Victoria- Bumala road that connects to the main Kisumu- Busia road. This finding is consistent with a study conducted in Nepal by Upadhyaya (2009), who found that due to flooding, most villages become isolated from major service centers increasing their vulnerability to flooding. The researcher also observed residents of Budalangi, also used boats to cross River Nzoia and small streams. This mode of transport was found to increase their vulnerability because the boats used are not able to brace strong winds resulting to their capsizing and drowning of persons,
One respondent in Budalangi reported that:

In December 2013, 8 people drowned while crossing River Nzoia to the side that connects to port Victoria town. This was tragic, when the president visited the area, he provided us with life jackets and promised us that the government will construct a bridge connecting the two areas since the mode of transport is boat and majority of us cross over to town daily."

The study established as mentioned above that there were similarities in factors that contribute and increased states of vulnerability in the two study areas. However, the Vulnerability capacity assessment revealed that the community in Budalangi was more vulnerable to flood disaster. As mentioned above, majority of the households in Budalangi had more grass-thatched shelter, few health facilities; most of the roads are all weather. Additionally, the researcher observed that at the time of the research, most land (agricultural land) were still submerged from the last devastating floods of 2013 affecting households that relied on farming decreasing food security increasing poverty compared to Kano which had more semi-permanent shelter which were modified to withstand flooding to a certain level, the study area had more health facilities which were found to be accessible.

Furthermore, the study found that the two study areas had similar factors that contribute to increase states of vulnerability. The study revealed that, demographic factors as mentioned in section 4.2 above contributed to the households' states of vulnerability. The VCA also revealed that majority of the households owned 2-4 acres of land which they practice both

subsistence and cash crop farming. Although the two study areas had electricity supply, majority of the respondents reported that they were not connected. The two study areas received similar telephone networks, which do not get affected by floods, as well as radio networks.

4.4 COPING STRATEGIES

The findings presented in this section address the second objective of this study which is to identify coping mechanisms employed by the community during floods in the two study areas. These coping strategies fall into four major categories namely: economic, social/ organizational, technological, and cultural as identified by Twigg (2004).

4.4.1 Economic coping strategies in Kano and Budalangi

To assess the awareness of the respondents on the economic coping strategies employed, the respondents were asked to state which economic coping mechanisms they employed. The study revealed (see table 4.2.1) the following as the economic coping strategies employed by households in Kano and Budalangi:

1. Engaging in more than one source of income
2. Having large families with more adults
3. Having a savings and or a credit scheme and;
4. Employing negative economic coping strategies.

Section 2.8 of this thesis elaborates on how the above are useful economic coping strategies. The frequencies with regard to these strategies are presented below:

4.4.1.1 Engaging in more than one source of income

Engaging in more than one source of income determines a wide range of factors such as ability of households to access credit (Dercon and Krishnan, 1996 cited in Hussein and Nelson, 1999). Distribution of large households with more than one source of income is presented in table 4.4.1.1 below:

Table 4.4.1.1: Distribution of households that have more than one source of income in Kano and Budalangi

Households that have more than one source of income in Kano	**Frequency**	**Percentage**
Yes	80	53%
No	72	47%
Total	**152**	**100%**
Households that have more than one source of income in Budalangi	**Frequency**	**Percentage**
Yes	102	66%
No	52	34%
Total	**154**	**100%**

Source: Field survey 2015

The data presented in the table above shows that 53% of the respondents in Kano as compared to 66% of the respondents in Budalangi had more than one source of income. It was noted that 47% of respondents in Kano compared to 34% of respondents in Budalangi had only one source of income. Upon comparison, the study found similarities in sources of income in Kano and Budalangi and that they are not mutually exclusive and there are overlaps since most of the households surveyed engaged in other income generating activities aside from agriculture.

Diversity of economic activities within a household enhances resilience of flood prone livelihood by spreading risk and increasing the options for substitution between diverse livelihood components (Ellis 2000). Additionally, Kerner and Cook (1991), Murray (1981), and Mbithi and Wisner (1973) had found in their research that households that engaged in agriculture fended off vulnerability by diversifying income sources by engaging in non-farm activities.

4.4.1.2 Having large families with more adults

The study examined how large families with more adults enabled a household to cope during flooding in the two study areas. Distribution of large households with more adults is presented in table 4.4.1.2 below:

Table 4.4.1.1: Distribution of large households with adults in Kano and Budalangi

Households that have large families with more adults in Kano	**Frequency**	**Percentage**
Yes	24	16%
No	128	84%
Total	**152**	**100%**
Households that have large families with more adults in Budalangi	**Frequency**	**Percentage**
Yes	25	16%
No	129	84%
Total	**154**	**100%**

Source: Field data 2015

When it comes to looking at large households with more adults as a coping strategy, the study found that equal percentage of respondents (16% each) in Kano and Budalangi had large families with more adults. An equal percentage (of 85%) of respondents in Kano and Budalangi did not have large families with more adults. Literature argues that such households (households with more adults) are better placed when flooding occur, as they provide additional labor and manpower. (Twigg, 2004:134).

4.4.1.3 Having a savings and or a credit scheme

Additionally, the study sought to establish how having a savings and credit scheme enabled households to cope with flood disaster. The distribution of households with a savings and credit scheme is presented on table 4.4.1.2 below:

Table 4.4.1.2: Distribution of households with a savings and credit scheme in Kano and Budalangi

Households with a savings and credit scheme in Kano	**Frequency**	**Percentage**
Yes	112	74%
No	40	26%
Total	**152**	**100%**
Households with a savings and credit scheme in Budalangi	**Frequency**	**Percentage**
Yes	79	51%
No	75	49%
Total	**154**	**100%**

Source: Field survey 2015

Looking at savings and credit schemes as a coping strategy, the study found that respondents who had a savings and credit schemes in Kano represented 74% compared to 51% of respondents in Budalangi. Combined results of the survey revealed that 191 (62% of the sample population) had a savings and credit scheme while 115 (38% of the sample population) did not have a savings and credit and credit scheme.

Household with savings are less vulnerable to future poverty due to disasters compared to households without savings. The presence of savings indicates the household is able to smooth their consumption in the presence of shocks enabling them to bounce back from disaster. Consistent with findings from across the world, self-insurance mechanisms decrease the likelihood of shocks acting as poverty traps. Literature (Decron, 2002), savings and credit schemes are important mechanisms for reducing vulnerability as it provides access to other forms of capital. It can be effective in reducing.

4.4.1.4 Employing 'Other' economic coping strategies

Employing 'other' coping strategies, were viewed as negative or erosive coping strategies, was also established in the study. The distribution of other or negative economic coping strategies is presented in table 4.4.1.3 below:

Table 4.4.1.3: Distribution of "other" economic coping strategies employed in Kano and Budalangi

'Other' economic coping strategies employed by households in Kano	**Frequency**	**Percentage**
Yes	90	59%
No	62	41%
Total	**152**	**100%**
'Other' economic coping strategies employed by households in Budalangi	**Frequency**	**Percentage**
Yes	87	56%
No	67	44%
Total	**154**	**100%**

Source: Field data 2015

The study found that respondents in Kano and Budalangi 59% and 56% respectively adopted these strategies clarified as 'others'. It was also noted that 41% compared to 44% of respondents in Kano and Budalangi respectively did not employ these strategies employed as 'others'. This implies that a majority of the respondents in the two study areas used 'others' as a coping strategy further implying that many are able to bounce back from flood disaster.

In the table above the data lists negative strategies as adopted by respondents. This includes: reducing expenditure for education, rationing of food by reducing the quantity and frequency and number of meals for both children and adults due to food shortage, sale of productive assets. More consistent with literature is the finding that coping strategies, which more unambiguously erode the households stock of productive assets are seldom chosen. Among these are strategies involving disruption of children's education (Barham *et al.*, 1994). There is also strong evidence from the survey that strategies involving reducing household consumption, reducing expenditure and sale of assets. According to Gillard *et al* (2008); found that disaster victims in Philippines relied on assistance, storied basic food items such as rice and sugar; sold household property/assets such as mobile phones; bicycles at cheap prices; sale of livestock; children dropped out or were withdrawn from school to help with domestic chores while some households sent their children to live with relatives who reside in non-flood locations (Hurearea *et al.*; 2010).

4.4.2 Social coping strategies

Social coping strategies in this study identify the family as a fundamental social mechanism for reducing risks. Extended kin relations were identified as networks for exchange, mutual assistance and social contact (Twigg, 2004). NGOs and government support were also identified as coping strategies employed by households (Nyakundi, 2010). The study revealed the following as the social coping strategies employed by households in Kano and Budalangi:

1. Mutual assistance
2. Support from NGOs
3. Support from government

The study observed through Key Informant Interviews and respondents that NGO support included relief distribution of food and non-food items from relief agencies such as Kenya Red Cross Society, USAID, VIRED, CREPP, World Vision, ADRA Busia Community Development Organization (BUCODEV), UNICEF, and World Food Programme (WFP).

The study observed that through Key Informant Interviews and respondents that government support included food and non-food items as well and relief was distributed through government institutions such as Ministry of Health, Agriculture, Special programmes and Water and Irrigation.

4.4.2.1 Mutual Assistance

Mutual assistance in this study included support from kin, neighbors and friends. A social and kinship tie plays a crucial role in minimizing vulnerability, especially at the time of crop failure and loss of all properties due to disasters (Ribot, 2009). Respondents reported that they borrowed money, food and also temporarily located to their homes. Mutual assistance is presented on table 4.4.2.1 below:

Table 4.4.2.1: Distribution of households that depend on mutual assistance in Kano and Budalangi

Mutual assistance (From Neighbors and Kin) to households in Kano	**Frequency**	**Percentage**
Yes	128	84%
No	24	16%
Total	**152**	**100%**
Mutual assistance (From neighbors and Kin) to households in Budalangi	**Frequency**	**Percentage**
Yes	115	75%
No	39	25%
Total	**154**	**100%**

Source: Field survey 2015

A comparison of the study indicated that 84% of respondents in Kano compared to 75% of respondents in Budalangi rely on mutual assistance. It was noted that a small proportion 16% of the sample population in Kano compared to a quarter 25% of the sample population in Budalangi did not depend on mutual support. Respondents reported that besides receiving aid in kind or cash, they also borrowed money and food from relatives, neighbors and friends. This

finding is consistent with findings by Johan, (2000); Few *et al.* (2004); Sharma, (2000), borrowing and selling of assets by families in distress are coping actions.

Interestingly, majority of the respondents in the two study areas reported that households that seek assistance from relatives and neighbors did not get relief from NGOs and government while others did but in little quantities.

4.4.2.2 Non-governmental support

Support from NGOs in this study focuses on the kind of assistance provided to the affected communities and how effective the support is in enabling the affected populations cope with flooding. The distribution of households that get support from NGOs is presented on table 4.4.2.2 below:

Table 4.4.2.2: Distribution of households that depend on support from NGOs in Kano and Budalangi

Support from Non-governmental Organizations in Kano	**Frequency**	**Percentage**
Yes	71	47%
No	81	53%
Total	**152**	**100%**
Support from Non-governmental Organizations in Budalangi	**Frequency**	**Percentage**
Yes	127	82%
No	27	18%
Total	**154**	**100%**

Source: Field survey 2015

Respondents who received support from NGOs in Kano represented 47% of the sample population compared to respondents in Budalangi who represented 82% of the sample population. It was noted that 53% of the sample population in Kano compared to 18% of the sample population in Budalangi did not depend on aid from NGOs.

Respondents received relief in terms of food such as Maize, beans, rice, cooking oil and salt and Non-food items such as tents, mosquito nets, jerry cans, blankets, mattress water, purifying tablets, medicine, cooking utensils, and mobile toilets (Humanitarian Charter and Minimum

Standards in Disaster Response, 2004; Disaster Preparedness and Prevention Agency, 2006). One respondent in Kano reported:

"In the aftermath of floods, we receive food such maize, beans, rice, cooking oil, blankets, mosquito nets and tents from NGOs like Kenya Red Cross, VIRED, ADRA and World Vision. I would say we are lucky because these NGOs do not discriminate when distributing food and other items. They also help us evacuate to camps set up by them and the government"

FGDs in Kano reported that the major non-governmental organizations contributors during flood disasters include: Kenya Red Cross, VIRED, CREPP, World Vision and ADRA. Kenya Red Cross, World Vision and ADRA mainly provide temporary shelter and distribute food, blankets, water purifying tablets and mosquito nets. VIRED International has a food-for-work flood initiative that engages the local community in digging proper drainage systems, de-silting existing trenches and digging dams. CREPP encourages tree planting by distributing seedlings to schools and village youths. While all FGDs in Budalangi revealed that NGOs/CBOs that provided assistance include: Kenya Red Cross, Action Aid, USAID, and Busia Community Development Organization (BUCODEV), UNICEF, and World Food Programme (WFP). The Catholic Church was identified as the main religious organization that provided emergency assistance to flood victims.

Findings from the study revealed that most relief agencies were offering emergency supplies, but were reluctant to invest in pre-disaster and post-disaster phases. The main explanation for this was lack of funding for long-term projects. Key informants in the Kano felt the government-sponsored food for work program was creating a dependency syndrome. This finding concurs with Nyakundi *et al* (2010), who found that reliance on the government to offer relief before a disaster strikes is an expression of dependency syndrome in Kenya's flood prone areas.

4.4.2.3 Government support

The study sought to establish the effectiveness of government support to flood victims in Kano and Budalangi during flooding. The distribution of households that reported that they get support from the government is presented on table 4.4.2.3 below:

Table 4.4.2.3: Distribution of households that depend on support from the government

Support from government for households in Kano	**Frequency**	**Percentage**
Yes	63	41%
No	89	59%
Total	**152**	**100%**
Support from government for households in Budalangi	**Frequency**	**Percentage**
Yes	82	53%
No	72	47%
Total	**154**	**100%**

Source: Field survey, 2015

Respondents who received support from the government in Kano represented 41% of the sample population compared to respondents in Budalangi who represented 53% of the sample population. Residents in the two study areas highlighted that the government provided food such as: maize, beans, rice, cooking oil and drinking water and non-food items such as: mosquito nets, blankets, mattresses and safe grounds. A key informant from KRCS who stated that:

"Through line ministries and local administration worked closely with humanitarian agencies such as KRCS, VIRED and World Vision in managing displaced households in evacuation centers during distribution of relief food and non-food items and sensitizing the affected population on proper hygiene and sanitation. Through the Ministry of Health, the government conducted public health campaigns and awareness. Aside from this, the government also provided supply of water treatment chemicals as well as security."

Despite receiving support from the government, a majority of the respondents from the two study areas felt that the aid from government was insufficient hence could not support and sustain a family and inappropriately handled and distributed (Influenced by corruption and political affiliation). A study carried out in Krishna District West, Bengal by Nayak (2007) described a similar circumstance in which people were anxious to get relief material but there were lots of complaints from the people that relief material had not so far reached them.

This finding was also supported by FGD in Kabonyo sub-location in Kano who confirmed that relief distribution in the area is done by government officials who take relief for themselves in

large quantities while they give the affected households very little. Some unlucky households end up missing. FGD in Rukala and Lugale sub-locations in Budalangi also confirmed the above findings from the household survey. They reported that relief distribution in the area depends on a household political affiliation. The study also found that among the government institutions that provide assistance in the two study areas are Ministries of water, Ministries of health, Ministries of Agriculture, provincial administration, defense and special programmes.

4.4.3 Technological coping strategies

Technological coping strategies in this study focused on the structural activities employed by households living in flood prone locations to cope with flood losses/ damages. The structural activities identified (through direct observation) in the two study areas included; type of materials used for construction to minimize flood damages and the way people construct their houses. The study revealed the following as the technological coping strategies employed by households in Kano and Budalangi:

1. Using reinforcement
2. Building houses on silt, plinth/platforms of mud/concrete

An obvious technological coping strategy observed was the way housing in the two study areas were constructed to adapt to floods. Most houses in the two study areas were built on platforms of mud or concrete so that they remain above flood levels. A few houses were reinforced with strong timber with walls plastered with cement while most houses as observed used simple and substandard material to build as they could not afford quality material increasing their vulnerability to floods. Respondents from Kano and Budalangi respectively stated:

"My house is built with mud and timber; it is not as strong as you can see parts of my house are damaged. Aonge gi nyalo mar gero ot motegno (I don't have resources to reinforce it or build a stronger house). Sometimes when floods occur floods occur, my house collapses because it cannot withstand the pressure."- A respondent from Kano

"Every time floods occur, my house is destroyed because I don't have money to build a strong house so I use what I can afford which is usually not good quality."- A respondent from Budalangi

However, a comparison, the researcher observed that some houses in Budalangi were built on stilt allowing flood water to pass underneath while in Kano no house was build on stilt. This finding supports (Twigg, 2004; Douglas *et al*., 2008)

4.4.4 Cultural coping strategies

Cultural coping strategy is related to risk perceptions and religious views (Twigg, 2004). This gives a picture on how local knowledge relates to flood disaster. Local knowledge in this study focused on indigenous/ traditional knowledge of floods. The study found that cultural coping strategies employed included:

4.4.4.1 Risk perceptions

Risk perception refers to the intuitive risk judgment of individual and social groups in the context of limited and uncertain information (Slovic, 1987). People's perception of flood risk determines their coping strategies.

The study found similarities in risk perceptions in Kano and Budalangi. Respondents who had experience with floods were more likely to expect that floods would reappear and consequently they act protectively. Households relied on traditional knowledge, which slightly varied in the two study areas.

In Kano, respondents revealed that they monitored movement of the river to know when floods would occur. Bursting of the riverbanks due to the heavy rains in the area and runoff from Nandi Hills were reported as one of the main causes of flooding in the area. Another sign was change in the color of the river. As described by a village elder:

"We know when floods are approaching especially when the color of the river turns dirty brown and floating of debris, the level of the river increases, and the noise level of the river

increases. This signs enable us prepare for floods by putting up appropriate coping strategies such us modifying our houses by raising the foundations."

Participants from FGDs also highlighted other indicators such as loud persistent croaking of frogs, movement of ants to higher grounds; strong winds blowing from the river to the hills; river turns dirty brown; level of river rises and knowledge of the flood cycle. This finding supports a study by Nyakundi *et al* (2010) that showed that traditional knowledge enabled people to cope with floods.

Similarly in Budalangi, respondents mentioned that they monitored the river as an indicator of approaching floods. The household survey results revealed that they used traditional knowledge to monitor onset of floods. Among the techniques identified included: Change of color of river and floating debris, behavior of animals (croaking of frogs at night, migration of birds and sighting of *Ikhwasi* a type of eagle, appearance of safari ant in homesteads) and riverbanks and dark clouds in the direction of Mount Elgon. These traditional knowledge enabled households to make decisions such as where they would relocate during floods or seek alternative shelter, store food. The findings are consistent with findings of MRDC (2014).
All FGDs in Kano and Budalangi revealed that in their communities, elders both male and female predict flood disasters through monitoring the progression and giving advice, which govern the behavior of the community. This finding is similar to a study conducted by UNEP (2008).

4.4.4.2 Religious coping strategies

On religious views, many respondents in Kano and Budalangi relied on the church to enable them cope with flood impacts. They reported that the church provides Food and Non-food items, provides counseling and emotional support during flooding events. As described by one respondent:

"As Christians, whenever there is flooding, we do not only go to church for spiritual assistance but we also receive assistance in terms of food and other items."

Conversely, religious activities such as prayers and collective gathering are part of long term coping strategies to natural hazards (Berkes 1999, p22).

4.5 COPING STRATEGIES AND DEMOGRAPHIC VARIABLES

As noted in section 4.2, the demographic component of this study was used to determine states of vulnerability. In the preceding section, respondents coping strategies have been highlighted. It would now be of interest to relate these two variables. It would be of interest to see the level at which the demographic variables relate to the coping strategies. This will add more value to the research.

Therefore gender will be related to economic and social coping strategies, age will be related to economic and social coping strategies, marital status will be related to economic and social coping strategies, household size will be related to economic and social coping strategies, level of education will be related to economic and social coping strategies and level of income will be related to economic and social coping strategies. Combined data (i.e., data from Kano and Budalangi put together) will be used to relate the above variables.

4.5.1 Gender of respondents and economic coping strategies employed

This study sought to find out if there was a correlation between gender of the respondents and the economic coping strategies employed. Gender of the respondents and economic coping strategies (having more than one source of income, having large families with more adults, having a savings and credit scheme and safety nets and employing 'other' economic strategies) employed are presented below:

4.5.1.1 Gender of respondents and having more than one source of income

To assess the relationship between gender and having more than one source of income to cope with floods, a chi square test was conducted in a cross-tabulation of gender and households with more than one source of income as shown on table 4.5.1.1:

Table 4.5.1.1: Gender and households with more than one source of income in Kano and Budalangi

Gender of respondents	Households with more than one source of income in Kano and Budalangi		
	Yes	**No**	**Total**
Male	115	64	179
Female	68	59	127
Total	**183**	**123**	**306**
$\chi 2$ =3.56, degree of freedom=1, level of significance=0.05, critical limit=3.84			

Source: Field survey 2015

Results of the chi square test ($\chi 2$ =3.56) is less than the critical limit 3.84 at 1 degree of freedom indicating that there was no association at 0.05 levels of significant between gender and having more than one source of income as a coping strategy in Kano and Budalangi. This means that gender and having more than one source of income, as a coping strategy is not associated therefore the two variables should be treated separately.

The lack of association from the chi square results could be attributed to the fact that female headed households were found engage in agricultural activities than male headed households because they rely on one source of income due to lack of resources and they exhibited a narrow range of non-agricultural activities because. On the other hand, male-headed households were found to engage in non-agricultural activities to earn more income.

4.5.1.2 Gender and savings and credit scheme

To assess the relationship between gender and having a savings and or a credit scheme to cope with floods, a chi square test was conducted in a cross-tabulation of gender and households with a savings and credit scheme as shown on table 4.5.1.2:

Table 4.5.1.2: Gender and having a savings and credit scheme in Kano and Budalangi

Gender of respondents	Households with a savings and a credit scheme in Kano and Budalangi		
	Yes	**No**	**Total**
Male	114 (64%)	65(36%)	179
Female	76(60%)	51(40%)	127
Total	**190**	**116**	**306**
$\chi 2$ =0.50, degree of freedom=1, level of significance=. 05, critical limit=3.84			

Source: Field survey 2015

Results of the chi square test ($\chi 2$ =0.50) is less than the critical value 3.84 at 1 degree of freedom indicating that there was no association at 0.05 levels of significant between gender of respondents and having a savings and or credit scheme. The two variables are not associated therefore they should be treated separately.

4.5.1.3 Gender and "other' or negative economic coping strategies employed

To assess the relationship between gender and employing negative economic strategies to cope with floods, a chi square test was conducted in a cross-tabulation of gender and employing other economic coping strategies as shown on table 4.5.1.3:

Table 4.5.1.3: Gender and employing other economic coping strategies in Kano and Budalangi

Gender of respondents	**Other economic coping strategies employed by households in Kano and Budalangi**		
	Yes	**No**	**Total**
Male	86 (48%)	92(52%)	178
Female	62(49%)	66(51%)	128
Total	**148**	**158**	**306**
$\chi 2$ =0, degree of freedom=1, level of significance=. 05, critical limit=3.84			

Source: Field survey 2015

The chi square test ($\chi 2$ =0) was less than the critical value 3.84 at 1 degree of freedom indicating that there was no association at 0.05 level of significant between gender and employing other economic coping strategies in Kano and Budalangi. We conclude that the two variables are independent therefore they should be treated separately.

4.5.2 Gender of respondents and Social coping strategies employed

This study sought to find out if there was a correlation between gender of the respondents and the social coping strategies employed. Gender of the respondents and social coping strategies such as depending on NGO support e are presented below:

4.5.2.1 Gender and depending on NGO support

To assess the relationship between gender and depending on NGO as a flood coping strategy, a chi square test was conducted in a cross-tabulation of gender depending and depending non-governmental support on table 4.5.2.1

Table 4.5.2.1: Gender and depending on NGOs as a social coping strategy

Gender of respondents	**NGO support of households in Kano and Budalangi**		
	Yes	No	Total
Male	116(65%)	62(35%)	178
Female	82(64%)	46(36%)	128
Total	**198**	**108**	**306**
$\chi 2$ =8.73, degree of freedom=1, level of significance=. 05, critical limit=3.84			

Source: Field survey 2015

The chi square test results ($\chi 2$ =8.73) is more than the critical value 3.84 at 1 degree of freedom indicating that there was an association at 0.05 level of significant between gender and depending on relief/aid from NGOs in Kano and Budalangi. We conclude that the two variables are dependent or associated. This finding could be attributed to the fact that female-headed households are prioritized because they are more vulnerable due to gender differences and inequalities as mentioned on section 4.2.1 above.

4.5.3 Age and social coping strategies employed

This study sought to find out if there was a correlation between age of the respondents and the social coping strategies employed. Age of the respondents social coping strategies (mutual assistance, support from NGOs and government and other stakeholders) employed are presented below:

4.5.3.1: Age and dependence on mutual assistance

To assess the relationship between age and dependence on mutual assistance as a coping strategy, a chi square test was conducted in a cross-tabulation of age and dependence on mutual assistance is presented in table 4.5.3.1 below:

Table 4.5.3.1: Age of assistance and depending on mutual assistance

Age of respondents	Dependence on mutual assistance in Kano		
	Yes	**No**	**Total**
< 20 years	16(84%)	3(16%)	**19**
20-29 years	49(80%)	12(20%)	**61**
30-39 years	70(77%)	21(23%)	**91**
40-49 years	58(83%)	12(17%)	**70**
>50 +years	51(78%)	14(22%)	**65**
Total	**244**	**62**	**306**
$\chi 2$ =2.42, degree of freedom=4, level of significance=. 05, critical limit=9.49			

Source: Survey data 2015

The data results ($\chi 2$=2.42) was less than the critical value 9.49 at 4 degrees of freedom indicating that there was no association at 0.05 level of significant between age of respondents and depending on mutual assistance in Kano and Budalangi. The two variables are not associated therefore they should be treated separately.

4.5.3.2 Age of respondents and dependence on support from NGOs

To assess the relationship between age and dependence on NGOs as a coping strategy, a chi square test was conducted in a cross-tabulation of age and dependence on NGOs is presented in table 4.5.3.2 below:

Table 4.5.3.2: Age of respondents and depending on support from NGOs

Age of respondents	Support from NGOs		
	Yes	**No**	**Total**
< 20 years	11(58%)	8(42%)	**19**
20-29 years	37(61%)	24(39%)	**61**
30-39 years	56(62%)	35(38%)	**91**
40-49 years	48(69%)	22(31%)	**70**
>50 +years	46(71%)	19(29%)	**65**
Total	**198**	**108**	**306**
$\chi 2$ =2.56, degree of freedom=4, level of significance=. 05, critical limit=9.49			

Source: survey data 2015

Results of chi square test ($\chi 2$ =2.56) was less than the critical value 9.49 at 4 degree of freedom indicating there was no association between age of respondents and depending on support from

NGOs at 0.05 level of significant in Kano and Budalangi. The two variables are not associated therefore they should be treated separately.

4.5.3.3 Age and support from government

To assess the relationship between age and dependence on government as a coping strategy, a chi square test was conducted in a cross-tabulation of age and dependence on government is presented in table 4.5.3.3below:

Table 4.5.3.3: Age and depending on support from government

Age of respondents	**Support from NGOs**		
	Yes	**No**	**Total**
< 20 years	8(42%)	11(58%)	**19**
20-29 years	28(46%)	33(54%)	**61**
30-39 years	41(45%)	50(55%)	**91**
40-49 years	33(47%)	37(53%)	**70**
>50 +years	36(55%)	29(45%)	**65**
Total	**146**	**160**	**306**
$\chi 2$ =1.97, degree of freedom=4, level of significance=. 05, critical limit=9.49			

Source: Field survey, 2015

The chi square test ($\chi 2$ =1.97) was less than the critical limit 9.49 at 4 degrees of freedom indicating that there was no association at 0.05 level of significant between age of respondents and getting support from the government in Kano and Budalangi.

4.5.4 Marital status and Economic coping strategies

This study sought to find out if there was a correlation between marital status of the respondents and the economic coping strategies employed. Marital status of the respondents economic coping strategies (having more than one source of income, having large families with more adults, having a savings and credit scheme and safety nets and employing 'other' economic strategies) employed are presented below:

4.5.4.1 Marital status and households with more than one source of income

To assess the relationship between marital status of respondents and having more than one source of income, a chi square test was conducted in a cross-tabulation of marital status and having more than one source of income as presented in table 4.5.4.1 below:

Table 4.5.4.1: Marital status and households with more than one source of income

Marital status of respondents	Have more than one source of income		
	Yes	**No**	**Total**
Single	17(61%)	11(39%)	**28**
Married	124(66%)	65(34%)	**189**
Separated	5(25%)	15(65%)	**20**
Widowed	37(54%)	32(46%)	**69**
Total	**183**	**123**	**306**
$\chi 2$ =13.82, degree of freedom=3, level of significance=. 05, critical limit=7.82			

Source: Field survey 2015

Results of chi square test ($\chi 2$ =13.82) was more than the critical value 7.82 at 3 degrees of freedom indicating that there was a significant relationship at 0.05 level of significant between marital status of respondents and having more than on source of income in Budalangi. We conclude that the two variables are associated. This association could be attributed to the fact that households with both spouses are more likely to have different sources of income than single headed households.

4.5.5 Marital status and social coping strategies

This study sought to find out if there was a correlation between marital status of the respondents and the social coping strategies employed. Marital status of the respondents social coping strategies (having more than one source of income, having large families with more adults, having a savings and credit scheme and safety nets and employing 'other' economic strategies) employed are presented below:

Table 4.5.5.1: Marital status and NGO support

Marital status of respondents	Depending on NGO support		
	Yes	**No**	**Total**
Single	15(54%)	13(46%)	**28**
Married	123(65%)	66(35%)	**189**
Separated	15(75%)	5(25%)	**20**
Widowed	45(65%)	24(35%)	**69**
Total	**198**	**108**	**306**
$\chi 2$ =16.95, degree of freedom=3, level of significance=. 05, critical limit=7.82			

Source: Field survey 2015

The chi square test results ($\chi 2$ = 16.95) is less than the critical value 7.82 at 3 degree of freedom, indicating there was an association at 0.05 level of significant between marital status of respondents and depending on NGO support in Kano and Budalangi. We conclude that the two variables are dependent or associated. This association could be attributed to the fact that poor female headed households that are considered more vulnerable than other types of households.

4.5.6 Household size and economic coping strategies

This study sought to find out if there was a correlation between household size of the respondents and the economic coping strategies employed. Household size of the respondents economic coping strategies (having more than one source of income, having large families with more adults, having a savings and credit scheme and safety nets and employing 'other' economic strategies) employed are presented below:

4.5.6.1 Household size and large families with more adults

To assess the relationship between household size and having large families with more adults, a chi square test was conducted in a cross-tabulation of household size and having large families with more adults as presented in table 4.5.6.1 below:

Table 4.5.6.1: Household size and large families with more adults

Household size of respondents	**Have large families with more adults**		
	Yes	**No**	**Total**
1-3 people	12(20%)	48(80%)	**60**
4-6 people	22(14%)	138(86%)	**160**
7-10 people	14(18%)	66(82%)	**80**
Above 10 people	3(50%)	3(50%)	**6**
Total	**51**	**255**	**306**
$\chi 2$ =12.81, degree of freedom=3, level of significance=. 05, critical limit=7.82			

Source: Field survey 2015

The chi square test result ($\chi 2$ =12.81) is less than the critical value 7.82 at 3 degree of freedom. This indicates that there was no association between household size and having large families with more adults at 0.05 level of significant in Kano and Budalangi. We conclude that the two variables are independent or are not associated therefore they should be treated separately.

This association could be attributed to the fact that households that were large with more adults were more likely to have more sources income, as each adult was likely to pursue a different kind of income generating activity.

4.5.6.2 Household size and savings and credit schemes

To assess the relationship between household size and having a savings and credit scheme, a chi square test was conducted in a cross-tabulation of household size and having a savings and credit scheme as presented in table 4.5.6.2 below:

Table 4.5.6.2: Household size and having a savings and credit scheme

Household size of respondents	**Have a savings and credit scheme**		
	Yes	**No**	**Total**
1-3 people	40(67%)	20(33%)	**60**
4-6 people	103(64%)	57(36%)	**160**
7-10 people	44(55%)	36(45%)	**80**
Above 10 people	6(100%)	0(0%)	**6**
Total	**193**	**113**	**306**
$\chi 2$ =5.29, degree of freedom=3, level of significance=. 05, critical limit=7.82			

Source: Field survey 2015

The chi square test result ($\chi 2$ =5.29) is less than the critical value 7.82 at 3 degrees of freedom. This indicates that there was no association between household size and having savings and credit scheme with more adults at 0.05 level of significant in Kano and Budalangi. We conclude that the two variables are independent or are not associated therefore they should be treated separately.

4.5.7 Household size and social coping strategies

This study sought to find out if there was a correlation between household size of the respondents and the social coping strategies employed. Household size of the respondents social coping strategies (having more than one source of income, having large families with more adults, having a savings and credit scheme and safety nets and employing 'other' economic strategies) employed are presented below:

4.5.7.1 Household size and mutual assistance

To assess the relationship between household size and depending on mutual assistance, a chi square test was conducted in a cross-tabulation of household size and depending on mutual assistance as presented in table 4.5.7.1 below:

Table 4.5.7.1: Household size and mutual assistance

Household size of respondents	**Depending on mutual assistance**		
	Yes	**No**	**Total**
1-3 people	47(78%)	13(22%)	**60**
4-6 people	130(81%)	30(19%)	**160**
7-10 people	63(79%)	17(21%)	**80**
Above 10 people	4(67%)	2(33%)	**6**
Total	**244**	**62**	**306**
$\chi 2 = 1.65$, degree of freedom=3, level of significance=. 05, critical limit=7.82			

Source: Field survey 2015

Chi square test result ($\chi 2 = 1.65$) is less than the critical value 7.82 at 3 degrees of freedom. This indicated that that there was no association at 0.05 level of significant between household sizes and depending on mutual assistance in Kano and Budalangi. We conclude that the two variables are independent or are not associated therefore they should be treated separately.

4.5.7.2 Household size and support from NGOs

To assess the relationship between household size and depending on NGOS, a chi square test was conducted in a cross-tabulation of household size and depending on NGOs as presented in table 4.5.7.2 below:

Table 4.5.7.2: Household size and support from NGOs

Household size of respondents	**Depending on NGO assistance**		
	Yes	**No**	**Total**
1-3 people	36(60%)	24(40%)	**60**
4-6 people	97(61%)	63(39%)	**160**
7-10 people	61(76%)	19(24%)	**80**
Above 10 people	4(67%)	2(33%)	**6**
Total	**198**	**108**	**306**
$\chi 2 = 6.43$, degree of freedom=3, level of significance=. 05, critical limit=7.82			

Source: Field survey 2015

The chi square test result ($\chi 2$ =6.43) is less than the critical value 7.82 at 3 degrees of freedom. This implies that there was no association at 0.05 level of significant between household size and depending on NGO support in Kano and Budalangi. We conclude that the two variables are independent or are not associated therefore they should be treated separately.

4.5.7.3 Household size and support from government

To assess the relationship between household size and depending on government support, a chi square test was conducted in a cross-tabulation of household size and depending on government support as presented in table 4.5.7.3 below:

Table 4.5.7.3: Household size and support from government

Household size of respondents	**Depending on Government assistance**		
	Yes	**No**	**Total**
1-3 people	29(48%)	31(52%)	**60**
4-6 people	74(46%)	86(54%)	**160**
7-10 people	40(50%)	40(50%)	**80**
Above 10 people	3(50%)	3(50%)	**6**
Total	**146**	**160**	**306**
$\chi 2$ = 0.28, degree of freedom=3, level of significance=. 05, critical limit=7.82			

Source: Field survey 2015

The chi square test result ($\chi 2$ =0.28) is less than the critical value 7.82 at 3 degrees of freedom. This indicates that there was no association at 0.05 level of significant between household size and depending on government support in Kano and Budalangi. The two variables are not associated therefore they should be treated separately.

4.5.8 Level of education and economic coping strategies

This study sought to find out if there was a correlation between level of education of the respondents and the economic coping strategies employed. Level of education of the respondents economic coping strategies (having more than one source of income, having large families with more adults, having a savings and credit scheme and safety nets and employing 'other' economic strategies) employed are presented below.

4.5.8.1 Level of education and having more than one source of income

To assess the relationship between level of education and having more than one source of income, a chi square test was conducted in a cross-tabulation of level of education and having more than one source of income as presented in table 4.5.8.1 below.

Table 4.5.8.1: Level of education and having more than one source of income

Level of education of respondents	Households with more than one source of income		
	Yes	**No**	**Total**
No schooling	13(14%)	14(86%)	**27**
Primary school	77(61%)	50(39%	**127**
Secondary school	68(59%)	48(41%)	**116**
College/university	25(69%)	11(31%)	**36**
Total	**183**	**123**	**306**
$\chi 2 = 2.46$, degree of freedom=3, level of significance=. 05, critical limit=7.82			

Source: Field survey 2015

The chi square test ($\chi 2 = 2.46$) is less than the critical value 7.82 at 3 degrees of freedom. This indicates that there is no association at 0.05 level of significant between level of education and having more than one source of income in Kano and Budalangi. The two variables are not associated therefore they should be treated separately.

4.5.8.2 Level of education and having savings and credit scheme

To assess the relationship between level of education and having a savings and credit scheme, a chi square test was conducted in a cross-tabulation of level of education and having a savings and credit scheme as presented in table 4.5.8.2 below.

Table 4.5.8.2: Level of education and having a savings and credit scheme

Level of education of respondents	Households with a savings and credit scheme		
	Yes	**No**	**Total**
No schooling	11(41%)	16(59%)	**27**
Primary school	71(56%)	56(44%)	**127**
Secondary school	80(69%)	36(31%)	**116**
College/university	28(78%)	8(22%)	**36**
Total	**190**	**116**	**306**
$\chi 2 = 14.38$, degree of freedom=3, level of significance=. 05, critical limit=7.82			

Source: Field survey 2015

The chi square test result ($\chi 2$ =14.38) is more than the critical value 7.82. This indicates that there was an association at 0.05 level of significant between level of education and having a savings and credit scheme in Kano and Budalangi. We conclude that the two variables are dependent or are associated. Education was found to drive choice of coping strategy. This association could be attributed to the fact that more educated households relied most on savings likely to result from these households being known to most easily secure savings (Kiiza and Pederson, 2001) due to greater livelihood diversity. However, less educated households who engaged in diverse livelihood strategies depended on social support networks, which provide off farm exchange opportunities as additional coping strategies.

4.5.8.3 Level of education and employing 'other' or negative economic coping strategies

To assess the relationship between level of education and employing negative economic coping strategies, a chi square test was conducted in a cross-tabulation of level of education and employing other economic coping strategies as presented in table 4.5.8.3 below.

Table 4.5.8.3: Level of education and employing "other" economic coping strategies

Level of education of respondents	**'Other' or negative coping strategies employed**		
	Yes	**No**	**Total**
No schooling	19(70%)	8(30%)	**27**
Primary school	58(46%)	69(54%)	**127**
Secondary school	60(52%)	56(48%)	**116**
College/university	11(31%)	25(69%)	**36**
Total	**148**	**158**	**306**
$\chi 2$ =10.13, degree of freedom=3, level of significance=. 05, critical limit=7.82			

Source: Field survey 2015

The chi square test ($\chi 2$ =10.13) is more than the critical value, this indicates that there was an association at 0.05 level of significant between level of education and employing negative economic coping strategies in Kano and Budalangi. We conclude that the two variables are dependent or are associated. The lower level of education the more likely to have limited income generating options therefore, flooding is likely to exceed the capacity to cope hence the adoption of negative coping strategies.

4.5.9 Level of income and economic coping strategies

This study sought to find out if there was a correlation between level of income of the respondents and the social coping strategies employed. Level of income of the respondents social coping strategies (having more than one source of income, having large families with more adults, having a savings and credit scheme and safety nets and employing 'other' economic strategies) employed is presented below.

4.5.9.1 Level of income and households with more than one source of income

To assess the relationship between level of income and households with more than one source of income, a chi square test was conducted in a cross-tabulation of level of income and having more than one source of income as presented in table 4.5.9.1 below.

Table 4.5.9.1: Level of income and having more than one source of income

Level of income of respondents	**Households with more than one source of income**		
	Yes	**No**	**Total**
1000-5000	69(48%)	74(52%)	**143**
6000-10000	52(66%)	27(34%)	**79**
Above 10,000	62(74%)	22(26%)	**84**
Total	**183**	**123**	**306**
$\chi 2 = 16.85$, degree of freedom=2, level of significance=. 05, critical limit=5.99			

Source: Field survey 2015

Result of the test ($\chi 2 = 16.85$) is more than the critical value 5.99, indicating that there was an association at 0.05 level of significant between level of income and having more than one source of income in Kano and Budalangi. We conclude that the two variables are dependent or are associated. The practical implication of this finding is that households with a higher income can readily help themselves in a flood event hence are less vulnerable to flood impacts (Penning and Fordham, 1994).

4.5.9.2 Level of income and having a savings and credit scheme

To assess the relationship between level of income and having a savings or credit scheme, a chi square test was conducted in a cross-tabulation of level of income and having more than one source of income as presented in table 4.5.9.2 below.

Table 4.5.9.2: Level of income and having a savings and credit scheme

Level of income of respondents	Households with a savings and credit scheme		
	Yes	**No**	**Total**
1000-5000	75(52%)	68(48%)	**143**
6000-10000	47(59%)	32(41%)	**79**
Above 10,000	68(81%)	16(19%)	**84**
Total	**190**	**116**	**306**
$\chi 2$ =18.95, degree of freedom=2, level of significance=. 05, critical limit=5.99			

Source: Field survey 2015

The chi square test ($\chi 2$ =18.95) is more than the critical value 5.99, indicating that there was an association at 0.05 levels significant between level of income and having a savings and credit scheme in Kano and Budalangi. We conclude that the two variables are dependent or are associated.

4.5.9.3 Level of income and employing 'other' or negative economic coping strategies

To assess the relationship between level of income and employed 'other' or negative economic coping strategies, a chi square test was conducted in a cross-tabulation of level of income and employing other economic coping strategies as presented in table 4.5.9.3 below

Table 4.5.9.3: level of income and employing "other" economic coping strategies

Level of income of respondents	Negative economic coping strategies employed		
	Yes	**No**	**Total**
1000-5000	80(56%)	63(44%)	**143**
6000-10000	34(43%)	45(57%)	**79**
Above 10,000	34(40%)	50(60%)	**84**
Total	**148**	**158**	**306**
$\chi 2$ =6.51, degree of freedom=2, level of significance=. 05, critical limit=5.99			

Source: Field survey 2015

The chi square test ($\chi 2$ =6.51) is more than the critical value 5.99. This indicates that there was an association at 0.05 level of significant between level of income and engaging in negative economic coping strategies in Kano and Budalangi, with a considerably larger proportion of respondents relying on 'other' economic coping strategies.

The association could be attributed to the fact that households that had higher levels of income were less likely to adopt negative coping strategies in times of stress.

4.5.10 Level of income and Social coping strategies

This study sought to find out if there was a correlation between level of income of the respondents and the social coping strategies employed. Level of income of the respondents social coping strategies (having more than one source of income, having large families with more adults, having a savings and credit scheme and safety nets and employing 'other' economic strategies) employed is presented below.

4.5.10.1 Level of income and support from NGO

To assess the relationship between level of income and getting support from NGOs, a chi square test was conducted in a cross-tabulation of level of income and depending on NGOs as presented in table 4.5.10.1 below.

Table 4.5.10.1: Level of income and depending on NGOs

Level of income of respondents	**Depending on NGO assistance**		
	Yes	**No**	**Total**
1000-5000	103(72%)	40(28%)	**143**
6000-10000	54(68%)	25(32%)	**79**
Above 10,000	41(49%)	43(51%)	**84**
Total	**198**	**108**	**306**
$\chi 2$ =12.31, degree of freedom=2, level of significance=. 05, critical limit=5.99			

Source: Field survey 2015

The test ($\chi 2$ = 12.31) is more than the critical value 5.99. This indicates that there was an association at 0.05 level of significant between level of income and getting support from NGO support in Kano and Budalangi. We conclude that the two variables are dependent or are associated. This association could be explained by the fact that one of the vulnerability criteria for NGO assistance is poor of the poorest (those who have limited coping strategies and whom without assistance, the situation would deteriorate to emergency/catastrophic levels.

4.5.10.2 Level of income and support from government support

To assess the relationship between level of income and getting support from government, a chi square test was conducted in a cross-tabulation of level of income and depending on government as presented in table 4.5.10.2 below.

Table 4.5.10.2: Level of income and government support

Level of income of respondents	Depending on government assistance		
	Yes	**No**	**Total**
1000-5000	79(55%)	64(45%)	**143**
6000-10000	39(49%)	40(51%)	**79**
Above 10,000	28(33%)	56(67%)	**84**
Total	**146**	**160**	**306**
$\chi 2$ =10.27, degree of freedom=2, level of significance=. 05, critical limit=5.99			

Source: Field survey 2015

Results of the test ($\chi 2$ =10.27) is more than the critical value 5.99, which indicates that there was an association at 0.05 level of significant between level of income and getting government support in Kano and Budalangi. We conclude that the two variables are dependent or are associated.

4.6 GOVERNMENT MEASURES EMPLOYED TO MANAGE FLOOD DISASTER

Respondents from households, FGDs and Key Informants from both Kano plains and Budalangi reported that the county government has not come up any structural and non-structural measures to help reduce food impacts in the study areas because they were still new in office. However, respondents from both study areas reported that the national government has taken measures both structural and non-structural to help reduce flooding and its impacts in the two regions.

4.6.1 Structural measures

Through direct observation and discussions with Key informants and FGDs, the study established similarities in the structural measures adopted by the national government in managing floods in Kano and Budalangi included:

- Levees, embankments and dykes
- Dams
- Flood ways and canals
- Other structural measures (Diversions)

FGDs discussions with the youth in Kano and Budalangi revealed similarities in the structural measures adopted by the national government in managing floods in the two study areas. Participants expressed that the government has built dykes and embankments, flood ways and canals, river training, de-siltation of river, seepage control.

According to a representative from the National Irrigation Board in Ahero irrigation scheme in Kano:

"The national government is also engaged in construction of dykes, river training, de-siltation of rivers, seepage control and river bank stabilization. - Key informant, The National Irrigation Board Ahero irrigation sub-location, Kano

The researcher observed that dykes have been built in Kano and Budalangi. Upon comparison, the researcher observed that the dykes in Kano were highly raised while the dykes in Budalangi were not. It was noted that communities in Budalangi use the dykes more as roads and grazing cattle thereby reducing the heights.

Figure 4.7: Dykes in Kano and Budalangi respectively

Source: Field survey 2015

FGDs with women, men and youth in Kano and Budalangi, participants expressed similarities on issues surrounding the construction of dams as a structural measure in mitigating floods in

the two study areas. According to them, they were aware that there were plans made by the national government in the construction of dams in Nandi hills but due to resistance by the communities living in Nandi hills, the project has not yet been implemented.

Discussions with two representatives from National Irrigation Board in Kano and Budalangi respectively, reported that there have been plans put in place to construct a dam on Nandi hills that would control floods in Kano and Budalangi however the communities living in Nandi hills have are not keen on having the dam built because they fear environmental changes it would bring. Environmentalists have also revisited the construction of the dam. According to representatives from National Irrigation Board in Budalangi:

"The national government has come up with a permanent solution to control flooding by building dams at Mt. Elgon, Cheregany and Nandi Hills, however, the communities in those areas have been resistant and not ready to give up their land. Environmentalists on the other hand have also opposed the ideas of constructing dams in these locations because according to them, the project will interfere with the environment."

4.6.2 Non-structural measures

Non-structural measures are an alternative complementary to structural measures that were adopted by the national government to manage/mitigate floods. Non-structural measures employed in this study are tools used by the national government to implement disaster resilience and they included:

- Flood plain regulations such as (Zoning, building codes, housing codes, sanitary codes, land use planning).
- Forecasting and warning
- Other non-structural measures (Disaster preparedness, response, legislation and public awareness)

Results of the survey on the flood plain measures adopted by the government are presented on table below:

4.6.2.1 Flood plain Regulations

Floodplain regulations in this study are measures put in place by the government that enables households mitigate flood disasters. Flood plain regulations have been found to reduce the impacts of flooding (Burby, 1998; Randolph, 2004). They include: Zoning, building and house codes, land use planning and insurance policies). The distribution of flood plain regulations is presented on table 4.6.2.1 below:

Table 4.6.2.1: Distribution of flood plain regulation measures adopted in Kano and Budalangi

Flood plain regulations in Kano	**Respondents in Kano**	
	Frequency	**Percentage**
Yes	53	35%
No	99	65%
Total	**152**	**100%**
Flood regulations in Budalangi	**Respondents in Budalangi**	
	Frequency	**Percentage**
Yes	54	35%
No	100	65%
Total	**154**	**100%**

Source: Field survey 2015

The findings of the study found that an equal percentage 35% of respondents in Kano and 35% of respondents in Budalangi reported that the national government put in place flood regulations as a measure to mitigating flood disaster. It was noted that an equal percentage of 65% of respondents in Kano compared 18% of respondents in Budalangi reported that the national government did not put in place flood regulations as a measure to mitigating flood disaster.

From the findings above, it is evident that the enforcement of flood plain regulations governing settlement in zones designated, as flood prone is weak partly due to weak institutional capabilities to enforce regulations. Similarly, there is no effective coordination between different government departments and non-governmental organizations, resulting into waste of resources and duplication of efforts (Opere, 2004).

4.6.2.2 Land Use planning

Land use planning can be used to reduce danger of life and property when waters inundate the floodplains and the coastal areas. The number of casualties is related to the population in the area at risk. The distribution of respondents is presented on table 4.6.2.2 below.

Table 4.6.2.2: Distribution on land use planning in Kano and Budalangi

Land use planning in Kano	**Respondents in Kano**	
	Frequency	**Percentage**
Yes	147	98%
No	5	2%
Total	**152**	**100%**
Land use planning in Budalangi	**Respondents in Budalangi**	
	Frequency	**Percentage**
Yes	128	83%
No	26	17%
Total	**154**	**100%**

Source: Field survey 2015

The findings of the study revealed that a majority 98% of the respondents in Kano compared to a majority 83% of respondents in Budalangi engaged in land use planning. While 2% of respondents in Kano compared to 17% of respondents in Budalangi did not adopt proper land use. Similarities in land use planning in Kano and Budalangi were established as the two communities engaged in preserving natural resources of the flood plains. In Kano, the communities carry out interventions that conserve the wetlands such as engaging in horticultural production through organic farming, fish farming, and reforestation to reduce soil erosion (VIRED, 2006).

While in Budalangi, discussions with Key informants revealed that through the integrated flood management system to manage and control perennial flooding, the community has been trained on proper land use practices that have proven to reduce soil erosion. Land use planning in Kano and Budalangi is influenced by traditional practices and cultural values have been adapted to avoid dependency on outside support. Community members are involved in tree planting exercises targeting farms located on farm prone land and terracing of farmlands across the slopes (WKCDD&FMP, 2007). According to APFM (2007), land use planning and

regulations plays a vital role in balancing development requirements and preservation of the natural resources of the flood plains.

FGDs with youth in Kano, established that as a means of coping with floods, residents used floodwaters to irrigate farms; they planted flood resistant crops such as arrowroots and sugar cane. One key informant from the ministry of Agriculture Nyando district stated that:

"*Residents of Kano engage in conservation and rehabilitation of wetlands through mitigation activities through creating awareness, capacity building, engaging in alternative livelihood activities." Key informant-Ministry of agriculture*

4.6.2.3 Insurance policies

The study sought to find out if the national government had adopted and introduced insurance policies to households in Kano and Budalangi as a way of mitigating flood disasters. The distribution of insurance policies is presented in table 4.6.2.3 below:

Table 4.6.2.3: Distribution of insurance policies in Kano and Budalangi

Insurance policies in Kano	**Respondents in Kano**	
	Frequency	**Percentage**
Yes	19	13%
No	133	87
Total	**152**	**100%**
Insurance policies in Budalangi	**Respondents in Budalangi**	
	Frequency	**Percentage**
Yes	7	5%
No	147	95%
Total	**154**	**100%**

Source: Field survey 2015

The findings of the study found that 13% of respondents in Kano compared to 5% of respondents in Budalangi reported that they were aware of the insurance policies but did not have flood insurance while 87% compared to 95% of respondents in Kano and Budalangi respectively did not have any knowledge of this. Combined data revealed that 8% of the sample population in the two study areas had knowledge on the importance of insurance policies and reported that the government had not adopted this measure in their areas while

92% of the sample population did not have knowledge of this. This finding matches a study carried out in India by Talwar *et al* (2009), who found that India does not have flood insurance. However, separate insurance schemes are available for covering losses of dwelling units, household articles, crops, agricultural implements, livestock etc.

This mitigation strategy was found to be ineffective in the two study areas because the national government had not provided this measure as an alternative towards mitigating flood disaster. Respondents who were aware 8% reported that they were unable to afford insurance in even if the government put this measure in place.

4.6.2.4 Forecasting and warning

The study sought to identify flood-warning systems and associated procedures put in place by the government. The distribution of the responses is presented on table 4.6.2.4 below:

Table 4.6.2.4: Distribution of flood forecasting and warning in Kano and Budalangi

Forecasting and warning	**Respondents in Kano**	
	Frequency	**Percentage**
Yes	152	100%
No	0	0%
Total	**152**	**100%**
Forecasting and warning	**Respondents in Budalangi**	
	Frequency	**Percentage**
Yes	154	100%
No	0	0%
Total	**154**	**100%**

Source: Field survey 2015

On flood forecasting and warning, the results of the survey revealed that an equal percentage 100% of respondents in Kano and Budalangi received flood warning through their local radio stations but they never put them in practice this is because flood warning has been inaccurate most of the time but sometimes the warnings have been accurate. However, they do not relocate and wait to see if the floods will occur or not. In the study, all the respondents in Kano and Budalangi acknowledged the use of traditional knowledge on flood forecasting.

Furthermore, the study observed that flood maps were erected by the roadsides to identify flood prone areas in Kano while in Budalangi, there were no flood maps erected by the roadside. Comparatively in Budalangi, early warning systems; alert watch and warning bulletins from KMD, and automatic real time warning systems using observation, river gauges and radio transmission, and community operated warning system at bridges such as Rwambwa Bridge (NWC, 2015).

Figure 4.8: Measurement scale on Rwambwa Bridge on river Nzoia in Budalangi

Source: Field survey 2015

The picture above (Figure 4.6.2), shows a digital warning system at Rwambwa Bridge in Budalangi that measures the level of water in River Nzoia and sends signal on the level of water to Kenya Metrological Department headquarters in Nairobi which then sends a feedback to the community radio station (Bulala FM) the disseminates and alerts the community in Budalangi about the water levels and the possible occurrence of flooding. (The arrow on figure 6 above shows the digital measuring station).

Figure 4.9: Flood hazard map in Ahero irrigation scheme in Kano

Source: Field survey 2015

4.6.2.5 'Other' non-structural measures

'Other' structural measures adopted by the national government in mitigating flooding in Kano and Budalangi include: Preparedness, relief, recovery, legislation and public awareness. 'Other non-structural measures adopted are presented on table 4.6.2.5 below.

Table 4.6.2.5: Distribution of "other" non-structural measures employed

Use of other non-structural measures	**Respondents in Kano**	
	Frequency	**Percentage**
Yes	86	57%
No	66	43%
Total	**152**	**100%**
Use of other non-structural measures	**Respondents in Budalangi**	
	Frequency	**Percentage**
Yes	42	27%
No	112	73%
Total	**154**	**100%**

Source: Field survey 2015

The survey noted that 57% of the sample population in Kano compared to 27% of the sample population in Budalangi reported that the government employed the above mentioned 'other' non-structural measures to mitigate flood effects in the two study areas.
The findings therefore indicate that 'other 'measures adopted by the households were moderately effective in mitigating flood disasters in the two study areas.

The study established that a system for disaster preparedness and response planning including flood fighting has been in place in Kano and Budalangi for a long time and the national government has the primary responsibility for this. Additionally, the study established that flood response and relief are well laid out procedures at the local and national levels. These involve provision of food and non-food items (Talwar, *et al.,* 2009).

4.6.3 Flood proofing techniques employed

Flood proofing techniques are a combination of structural and non-structural measures for mitigating floods. These techniques are usually adapted to protect structures from damages caused by floodwaters. The techniques adopted included:

1. Use of sandbags
2. Blocking windows and doors
3. Elevation
4. Relocation
5. 'Other flood proofing techniques such as digging trenches and planting trees around the homestead.

4.6.3.1 Use of sandbags

The study established that respondents in Kano and Budalangi used sand bags to protect their houses and property from damages caused by floodwaters. The distribution of respondents who used sand bags is presented on table 4.6.3.1 below.

Table 4.6.3.1: Distribution of use of sand bags by households in Kano and Budalangi

Households that use sand bags	**Responses in Kano**	
	Frequency	**Percentage**
Yes	104	68%
No	48	32%
Total	**152**	**100%**
Households that use sand bags	**Responses in Budalangi**	
	Frequency	**Percentage**
Yes	149	97%
No	5	3%
Total	**154**	**100%**

Source: Field survey 2015

Results of the survey revealed that in Kano, respondents who used sand bags represented 68% compared to 97% of respondents in Budalangi. Traditionally, sand bags have been used to block doorways, drains and other openings to prevent water backing up. Sometimes sandbags are piled by the river banks to slow flood waters because they can only keep water out for short periods giving households time to relocate and move their property and assets to safe grounds. One respondent stated that:

"Majority of households used sand bags because it is cheap and they filter out some muddy sediments found in flood waters. Using sand bags is not effective because it only keeps flood water out for a short time."

Figure 4.10: Sand bags in use to prevent floodwater in Budalangi

Credit: Royal media

4.6.3.2 Blocking/ sealing of doors and windows

The study established that respondents in Kano and Budalangi blocked their houses to prevent floodwaters from entering their houses. The distribution of respondents who employed this technique their houses/homes is presented on table 4.6.3.2 below.

Table 4.6.3.2: Distribution of responses of households that seal windows/doors in Kano and Budalangi

Households that sealed doors/windows	**Responses in Kano**	
	Frequency	**Percentage**
Yes	31	20%
No	121	80%
Total	**152**	**100%**
Household that sealed doors/windows	**Responses in Budalangi**	
	Frequency	**Percentage**
Yes	3	2%
No	151	98%
Total	**154**	**100%**

Source: Field survey 2015

Respondents who said that they blocked their window/doors represented 20% in Kano compared to 2% of respondents in Budalangi.

4.6.3.3 Elevation

The study established that respondents in Kano and Budalangi elevated their houses to prevent floodwaters from entering their houses. The distribution of respondents who elevated their houses/homes is presented on table 4.6.3.3 below.

Table 4.6.3.3: Distribution of households that elevate their houses in Kano and Budalangi

Households that elevated their houses	**Responses in Kano**	
	Frequency	**Percentage**
Yes	67	44%
No	85	56%
Total	**152**	**100%**
Households that elevated their houses	**Responses in Budalangi**	
	Frequency	**Percentage**
Yes	62	40%
No	92	60%
Total	**154**	**100%**

Source: Field survey 2015

Respondents who elevated their houses represented 44% of the sample population in Kano compared to 40% of the sample population in Budalangi. It was noted that 56% of the sample population in Kano compared to 60% of the sample population in Budalangi did not elevate their houses. From the findings above, it is evident that a considerable proportion of respondents adopted this technique in preventing floodwater from causing damages (Talwar, *et al.,* 2009).

Figure 4.11: A house elevated from the ground in Rukala sub-location in Budalangi

Source: Field survey 2015

4.6.3.4 Relocation

Relocation is a flood proofing technique employed by households as an alternative to elevation. The study established that households in Kano and Budalangi relocated to safe grounds temporarily during flooding. The distribution of the responses is presented in table 4.6.3.4 below.

Table 4.6.3.4: Distribution of responses on relocation by households in Kano and Budalangi

Households that relocated	**Responses in Kano**	
	Frequency	**Percentage**
Yes	116	76%
No	36	24%
Sub-total	**152**	**100%**
Households that relocated	**Responses in Budalangi**	
	Frequency	**Percentage**
Yes	149	97%
No	5	3%
Sub-total	**154**	**100%**

Source: Field survey 2015

A majority of the respondents 76% relocated to safer grounds in Kano compared to 97% of the sample population in Budalangi, none of the respondents demolished their houses in both Kano and Budalangi while 39% of the respondents of the sample population in Kano compared to 29% of respondents of the sample population in Budalangi reported that they used other flood proofing techniques. This could be attributed to the fact that some homes were located on raised grounds therefore were not affected by flooding.

From the findings above, it is evident that relocation was a temporary measure employed by a majority 87% of the respondents in Kano and Budalangi. Respondents reported that they had identified safe grounds and temporarily moved but as soon as floodwaters subside, they returned to their homes. The study observed that this measure does not control flooding and reduce flood induced impacts but protects households, their property and assets from damage.

FGDs with all participants in Kano revealed that majority of the community do not move to higher grounds this reluctance is necessitated by the fact that moving to higher grounds will affect their reliance of relief. FGDs with all participants also revealed a strong attachment to their land and in the event of free land allocation by the national government; the participants reported that they were scared they would be resettled on small land holdings with no land to cultivate.

Furthermore, FGDs with all participants in Budalangi revealed a comparison between Kano and Budalangi. They reported that the residents of Budalangi are attached to their ancestral land because they believed they cannot be buried away from their ancestral land and that majority are named after their ancestors "*Misambwa"* who control their lives. They also reported that each village has built a shrine "*Ndekwe*" where they keep offer sacrifices for the "*Misambwa"* who are believed to control floods by causing floods when they are angry. This finding supports findings by Abuya (2013), who found that Graves are important places of worship as they serve as shrines. Graves assume the position of "land titles" and signify land ownership. The findings in Kano were contrary to Budalangi because the community in Kano is only attached to their ancestral land only in cases where they have done major developments on the land but they do not hesitate to relocate permanently to safe grounds. The study found

that in Kano, residents have permanently relocated/ migrated to safe grounds while they continue to cultivate the flood prone locations which is their ancestral land.

Discussion with a representative from the Ministry of Agriculture in Kano and a teacher from Budalangi revealed that majority of the community do not move to higher grounds even those who have land at raised grounds. It was reported that they do not want to relocate until their homes are flooded. It emerged that the reluctance to relocate is necessitated by the fact that relocating will prevent them from getting free food and non-food items.

This finding is similar to those of a study carried out in Tanzania (Gaston, unpublished) which revealed that pressure to live in flood-prone areas, which typically are surrounded by rich alluvial soils, abundant water supplies is on the increase as the country's population increases. Similarly, following the 2000 Mozambique floods, where livelihood of people depended on the flood plain, government action to relocate vulnerable populations was met with a lot of resistance as the affected population moved location but maintained temporary housing in the flood plains and eventually moved back. The people feared leaving and potentially losing their possessions or their property claim (Rojas, 1997; Few *et al*, 2004).

"A considerable numbers of people in Kano have permanently relocated to safe areas around Ahero town and Tura sub-location while they continue to cultivate their ancestral land which is the flood prone areas. Although they have adapted to co-exist with floods, they have realized its time they took safety precautions since floods interrupt their daily activities." *Key informant-Ministry of Agriculture Nyando*

Figure 4.12: Evacuation centers in Kano and Budalangi

Source: Field survey 2015

FGDs in Kano also revealed that at the evacuation centers, women and young girls engage in immoral sexual behavior in exchange for money and food. HIV/AIDS and STI/STDs infections are in the increase because there is increased sexual harassment, promiscuity and exploitation. Additionally, the study found that the campsites get congested therefore; the affected populations were at high risks of contracting communicable diseases.

"When flooding occurs, women and young girls in this area engage in risky behaviors such as indulging in sexual behaviors in exchange of food and money since their daily livelihoods get affected because of this, organizations such as Kenya Red Cross provide condoms to the evacuation centers to prevent the spread of Sexually Transmitted Infections (STIs)." Key informant- Kenya Red Cross Nyando

Similarly, FGDs with youth women and men, in Budalangi highlighted that women face challenges in evacuation centers and camps which are similar to findings in Kano such as increased sexual harassment, exploitation and promiscuity at camps which increase the risk of HIV/AIDs and STIs; the camps are small and they lack privacy since they have to stay with

their children who some are teenagers in temporary shelter and camps; Pregnant mothers are unable to visit maternal clinics and lactating mothers are unable to get proper diet.

Figure 4.13: Community members in Budalangi constructing temporary shelter on safe ground

'Other' flood proofing techniques employed by households in Kano and Budalangi include: digging trenches and planting trees around the homestead. Responses of other flood proofing techniques employed are presented below.

Table 4.6.3.5: "Other" flood proofing techniques employed in Kano and Budalangi

Households that employed other flood proofing techniques	**Responses in Kano**	
	Frequency	**Percentage**
Yes	60	39%
No	92	61%
Total	**152**	**100%**
Households that employed other flood proofing techniques	**Responses in Budalangi**	
	Frequency	**Percentage**
Yes	45	29%
No	109	71%
Total	**154**	**100%**

Source: Field survey 2015

The findings of the study established that 39% of respondents in Kano compared to 29% of respondents in Budalangi employed other flood proofing techniques while 61% of respondents in Kano compared to 71% of respondents in Budalangi did not employ other flood proofing techniques to reduce flood impacts on their property. However combined data revealed that 34% of respondents in Kano and Budalangi employed other flood proofing techniques while 66% of respondents in the two study areas did not employ other flood proofing techniques.

4.7 COMMUNITY MANAGED DISASTER RISK REDUCTION IN KANO AND BUDALANGI

The third objective of this study was to analyze Community Managed Disaster Risk Reduction (CMDRR) system in place in the two study areas. The study sought to establish interventions put in place by the community to reduce flood risks after employing various coping strategies during flooding as mentioned in section 4.4 above. Information was gathered from FGDs and Key Informants in Kano and Budalangi. The study established that Kano and Budalangi have well-established Community Managed Disaster Risk Reduction systems in place. The study sought to establish interventions put in place by the community that would enable a more pro-active and long-term approach to manage flood disasters.

Comparison between the two study areas revealed that, communities in the two study areas are engaged in Flood Risk Reduction activities.

Upon comparison, discussions with KII in Kano revealed that the District Disaster Management Committees (DDMC) coordinates flood management at the District. The DDMC is represented at the location and sub location levels and it is tasked with planning and setting up structures to mitigate, prepare and respond to flooding. The Community Based Disaster Management team, Disaster Risk Reduction Unit and volunteers are involved in public awareness campaigns, which have resulted to increased awareness and enabled the community members to share information regarding flood management in Kano.

The communities in Kano through Community Based Flood Management are involved in flood mitigation activities whereby they implement both structural and non-structural measures.

The villagers supported by the Community Based Flood Management Team continue to implement mitigation measure such as digging trenches, unblocking tunnels, constructing earth dams and water pans, constructing channels by the road sides and draining main river channels. They are also involved in constructing evacuation centers and putting up storage facilities, boreholes and toilets and establishing evacuation routes by constructing culverts and re-enforcing them to ensure effective handling of flood water, foot bridges and weirs, they also engage in reforestation, land and water management. The non-structural measures employed included the development and training Community Based Flood Management Organizations; public awareness campaigns through education programmes and dissemination of information using radio programmes. One Key Informant stated:

"Through Disaster Risk Reduction Initiatives, the communities in Kano have established learning groups that empower them economically building their resilience to flood disasters. They are also able to identify evacuation centers with the help of Kenya Red Cross Society. Once they have identified the evacuation centers, they make them habitable by draining water around the evacuation centers, constructing water pans." Key informant –KRCS Nyando

Discussions with the Key Informants also revealed that DDCM, together with the chiefs and sub chiefs organize, implement and oversee the food for work program introduced by the government to engage the community in managing floods.

FGDs with the youth and women in Kano confirmed that chiefs are involved in mobilizing local people to willingly participate in flood control programmes. The food for work and voucher for work methods are used to mobilize the community for action as poverty also pushes the people to participate in order to get food and medical facilities.

Through village training and loaning initiatives the communities in Kano have established Self Help Groups (SHGs), which have built resilience of the community through group savings and support from development organizations. Ministry of Agriculture in Nyando has empowered the farmers in Kano to manage flood risks through a combination of crop diversification and improved practices where they grow sorghum, cowpeas, green grams and sweet potatoes to supplement maize and beans. FGDs with the youth groups in Kano revealed that the youth are

involved in horticultural activities where they are intensively growing tomatoes, watermelons and onions. This finding was confirmed by Key informants from the Ministry of Agriculture in Nyando who revealed that the youth in this community are actively engaged in mitigation activities such as planting trees along the river banks of Nyando. Water Resource Users Association (WRUA) supports this project.

Additionally, the community members have put in place Community Based Early Warning information identification structures in villages around River Nyando. People who live in these villages are able to detect on coming floods through traditional knowledge by observing level of water downstream and up stream, change in color of the River water and sound of the river. They also have contacts in Nandi hills that give updates to Disaster Committees in Kano on water levels up stream. They also rely on Kenya Meteorological Departments for updates.

Similarly in Budalangi, discussions with Key informants revealed that through the western Kenya Community Driven Development and Flood Mitigation project, has put in place flood control measures and management which are immediate/short, medium and long term interventions. The short-term interventions include: River trainings (river diversions), dyke rising, weak area repairs and seepage control. Medium term interventions include community based early warning system, check dams/weirs/ silt traps, design and construction of a new set of dykes, and deliberate efforts towards integrated catchment conservation and a forestation. Long-term interventions entail the design and construction of multi-purpose dams with continuous catchment management.

The community in Budalangi has a well established Community Based Early Warning System which is a people centered system and empowers individuals and communities threatened by floods to act in sufficient time and in an appropriate manner so as to reduce the possibility of personal injury, loss of life, damage to property, environment and loss of livelihood. This system provides the community and disaster risk management stakeholders with advance information on the flood risks that can be readily translated to disaster prevention, preparedness response actions against loss of lives and injuries. CBEWS also helps reduce

economic losses by allowing people to better protect their assets and livelihood by evacuating them to higher grounds in case of an impending flooding event. One Key informant stated:

"*The community has a well established Indigenous early warning committee managed by the elders of council. The elders of council alert the community in Budalangi of flooding if there is heavy rain up-stream and advice the community not to plant crops if there is heavy rain down-stream as it results to logging." Key informant BUCODEV in Budalangi sub-location*

Early warning information is disseminated through Bulala FM station a community radio station established in Budalangi sub-location with the support of WKCDD&FMP and Kenya Meteorological Department (KMD) that broadcasts and disseminates the daily flood watch bulletins in local (Kinyala) and Kiswahili languages. A discussion with a key informant from the Ministry of Agriculture confirmed that through Bulala FM, the Ministry uses this avenue to inform the community of farming methods during planting and other crop and livestock production.

Figure 4.14: Community radio station (Bulala FM) in Budalangi sub-location

Source: Field survey 2015

The Western Kenya Community Driven Development and Flood Mitigation Project has involved the local community in all aspects of the flood management activities. Based on experience and lessons from countries prone to flooding, the Project has recognized that in order to build strong disaster-resilient communities, the community members' first need to be adequately empowered so that they can cope effectively with the adverse effects of natural disasters. A community based Disaster Risk Reduction Extension Provider group comprising of 40 members was formed by the WKCDD&FMP. This group undertook an exchange visit to India where they learnt about community based flood management. They participate in disaster response activities such as assessment relief distribution and evacuation missions. They have networked with organizations like UN-OCHA and World Vision in undertaking its activities. The community has been able to undertake hazard and vulnerability mapping of the flood plain area.

The community has been trained on proper land use practices that have over time reduced soil erosion and runoffs. The communities in Budalangi are involved in improved farming methods, afforestation and reforestation and engaging in alternative livelihood such as bee keeping. The community is also engaged in other mitigation activities such as planting trees, clearing bushes on streams and digging terraces across the farm lands, distillation of river beds and river mouths. The community is also involved in rehabilitating existing dykes with the support of National Water Cooperation in Rwambwa sub-location in Budalangi.

Figure 4.15: Community members digging trenches in Budalangi

Credit: Royal media

Discussions with a Key informant from Kenya Metrological Department revealed that WKCDD&FMP was only implemented in Budalangi and not Kano because Budalangi was found to be more vulnerable and that there was likelihood that other similar projects were being implemented in Kano. The key informant reported that at the time of implementing WKCDD&FMP in Budalangi.

These mitigation activities are done through food-for-work programme funded by World Food Programme and is administered by the national government. Through this, it is evident that the national government has a relationship with the communities in Kano and Budalangi. Aside from this, the study also established through KII, that the government undertook efforts to rehabilitate dykes. This was backed by observation from the researcher who observed dyke rehabilitation at Magina sub-location in Kano and rehabilitation of dykes in Magombe sub-location in Budalangi. A key informant from National Water Cooperation in Rwambwa sub-location in Budalangi reported that:

"*The community here is helpful in mitigating floods they clear overgrown bushes that weaken the dykes around the dykes." Key informant National Water Cooperation*

Additionally, the study established through FGDs in Kano and Budalangi community members engaged in exchange programmes where they shared experiences they had in managing flooding giving the community an opportunity to demonstrate their work in CMDRR. In Kano, the level of engagement with other communities was at national level. Community members in Kano had exchange programme with members of community from Budalangi and vice versa however, in Budalangi, the level of engagement was at international level where selected members of the community visited Finland in 2008 and India in 2010. These exchange visits enabled the two study areas to share their experiences on flood management and how they managed the process of Disaster Risk Reduction.

Furthermore, the study established that both communities have a relationship with the national government. The government undertook efforts to restore damaged infrastructure and rehabilitate dykes to control floodwaters. One key informant from National water Cooperation in Rwambwa sub-location in Budalangi reported that:

"The national government has implemented short term interventions to manage floods in Budalangi, the government has built large culverts which enable the community to cross from one point to the other, and it has restored breeched river banks, done river training along major meanders to realign a natural water course and shorten the river by cutting meanders. The river trainings were done in Rugunga, Siginga, Sibuka and Khainga, the national government is also rehabilitating dykes by raising them and seepage control and conducting bio-engineering measures such as planting trees and grass to hold the soil."

4.8 GAPS THAT EXIST IN THE PHASES OF DISASTER MANAGEMENT

The study identified gaps that exist in the phases of flood preparedness and mitigation on one hand and response and recovery on the other in Kano and Budalangi.

4.8.1 Gaps in the phase of preparedness

The study found that in both Kano and Budalangi, preparedness levels are organization specific and not cross cutting leaving one or two actors to respond to major disaster.

The found that the two study areas lack adequate finances, human resources and equipment to adequately prepare for floods. One key informant stated that:

"*The amount of money made available for managing flood disasters in Kano is far less than the realistic amount urgently needed to manage floods successfully. Furthermore, lack of specialized equipments hampers effective preparation in managing floods."*

Another gap that affects flood is lack of an effective forecasting and warning system. The study found that Budalangi has a well-established community radio station Bulala FM mandated to disseminate flood warnings alerts from the Kenya Metrological Department while Kano does not have a community radio station with a similar mandate. At the time of the research, the study established that the community radio station in Budalangi Bulala FM was off air. Discussions from FGDs with all women, youth and men groups in Kano and Budalangi reported that they did not rely on flood warnings and alerts because they have proved to be inaccurate and unreliable most times therefore they do not relocate to safe grounds till the first onset of floods.

Another gap that affects flood preparedness in Kano and Budalangi is inadequate information and data. The study found that, data collection, analysis and storage was not adequate leading to poor planning, ineffective monitoring and evaluation of flood risks. Sutton and Tierney (2006) argued that, activities associated with disaster preparedness include development planning processes to ensure readiness; formulating disaster plans, stockpiling resources necessary for response and developing skills and competencies to ensure effective performance to disaster related tasks.

Furthermore, the study found that the community members have not been trained on first aid measures and also do not stockpile emergency supplies in preparation for floods. One key informant from KRCS in Nyando states that: "Households lack adequate information on stockpiling of food and NFIs in readiness for flood disaster." Additionally, the two areas lack adequate monitoring of communication tools. Radios and televisions have been used to communicate warnings however, there is insufficient follow up on what does and does not work.

4.8.2 Gaps in the phase of mitigation

The study identified inadequate policy, legal and institutional frameworks as a major gap in mitigating flood disasters in Kano and Budalangi. The lack of a flood management policy has contributed to a major challenge to mitigate the adverse effects of floods.

Another challenge identified in mitigating floods in Kano and Budalangi is disaster management capabilities within communities and institutions are weak. This finding supports a study conducted by Karanja *et al* (2001).

The study also identified inadequate regional and international linkages as a gap in mitigating adverse flood effects. FGDs with women, men and youth in Kano areas reported that they had one exchange visits to Budalangi but have never had the opportunity to share their experiences with people who share similar flood effects from other countries. Comparatively, discussions FGDs with youth in Budalangi reported that the community members have had only two international exchange visits to Finland in 2008 and India in 2010. The participants from the FGDs reported that the selection of the people who represented Budalangi was prejudice since a majority of those who represented the whole community in the exchange visit were not literate and did not have the capacity to report back to the community and also train other community members on what they learnt. As one respondent from the FGD reported:

"Most of the people who were selected to represent us in India and Finland were not literate as we seated here today I can tell you that we do not know what they learnt in terms of flood

management when they travelled abroad. It is sad that they are just sitting on valuable information which could tremendously help the community."

4.8.3 Gaps in the phase of Response

The study found that response in Kano and Budalangi was reactive and short term due to lack of a contingency plan that would clarify goals, strategies, roles and responsibilities that would effectively help create new relationships with NGOs, government and local actors to strengthen those that already exist.

Additionally, FGDs confirmed that community members in Kano and Budalangi lacked resources to bounce back. Flood response in the two study areas has been slow due to poor infrastructure. The study established that flood response in the two study areas is ad-hoc, uncoordinated and short-term mainly in the form of emergency relief services to the worst areas. Additionally, the communities lack adequate financial resources to respond to floods.

4.8.4 Gaps in the phase of recovery

The study found out that there were gaps that existed in the recovery phase of managing flood impacts in Kano and Budalangi. The study established that residents of Kano lack support systems that provide special care and attention such as psychosocial support that would help victims cope and deal with emotional and social problems and distress caused by of flooding while in Budalangi, BUCODEV focused on providing counseling services to rehabilitate the community members as they return home.

The two study areas lack disaster risk reduction programmes in schools, focusing on preparation and identifying vulnerable groups. This finding is consistent with a study conducted by Ozmen (2006:384) that DRR programmes lack in the school curriculum. Both Kano and Budalangi also lack education and awareness on human rights laws within the camp settings and evacuation centers.

The study found that community members in Kano and Budalangi are not aware in the role of the insurance in mitigating the impact of flood disasters. Insurance firms have not developed affordable products that can be made available to the society

CHAPTER FIVE: SUMMARY, DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This study sought to assess the factors affecting flood resilience in Kano and Budalangi flood plains. The specific objectives of this study were: To establish factors that contribute to states of flood vulnerability; To identify coping mechanisms employed by the communities in Kano and Budalangi; To analyze Community Managed Disaster Risk Reduction systems in place and To identify gaps that exist in the phases of preparedness and mitigation on one hand and response and recovery on the other.

This chapter gives a synopsis of the main study findings and draws conclusions and recommendations based on the research findings.

5.2 Summary of the Findings

The paper addresses findings related to the first objective, which sought to establish factors that contribute to states of flood vulnerability. The study established that there were similarities in factors that contribute to states of vulnerability in Kano and Budalangi. Demographic factors were found to contribute to states of flood vulnerability.

Gender was found to be a factor that contributed to states of flood vulnerability in the two study areas because as a primary factor of social organization, it shapes the social world within natural events occur. Age was correlated to a number of factors associated with one's likelihood of withstanding a disaster. Age was found to influence socio-economic status, access to resources and responsibility for disaster preparedness and response activities. As a factor that contributes to states of vulnerability, marital status was found to determine access to resources in the household that could be used to cope with flood disasters. Household size was also found to be an important factor that contributed to states of flood vulnerability as the study focused on households' economic condition. In the two study areas, larger households were found to be poorer and more economically viable. With regards to level of education, heads of households with low levels of education. Length of residency on the flood prone locations was found to be a factor that contributed to vulnerability as households that had resided in flood prone locations for shorter periods were found to be more vulnerable as they lacked the

capacity to endure, adapt, adjust and mitigate flood threats. The study found that agriculture was the main source of income in most households in the two study areas. Households that relied on agriculture only as their main source of income and did not have alternative sources of income were found to be more vulnerable as floods destroyed their livelihood by sweeping away crops and livestock. Households with low levels of income were found to be the primary victim of flooding as they lacked resources and assets that would enable increase their resilience.

With regards to coping strategies employed, the study identified similarities in coping strategies employed in the two study areas. Communities employed economic coping strategies which included engaging in more than one source of income, having a savings and credit scheme, having large families with more adults and engaging in 'other' economic coping strategies such as withdrawing children from school to assist with domestic chores, sale of assets, flood rationing and reducing household expenses; social coping strategies included depending on mutual assistance between family networks and communities, Non-governmental Organizations, government and other stakeholders; technological coping strategies included modification and reinforcement of houses and other shelter within the homesteads and cultural coping strategies included risk perceptions and religious views that enabled them recover/bounce back to their normal daily activities.

The study also established that both communities put in place interventions that enabled them manage floods. Additionally, the study identified gaps that existed in the flood management cycle that posed major challenges in preparedness and mitigation and response and recovery of the community.

5.2.1 Discussion of findings

The above findings provide useful insights on resilience to flood disasters in Kano and Budalangi.

5.2.1.1 Factors that contribute to states of vulnerability

The results highlight demographic factors as factors that contribute to states of vulnerability in the two study areas were contributed by gender, age, marital status, household size, level of education, source of income and level of income. This finding concurs with (Burton and Cutter 2008; Wisner *et al.*, 2004; Cutter *et al.,* 2003; Bolin and Stanford 1998), who found that education level, age, gender, income level, household size and marital status were factors that increased social vulnerability of households.

Heads of households (both males and females) were represented in the survey. From the findings of the study, female/ women headed households were found to be more vulnerable because traditional expectations and home based responsibilities limit their opportunities for education, access to information, political involvement, a myriad of other resources, and they are disproportionately employed in unpaid and underpaid and lack of which reinforces the cycle of their vulnerability (Anderson, 1994; Enarson, 2000). Respondents of all ages (18 through to over 50 years) were represented in the survey. From the findings of the study, the elderly were found to be more vulnerable because they are more likely be physically challenged, had reduced mobility, reduced strength and to be of poor health, they depended on others for survival because they had little financial resources and were attached to their ancestral land (Eidson *et al.*, 1990; Schmidlin *eta al.,* 1995; Morrow 1999).

As observed from the findings in section 4.2.3 above, heads of households who did not have spouses (Single/unmarried, widowed and separated) were found to be vulnerable because they were over represented among the poor and lacked an income-earning partner (Chant, 2008; Koc, 1998). Additionally, they were found to lack the necessary resources to respond and recover from flooding therefore they engaged in sexual behavior that put them at risk of transmitting HIV/AIDs and STIs. By contrast, large households were found to be more vulnerable because they were poor, lacked well developed social security systems and had low securities increasing fertility rates resulting to large households thereby increasing dependency within the households. Cutter *et al* (2003) argues that families with more numbers of dependent often lack finances to outsource care for dependents.

The study found that households with low educational levels were vulnerable because they lacked well remunerated employment resulting to less social power and fewer economic resources and physical capacity to anticipate, survive and recover from efforts of massive floods. These households were found to be less resilient to flood disasters. With regards to length of residency, households who resided in the flood prone locations for shorter periods (less than one year) were more vulnerable because they lacked a wider social network and capacity to cope.

Agriculture was found to be the main source of income in the two study areas. Households that depended on agriculture as their main and only source of income were vulnerable because during flooding, those who depend on farming had their farms submerged and crops swept away or destroyed livestock were also swept away and grazing land submerged. Such households lacked alternative sources of income however, it is important to note that they resorted to non-farm activities during flooding to compliment their main source of income. Additionally, heads of households with lower income levels were more vulnerable because they were found to be poor and lacked resources to relocate to safe grounds, their houses were poorly constructed as they could not afford the cost of repair and reconstruction (Pastor *et al,*. 2006; Vaughan, 1995).

The findings also found that besides the demographic factors, other factors that increase states of vulnerability to flooding in the two study areas included: type of housing, acreage of land under agriculture, number of institutions such as hospitals and schools, water and electricity supply and communication and transport networks. This finding is consistent with studies (Dwyer *et al.,* 2004; Cutter *et al.*, 2003; Bolin Stanford 1998), found that the quality of human settlements (housing type and construction, infrastructure and lifelines) increased households' vulnerability to flooding.

The findings above support vulnerability theory (see 2.12.1), which states that individuals and groups exposed to hazards are not vulnerable to the same degree; rather, people display patterns of differential loss. Vulnerability differentials manifest in terms of education and socio-economic status. In addition to exposure to stress or crisis, the differential vulnerability

is also said to depend on the *coping ability*, defined as a combination of resistance (the ability to absorb the damaging impacts of a hazard and continue functioning) and resilience (the ability to recover from losses quickly) of those affected.

5.2.1.2 Coping mechanisms employed

General findings of the study revealed that households in the two study areas employed similar coping strategies to mitigate flood impacts. Coping strategies employed by were categorized as economic, social, cultural and technological (Twigg, 2004).

The findings of revealed that economic coping strategies employed were found to be less effective as some of the strategies employed such as withdrawing children from school to help in domestic chores and engage in extra income generating activities, sale of property and assets, food rationing which could result to malnutrition and poor health among children, pregnant and lactating mothers, Persons Living with HIV/AIDs and elderly persons were erosive putting households in the two study areas in states of vulnerability. The findings are in line with the model (see 2.13), which indicates that households that employ negative coping strategies, which are also erosive, increased their vulnerability to flooding. The findings are also in line with a study conducted by Van der Geest *et al* (2004).

The study established that cultural and social/organizational coping strategies were the most effective strategies employed in dealing with flood impacts in the two study areas. They included: support (in kind or cash) from friends, relatives and neighbors, dependency on NGOs and government support, emotional support and counseling from the church.

Furthermore, the study identified technological coping strategies as techniques used by households to cope with floods. Households modified their houses by raising the foundations above the ground. Households also reinforced their houses by using cement and corrugated iron sheets to construct their houses. A comparison emerged in Budalangi where the study found that houses were constructed on silt as opposed to Kano.

5.2.1.3 Community Managed Disaster Risk Reduction system

An analysis of the CMDRR systems in place established that the communities in Kano and Budalangi put up interventions that enabled them manage floods through their continuous participation in various activities. The study found that through activities such as development of the communities' hazard map, mapping of relevant actors in Disaster Risk Reduction, lobby campaign on reforestation by the riverbanks, the communities in Kano and Budalangi increased awareness of risks, threats and vulnerabilities in meetings. They also engaged in flood mitigation activities such as reforestation, improved farming methods, and diversified income, creating barriers; engaged in exchange programmes where they shared experiences on how they managed flood disasters; they established a relationship with the national government where the government undertook efforts to rehabilitate dykes.

5.2.1.4 Gaps that exist in the phases on disaster management

The study identified similarities in gaps that existed in the phases of flood disaster management in Kano and Budalangi which were:

(a) Preparedness

- Lack of adequate finances, human resources and equipment to adequately prepare for floods.
- Forecasting and warning were found to be ineffective due to lack of appropriate communication systems. The study found that in Budalangi, the community radio station Bulala FM mandated to disseminate flood warnings and alerts was not operating at the time of the research while Kano does not have a specific community radio station mandated to disseminate flood warnings and alerts.
- The study found that there was inadequate information and data leading to poor planning, ineffective monitoring and evaluation to ensure readiness.
- Households in the two communities have not been adequately trained on first aid measures, they do not stock pile emergency supplies.

(b) Mitigation

- Lack of policy, legal and institutional framework.

- Flood disaster management capabilities within the two communities and institutions are weak. Disaster management has not been devolved therefore the county governments have not taken charge in this process.
- Inadequate regional and international linkages.

(c) Response

- Response initiatives are reactive and short term.
- Lack of adequate finances to respond to floods.
- Corruption by government agencies involved in response activities such as distribution of relief.

(d) Recovery

- Lack of support systems that provide special care and attention such as psychological support.
- Lack of education and awareness on human rights laws within the camps and evacuation centers.
- Lack of insurance to enable flood victims to bounce back.

5.3 Conclusions

A number of conclusions can be drawn from the findings of the study. First household characteristics gender, age, marital status, size of household, level of education, sources and levels of income were found to contribute to states of vulnerability. Secondly, the Vulnerability Capacity Assessment (VCA) tool established that other factors types of houses, acreage of land under agriculture, number of institutions, communication and road and transport network increased states of flood vulnerability. Most of the coping strategies employed were not effective since most respondents employed erosive coping strategies therefore the communities were still vulnerable to flooding. Communities' participation in flood risk reduction in the two study areas was not as effective as the community was not actively involved and finally, gaps that existed in the phases of flood preparedness and mitigation on one hand and response and recovery on the other were clear indicators that contributed to states of vulnerability.

5.4 Recommendations

The findings of this study have important implications for the improvement of communities' resilience to flood disaster in the two study areas. They also provide directions for further research.

- There is need to harmonize disaster management programmes at all levels and have the right resources and inclusion of Disaster Risk Reduction studies to the school curriculum.
- There is need for flood risk reduction interventions, which include community preparedness and early recovery interventions to enable the affected households to cater for basic needs.
- There is need for flood response operations before flooding occurs in Kano and Budalangi to mitigate flood damages due to recurring floods deepening the vulnerability of already stretched households that have to rebuild their lives.
- County government should be involved in flood management activities. This can be achieved by continuous building of institutional and human resource capacity at county and national levels.
- The national government should implement the proposal of building dams in Nandi hills as a permanent solution of controlling flooding in the two study areas.

5.4.1 Recommendations for further research

To further knowledge there is need for additional research on:

- A detailed study on Community Managed Disaster Risk Reduction should be carried out in Kano to establish what community activities increase their resilience to flood disasters.
- A study on community insurance and property security in flood prone areas should be carried out in the two study areas.

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APPENDICES

APPENDIX ONE: INTERVIEW SCHEDULE QUESTIONNAIRE

IDENTIFICATION

SUB-LOCATION:

DATE OF INTERVIEW: _____

TIME OF INTERVIEW: START AT: _____END:_____

Introduction

My name is Sarah Otieno. I am a Master of Arts student in Disaster Management at University of Nairobi currently conducting research on "A comparative study of resilience to flood disaster in Kano plains and Budalangi" and as part of a research project to meet academic requirements I am researching Kano plains and Budalangi residents. This study seeks to assess factors affecting resilience to flood disaster in the two areas. The study will establish factors that contribute to states of vulnerability; the study will seek to identify copying mechanisms employed by the communities during flooding and strengthen positive coping strategies and gaps that exist in the disaster management phases. Your household has been randomly selected to participate in this confidential survey and your name and address will not be disclosed. Your response to this survey is very important, as it will provide valuable information about flooding in your community. I will request 30 minutes of your time to ask you a few questions to enable me complete the questionnaire. I want to assure you that your answers and opinions will be treated in the strictest of confidence.

Level 1: Household Demographic Information

1. Sex of respondent: Female [ ] Male [ ]

2. Age of respondent: <20 years [ ] 20-29 years [ ] 30-39 years [ ] 40-49 years [ ] 50+ years [ ]

3. Marital status: Married [ ] Divorced [ ] Separated [ ] Widowed [ ] Single [ ]

4. How many people live in this household?

1- 3 [ ] 4-6 [ ] 7-10 [ ] above 10 [ ]

5. Level of education: No schooling [ ] Primary [ ] Secondary [ ] College/University [ ]

6. How long have you stayed in this community?

Less than <1 year [ ] 1-5 years [ ] 5-10 years [ ] 10+years [ ]

7. What is your religion? Christianity [ ] Islamic [ ] Traditionalist [ ] Other (Specify)……

…...

8. What are the sources of income for this household?

8. What is your estimated monthly average income?

1000 – 5000 [ ] 6000-10,000 [ ] 10,000 and above [ ]

9. How many people are in this household? How many adults and how many children?

10. How many people are working/have an income?

11. Factors that contribute to states of vulnerability

2. Resource Inventory	No.	
TYPE OF SHELTER		
Permanent		
Semi-permanent		
Grass thatched		
AREA	ACREAGE	
Land under agriculture		
HEALTH FACILITIES IN YOUR LOCATION	No.	
Hospitals		
Dispensaries		
Clinics		
WATER SUPPLY		
Piped water	Does your community have piped water? Yes [ ] No [ ]	
Boreholes (No.)		
Other (specify)		
ELECTRICITY	Is the	

	community supplied with electricity? Yes [ ] No [ ]	
COMMUNICATION	Which telephone network do you receive in your community? Safaricom [ ] Airtel [ ] Orange [ ] Other (Specify)	
	Which radio stations do you receive in your community?	
TRANSPORT AND ROAD NETWORK	Name the roads	
All weather roads		
Seasonal roads		

12**.** Coping mechanisms employed by the household during flooding and strengthen positive coping strategies

	Primary source (interview)	**Observation**	**Secondary source**
1. Which of the following flood proofing techniques do you use to reduce flood damage? (Tick all that are applicable)	1.Sand bags [ ] 2.Blocking/sealing of doors and window of your house [ ] 3.Elevation [ ] 4.Relocation [ ] 5.Demolition [ ] 6.Other methods (List if any		
2. What adaptive strategies does your household use to cope with flooding in terms of the following?			
(a)Economic/material (Tick where applicable)	1.Have more than one source of income [ ]		

	2.Have large families with more adults [ ] 3.Have a savings and credit scheme [ ] 4.List any other		
(b)Technological/structural (Tick where applicable)	1.Building houses in silt [ ] 2.Building houses on plinth/platforms of mud/concrete [ ] 3.Household escape areas under or/on top of roofs [ ] 4.List any other		
(c)Social/organizational (Tick where applicable)	1.Mutual assistance [ ] 2.Social contact [ ] 3.Support mechanisms [ ]		
(d)Cultural (Tick where applicable)	1. Risk perceptions [ ] 2.Religious views [ ]		
3. What measures has the county government and national government taken to help cope with flooding to reduce its impact?			
(a)Structural measures	1.Building Levees [ ] 2.BuildingEmbankments[ ] 3. Dams [ ] 4. Dykes [ ] 5.Flood ways and diversions [ ] 6. Any other (Please list)		
(b) Non-structural measures	1.Building zones [ ] 2.Introduction of building codes [ ] 3.Land use planning [ ] 4.Insuarance policies [ ] 5. Forecasting [ ] 6.Warning [ ] 7. List any other measures		

APPENDIX 2: FOCUSED GROUP DISCUSSION INTERVIEW GUIDE

My name is Sarah Otieno. I am a Master of Disaster Management student at University of Nairobi currently conducting research on "A comparative study of resilience to flood disaster in Kano plains and Budalangi" and as part of a research project to meet academic requirements I am researching Kano plains and Budalangi residents. This study seeks to assess factors affecting resilience to flood disaster in the two areas. The study will establish factors that contribute to states of vulnerability; the study will seek to identify copying mechanisms employed by the communities during flooding and strengthen positive coping strategies and gaps that exist in the disaster management phases.

To establish factors that contribute to states of vulnerability

1. What is your understanding of vulnerability? Briefly explain
2. Who are the most vulnerable to flooding? Why?
3. Why do you live on a flood prone area?
4. What strategies have been adopted by the community to reduce flood vulnerability?
5. What is your understanding of flood risk? Briefly explain
6. What strategies have been adopted by the community to reduce flood risks?
7. Please describe the last flooding event in the community? (When? what were the impacts? How did the community respond? Was this effective?

To identify coping mechanisms employed by the community during flooding and strengthen positive coping mechanisms

8. What is your understanding of coping mechanisms? Briefly explain
9. What current efforts are being made to cope with floods by?

Institutions	**Coping Mechanisms**
1.Community	
2. Government	
3. Other organizations	

10. What changes are the strengths and weaknesses of the coping strategies employed by the community?

Strengths	**Weaknesses**

Community Managed Disaster Risk Reduction systems in place

11. What activities do the community members engage in managing floods in your area?

Community's flood preparedness and mitigation and response and recovery

12. What challenges affect flood preparedness in your community?
13. What challenges affect flood mitigation on your community?
14. What challenges affect response to flood disaster in your community?
15. What challenges affect your community's recovery from a flood disaster?

APPENDIX 3: KEY INFORMANT INTERVIEW GUIDE

My name is Sarah Otieno. I am a Master of Disaster Management student at University of Nairobi currently conducting research on "A comparative study of resilience to flood disaster in Kano plains and Budalangi and as part of a research project to meet academic requirements I am researching Kano plains and Budalangi residents. This study seeks to assess factors affecting resilience to flood disaster in the two areas. The study will establish factors that contribute to states of vulnerability; the study will seek to identify copying mechanisms employed by the communities during flooding and strengthen positive coping strategies and gaps that exist in the disaster management phases. Your contribution will help in the completion of this study. Participation on this study is voluntary and your confidentiality will be preserved as the information you give will be used strictly for academic purposes.

Level 1: Personal Information

1. Sex: (tick as appropriate) Male [ ] Female [ ]
2. What is your highest level of education? (Tick as appropriate)

No schooling [ ] Primary [ ] Secondary [ ] College [ ] University [ ]

Others [ ],

specify…….

Position held:

……..

1. Please provide me with an overview of the flood situation over the last 5 years?
2. What has been the most significant impact of flooding in this community and to whom or what can this attributed?
3. What factors contribute to community's state of vulnerability to flooding?
4. What coping mechanisms are employed by the community to mitigate floods?
5. What factors affect community's ability to cope with floods?
6. What are some of the good practices that contribute to flood resilience from your own experiences?
7. What is the role of the community in managing flood risks?

8. What is the role of the county and national governments in flood risk reduction in this community?
9. What gaps exist in the phases of flood preparedness and mitigation on one hand and response and recovery on the other?
10. What are the institutional weaknesses in the current management of floods in the County?
11. What do you believe are the short term and long term goals for flood management in your area?

(a) Short term goals

(a) Long term goals

12. What recommendations do you have to improve community's resilience to flooding?

APPENDIX 4: OBSERVATION CHECK LIST

1. Demographic information	■Distribution of the population (age, work, gender) ■Daily routine (school-aged children in school, adult present with children at home, working in the fields) ■Family structure (nuclear or extended family present, child-headed households) ■Community interaction
2. Infrastructure	■Types of housing and other infrastructure, use of latrines ■ Construction materials, design and proximity of buildings ■ Types of roads ■Communication systems ■Sports facilities
3. Daily activities	■What people eat ■Where they shop ■Religion – churches, mosques, temples, etc. ■Recreational activities ■Types of transportation used
4.Visible vulnerabilities and capacities	