

ASSESSING AND MAPPING PEOPLE'S PERCEPTIONS OF VULNERABILITY TO LANDSLIDES IN BUDUDA, UGANDA

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ABSTRACT

This study explores people's vulnerability to landslides in Bududa, Uganda and how people perceive their vulnerability to such disasters in the face of a blatant government declaration that the area is risk prone and unsafe for human settlement. The study then explores GIS capabilities to map such perceptions and how ensuing maps can be used to communicate people's perceptions of vulnerability to landslides. Specifically examined are people's perceived causes of landslides, how people interpret their vulnerability to landslides; factors influencing their perceptions of vulnerability and their coping capacity.

This thesis is about vulnerability and representations of perceived vulnerability. The study uses the vulnerability paradigm and theoretical representations on vulnerability as theoretical frameworks. The paradigm expounds vulnerability to mean the characteristics of a person or group and their situation that influences their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard. The theoretical representations highlight known risk perceptions and principles of risk behavior.

A case study approach is adopted involving qualitative research methods and a customized perception mapping methodology using Geographic Information Systems (GIS). Data were collected through personal observation, formal and informal interviews, document review and spatial data capture using maps and global positioning systems on smart phone. In a case study approach, an empirical inquiry, which investigates contemporary phenomenon within its real-life context such as people living in a disaster prone area, is analyzed and interpreted through the selected theoretical framework.

The data reveals that, local people living in landslide prone areas in Bududa are aware of the risk but are bonded to the area mainly by poverty, religious and cultural beliefs, fertile land and socio-economic ties. Accordingly, illiterate and semi-literate respondents express strong attachment to culture, tradition and religious beliefs but at the same time attributing their continued stay to poverty and marginalization. Literate participants blame illiterate participants for being adamant and non-responsive to government programs aimed at relocating them to safer locations. Findings also reveal limited sensitization of affected communities about the inherent

dangers to their lives. Furthermore, coding and classification of non-spatial data and use of raster data formats are adopted to produce maps, which efficiently communicate perceptions of landslide vulnerability.

The study recommends augmented sensitization using 3 dimensional maps with emphasis on digital elevation modeling and household vulnerability mapping for improved response.

Key words: Landslides, Vulnerability Perceptions, Risk, GIS and Mapping Perceptions

DEDICATION

To my lovely children Elijah Salem Masuba and Gabriel Wanasolo

ACRONYMS

2D:	Two Dimensional
3D:	Three Dimensional
BDLG:	Bududa District Local Government
GIS:	Geographic Information Systems
GPS:	Global Positioning Systems
M.A.S.L:	Meters Above Sea Level
NEMA:	National Environment Management Authority
NTNU:	Norwegian University of Science and Technology
OPM:	Office of the Prime Minister
S/C:	Sub-County
TIN:	Triangulated Irregular Network
UN-OCHA:	United Nations Office for Coordination of Humanitarian Affairs
UPDF:	Uganda People's Defense Forces
URCS:	Uganda Red Cross Society
URL:	Uniform Web Locator

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CHAPTER ONE

1. GENERAL INTRODUCTION

Uganda is one of the most beautiful countries in Africa with a rich physical landscape comprising of mountains, hills, valleys and flat plains spanning across the country. Situated in Eastern Africa, Uganda is mostly a plateau with agriculture as the main economic activity (Wikipedia 2012). Landslides have been recognized as a widespread phenomenon in the East African highlands, having a great social and economic impact. Previous studies around Mt. Elgon show that increasing population pressure on land in search of land for settlement and cultivation is one of the major causes of mass movements. The most recent catastrophic landslide was recorded in March 2010 at Nametsi Village in Bududa District. The district is densely populated with about 952 persons per square kilometer (Kitutu et al. 2011). This thesis explores people's vulnerability to landslides and how perceptions of such vulnerability can be represented and communicated through maps to improve preparedness and management of landslides.

This chapter is divided into four sections. The first section gives an overview of the research problem. The second section provides information about the research gap regarding representation of perceptions of risk¹. The third section puts the study into perspective through formulation of objectives and research questions whereas the fourth section gives an outline of each chapter in summary.

1.1. Overview of the Problem, Background and Underlying Observations

The first studies on landslides in the area were conducted by Breugelmans (2003), Knapen (2003), and Knapen et al. (2006) focusing mainly on characteristics and causal factors of landslides in Manjiya county, which has now been split into two districts: Bududa and Manafwa. They mapped and investigated 98 recent (up to 2006) landslides by statistically comparing topographical characteristics from landslide sites with those from the whole study area. Their study revealed that landslides occur predominantly on steep concave slopes that are oriented to the main rainfall direction

¹ In this study, risk is understood to mean, a potential threat to humans and their welfare plus their exposure and susceptibility to losses in the face of a likely landslide occurrence based on interpretations from Blaikie *et al.* (1994).

(northeast) and at a relatively large distance from the water divide (Claessens et al. 2007). There is a wide range of failure mechanisms and triggering causes of landslides. Local geological and topographic conditions determine the type of landslide in a specific region. Some regions are particularly susceptible to landsliding including: steep slopes in the mountains; weak cretaceous bedrock along valleys in the Prairies; and valleys eroded into fine-grained sediments in areas once covered by glacial lakes and seas. However, impact is greatest where landslide occurrence coincides with human activity (NRCAN 2011). Previous studies around Mt. Elgon show that high annual rainfall, steep slopes, deforestation, high weathering rates and slope material with a low shear strength or high clay content are considered the preparatory causal factors for mass movements.

Increasing population pressure and its associated effects, has increased slope disturbance, due to inconsiderate irrigation and deforestation.

Such triggering factors as well as earthquakes and extreme rainfall events turn the East African highlands into an inherently susceptible region for landslides (Glade and Crozier, 2004 cited in Knapen et al. 2007).

In March 2010, a landslide occurred at Nametsi Village in Bukalasi sub-county reportedly killing an estimated 300 people (section 2.3). Rescue efforts were intricate due to the challenging terrain. Studies show that landslides in the area have claimed approximately over 400 lives since 1970. Moreover, these casualties happen within a limited area and majority of them happened in one single event (about 300 in the 2010 landslide in Nametsi). According to the Uganda Red Cross Society, new cracks on Mt. Elgon in Manafwa and Bududa districts are threatening lives of 8,586 people and the affected people need to be relocated immediately. The government of Uganda accordingly declared the affected areas risk prone and unfit for human settlement. But in spite of this open threat, the population on Bududa's mountain slopes has been steadily growing with the recent growth rate estimated at 3.5% per annum.

Local Media reports have continuously warned of landslides in areas around the Mt. Elgon region during this study (see for instance, the New Vision Newspaper, (14th September 2011); The New Vision newspaper, (31st August 2011); the Newvision Newspaper, (8th June 2011); the New Vision newspaper, (June 6th 2011); the Monitor newspaper, (23rd May 2011).

In figure 1, a cluster of abandoned remains of the settlements (circled) that narrowly survived the 2010 landslide are visible. In the vicinity, some of the households that were interviewed are marked with red dots.



Figure 1. **An aerial photo view of the 2010 landslide disaster site in Nametsi Village (Source: NEMA, 2010)**

Based on the above literature review, this study has the following underlying observations:

First, the area is prone to new disasters and unfit for human settlements yet human settlements still exist.

Second, human induced causal factors of landslides are still at play and the population is likely to continue growing in the area.

The compelling question from which this study draws inspiration is, ‘how do people in this area perceive their vulnerability to landslides?’ It is generally assumed that in light of such looming disaster, those who promote and regulate health and safety need to understand how people think about and respond to risk (Slovic 1987). This will provide a basis for understanding and anticipating public responses to hazards and improving the communication of risk information among lay people, technical experts, and decision-makers.

1.1.1. Overview of the Research Problem

Previous studies on vulnerability to landslides and people's perceptions of risk have covered vulnerability assessment and mapping, social resilience and adaptation, human response to, hazard monitoring for mitigation, hazard proneness, and vulnerability reduction mostly in relation to flooding, climate change in general and landslides (see for instance, Baird 1975; Allen 2003; Downing 2003; Elliot & Pais 2006; Siegrist, & Gutscher 2006; Gaillard, 2010; Kitutu 2011; Rød et al. 2012;). Those that have incorporated GIS as a tool have mainly used it to map physical, social and integrated vulnerability (Rød et al. 2012); quantifying and mapping household level vulnerability (Kitutu et al. 2005); model landslide hazards, slope analysis, and to show level of physical vulnerability (Knapen et al. 2007; Chen et al. 2008; Krishnamurthy et al. 2011).

The broad background interest of this study is vulnerability to landslides in Bududa and how affected people perceive their vulnerability to such catastrophic events. Further more, this study explores possibilities of using GIS to map non-tangible phenomena such as perceptions of vulnerability. The theoretical focus is on the vulnerability paradigms and discourses, which will help to analyze and understand the study's field findings and to draw conclusions. Theoretical perspectives on risk perceptions and principles of risk behavior will be explored.

The research problem is therefore *to explore people's perceptions of vulnerability to landslides and map these using GIS*. The research findings may (where possible) be presented to policy makers and I hope that the results will inform the decision making process regarding risk perceptions and resilience to landslide disasters in Uganda. Consequently, appropriate preparedness and management measures will be sought thus increasing people's safety and preventing or reducing loss of lives.

1.1.2. Background to the Study

This thesis explores three central issues: First, the study discusses the factors contributing to the relentless human settlements in this area (Chapter 5). Second, the study delves into the perceptions of respondents about the risk of landslides pursuant to the known risk perceptions from previous studies and briefly highlights their coping capacity. Thirdly, the study explores possibilities of representing people's

perceptions of vulnerability using maps² and gives a literature review on its general applicability in landslide disaster studies before elaborating specifically on how to use GIS in mapping human perceptions (Chapter 5).

Landslides have been recognized as a widespread phenomenon in the East African highlands, having a great social and economic impact. In Uganda, landslides are common in the mountainous areas of Sironko, Kapchorwa, Mbale, Kabale, Rukungiri, Mbarara, Kasese, Bushenyi, Bundibugyo and Kanungu Districts. Losses triggered by natural disasters have been highlighted by the UNDP as the main cause of failure to meet some millennium development goals in many developing countries. Studies have shown that the most common losses induced by landslide disasters include destruction of infrastructure, erosion of livelihoods, damage to the integrity of ecosystems and architectural heritage, injuries, illness, psychosocial defects and deaths. Mass movements associated with intense rainstorms are reported to have occurred periodically in Manjiya County since the early 20th century but the increase in fatalities and losses as a consequence of the enormous population growth draws attention to the phenomenon nowadays (Knapen et al. 2006).

The stagnation caused by disasters to development paths, especially of poor countries is enormous. Poor countries and particularly the poor people in those countries suffer most since most of them live on marginal lands and depend almost entirely on high-risk, low return livelihoods such as rain-fed agriculture. This calls for a concerted effort towards natural disaster management. The World Disaster Report (2009) recommends technically sound, politically viable and communally acceptable early warning systems for timely preventative response to disaster risk.

1.1.3. Objectives of the Study

The overall objective of this study is to explore people's perceptions of vulnerability to landslides and map these using GIS in order to show how maps can be used to communicate people's perceptions.

² The term maps in this thesis is used to refer to GIS generated maps.

The objective can be broken down and explained through three principle sub-objectives and respective research questions:

1. To find out people's perceptions of risk to landslides.
 - Do people know about landslides and the associated dangers?
 - Are people who are living near a recent landslide disaster site afraid of landslides, and do they see landslides as a threat to their lives?

2. To identify the factors influencing people's continued stay in areas prone to landslides around the Mt. Elgon in Nametsi Parish.
 - Why do people continue to live in this area?
 - Are there safer alternatives for their resettlement?
 - Are they willing to move and settle in a safer place?
 - If safer alternatives are available, why have they not moved?
 - What is their coping capacity?

3. To find out how GIS generated maps can be used to communicate people's perceptions of risk to landslides.
 - Is it possible to communicate how people perceive risk through maps?
 - Can maps improve preparedness and management of landslides, and if so, how?

1.2. Outline of the study

Chapter one introduces and presents a background to the study, the research problem and the ensuing research questions, as well as the scope and delimitations of the study. Chapter two puts the study into context by presenting a brief description of the study area highlighting Uganda's location, drainage and climate, topography, and population. The actual study area is then briefly described in terms of Geographic Location, Socio-economic characteristics and the History of Landslides. Chapter three presents the methodology used to collect and analyze the data used for this thesis. Details of the sample selection, data collection techniques and methods of analysis are

also presented. Chapter four examines the vulnerability paradigm as well as literature on risk perceptions and principles of risk behavior, which takes the concept of vulnerability from the basic understanding of being prone to or susceptible to damage or injury (Physical Vulnerability), to further look at the characteristics of a person or group and their situations that influence their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard (Social Vulnerability). Chapter five presents the empirical findings arranged according to first, the objectives of the study and second, the compelling themes within which the narratives were provided by key informants and respondents. A discussion of the study's theoretical contributions to people's perceptions of risk to landslides is then presented in relation to the findings. The chapter then delves into mapping of risk perceptions. Variables are coined out of the empirical findings and outcomes of the qualitative analysis producing a range of thematic maps in line with chosen themes. Chapter six presents an overall review of the research objectives, findings, conclusions, and recommendations of this study. The chapter also provides a direction for future research in mapping vulnerability perception and concludes by recommending adoption of GIS generated 3 Dimensional (3D) maps of perceptions to not only inform decision makers but also improve communication and community sensitization about vulnerability to landslides. The perception mapping is also recommended for enrichment of disaster related information and to improve and focus landslide disaster planning and management efforts.

CHAPTER TWO

2. BACKGROUND TO THE STUDY AREA (THE SETTING)

2.1. Introduction

This chapter presents a descriptive outline of the study area. The first section briefly examines Uganda's profile putting the study area in context. The second section describes the geographical location of the study area. The third section briefly describes Bududa's socio-economic and geographical profile, whereas the fourth section describes the history of landslides in the study area and surrounding areas. Two sub-counties of Bukalasi and Bumayoka were selected for this study because of their proximity to the most recent landslide disaster location in the Bududa District (section 2.5). As documented by Kintu et al. (2009), the villages in the two sub-counties have had repeated occurrences of landslides due to their location on the steep slopes of Mt. Elgon, loose soil types, bi-modal heavy rainfall patterns and a high population growth rate. This makes them more vulnerable to future landslides and the associated consequences.

2.2. Brief Profile of Uganda

2.2.1. Location, Drainage and Climate

Uganda is located on the East African plateau, lying mostly between latitudes 4°N and 2°S (a small area is north of 4°), and longitudes 29° and 35°E (see figure 2). The East and Southwest are mountainous with Mt. Elgon and Mt. Rwenzori as the largest mountains in the country. Much of the south is poorly drained, while the centre is dominated by Lake Kyoga, which is also surrounded by extensive marshy areas. Uganda lies almost completely within the Nile basin. The Victoria Nile drains from Lake Victoria into Lake Kyoga and thereafter, into Lake Albert on the Congolese border. It then runs northwards into South Sudan. One small area on the eastern edge of Uganda is drained by the Turkwel River, which is part of the internal drainage basin of Lake Turkana (Wikipedia, Uganda 2012). Figure 2 shows Uganda's Relief and its location in East Africa while figure 3 shows the location of the study area in Uganda.

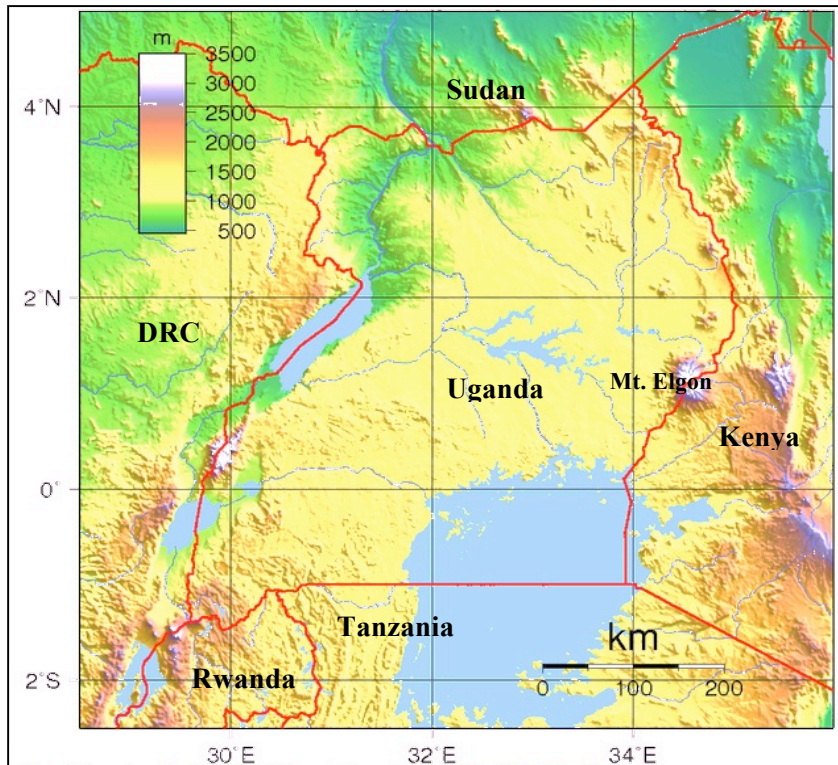


Figure 2. Location and Relief of Uganda (Source: Wikipedia, Uganda 2012)

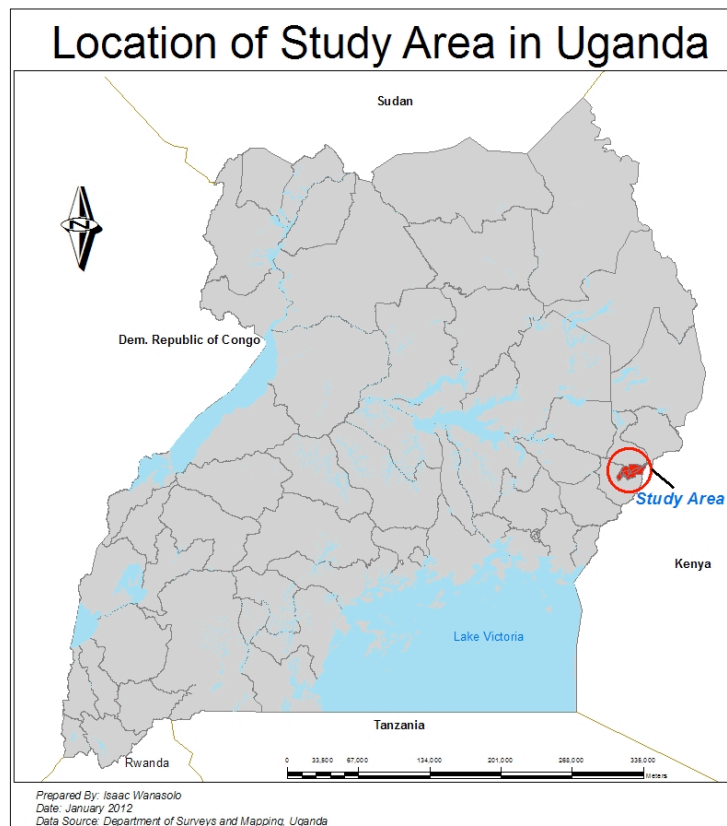


Figure 3. Location of the study area (Bududa) in Uganda

2.2.2. Topography and Population

Mountains mark both eastern and western borders of Uganda. The Ruwenzori Mountains form about eighty kilometres of the border between Uganda and the Democratic Republic of Congo (DRC) with highest peaks of Margherita (5,113 m.a.s.l) and Alexandria (5,094 m.a.s.l). Farther south, the northernmost of the Mufumbiro volcanoes reach 4,132 m.a.s.l on Mount Mhavura (3,648 m.a.s.l), on Mount Mgahinga (3,477 m.a.s.l), and on Mount Sabinio, which marks the border with Rwanda and DRC (Wikipedia, Uganda 2012).

In eastern Uganda, the border with Kenya is also marked by volcanic mountains. Dominating these, approximately 120 kilometers north of the equator, is Mount Elgon, which rises from the 1,200 m.a.s.l plains to reach a height of 4,324 m.a.s.l. Mount Elgon is the cone of an extinct volcano, with ridges radiating 30 kilometers from its crater. Rich soil from its slopes is eroded into the plains below. Two other volcanic mountains are north of Mount Elgon: Kadam (also known as Debasien or Tabasiat) Peak reaching a height of 3,054 m.a.s.l, and Mount Moroto at 3,085 m.a.s.l. In the far northeast, Mount Zulia, Mount Morungole, and the Labwor and Dodoth Hills reach heights in excess of 2,000 meters. The lower Imatong Mountains and Mount Langia, at 3,029 meters, mark the border with Sudan (Wikipedia, Uganda 2012).

Uganda's population is currently estimated at 34,612,250 people growing at a rate of 3.4% per annum (CIA World Fact Book in Index Mundi 2012). Table 1 shows the growth trend since the year 2000.

Table 1. Uganda's Population Trend since the year 2000 (Source: CIA World Fact Book, in Index Mundi)

Year	Population
2000	23,317,560
2001	23,985,710
2002	24,699,070
2003	25,632,790
2004	26,404,540
2005	27,269,480
2006	28,195,750
2007	30,262,610
2008	31,367,970
2009	32,369,560
2010	33,398,680
2011	34,612,250

2.3. The Bududa District

2.3.1. Location

Located in Eastern Uganda, Bukalasi and Bumayoka Sub-counties are found in Bududa District. The District is bordered by Sironko District to the north, the Republic of Kenya to the east, Manafwa District to the south and Mbale District to the west. The district headquarters at Bududa are located approximately 23 kilometres (14 miles), by road, southeast of Mbale, the largest city in the sub-region. The District is geographically bound by latitude $1^{\circ} 04''\text{N}$ and $1^{\circ} 00'' \text{N}$, longitude $34^{\circ} 15''\text{E}$ and $34^{\circ} 26''\text{E}$ (Wikipedia, Uganda 2012).

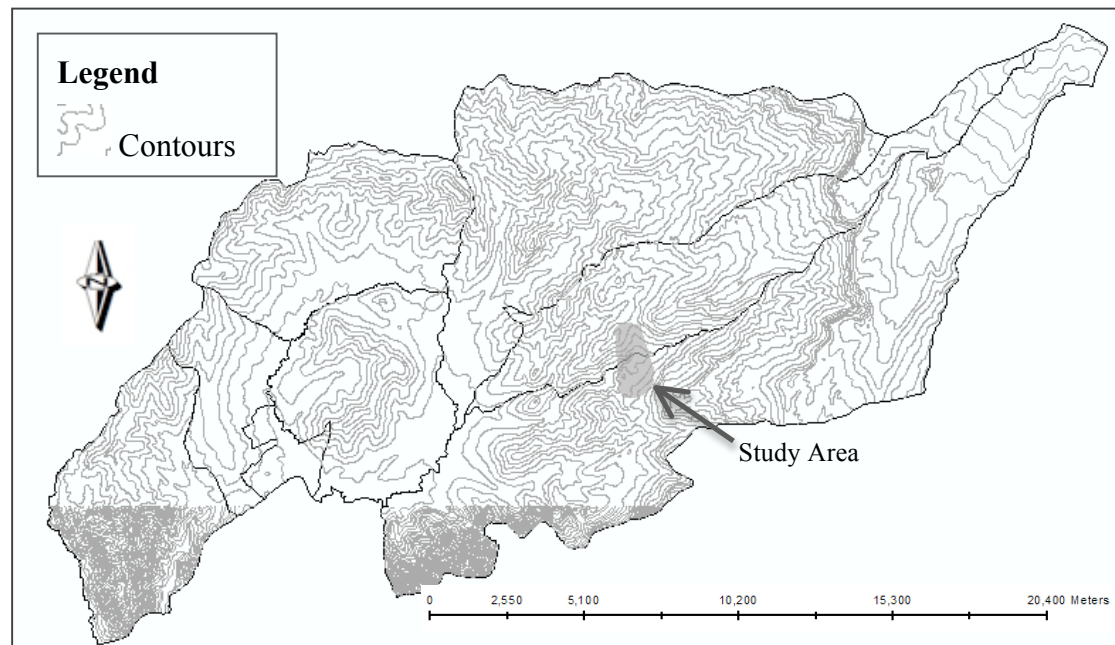


Figure 4. Contour Map showing hieght about sea level in the Study Area

Bukalasi and Bumayoka sub-counties lie between the Mt. Elgon national forest reserve and Bubiita sub-county to the east, Buwaali sub-county to the west and southwest, and Bukiyi sub-county to the north and northwest.

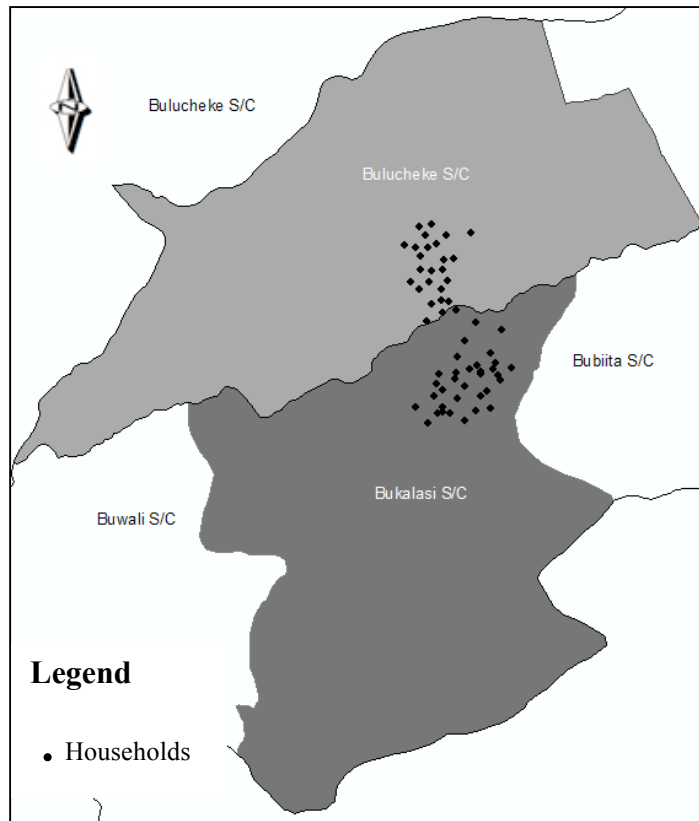


Figure 5. Location of Bukalasi and Bumayoka sub-counties and households interviewed

2.3.2. Brief geographic and socio-economic profile of Bududa District

Bududa is largely a rural district with nine urban growth centers, which also serve as lower local governments, eight of which are sub-counties and one town council. They include; Bududa, Bukalasi, Bukibokolo, Bukigai, Bulucheke, Bumasheti, Bumayoka, and Bushika sub-counties and Bududa Town Council (BDLG Five Year Strategic Plan 2007).

Bududa District is situated about 1800 meters above sea level (5,900ft) on the south western foot-slopes of the Mt. Elgon ranges with an average annual precipitation above 1500mm (Kitutu et al. 2011). The district has two distinct wet seasons distinguished by two dry seasons in December to February and in July. The precipitation usually peaks in May and October and it is largely influenced by the high altitude. The District has a unique relief consisting of ridges, cliffs and steep slopes, which are V-shaped indicating presence of river incisions. The natural

vegetation cover consists of dwindling bamboo forests, grasses and other tree species. Mt. Elgon National Park covers approximately 40% of the district (Kintu et al. 2009).

In 2006, the District Census Report revealed that the district had a total of 73,861 females and 74,468 males, which places the male to female ratio at approximately 1:1 respectively. According to the Uganda Population and Housing Census Report of 2002 as cited in BDLG Strategic Plan of 2007, the population is steadily growing at a rate of 3.8% per annum. Kitutu et al (2011) reveals that Bududa District is densely populated, with about 952 persons per square kilometer. The increasing population has been seen as the main cause of deforestation along the slopes of Mt. Elgon because of the continuous search for settlement and agricultural land.

The major economic activity in Bududa is subsistence agriculture. This is because the district is endowed with fertile volcanic soils and abundant rainfall (average: 1,500mm/year). This ensures sufficient production of food crops as well as cash crops such as coffee, beans, plantain/bananas, carrots, cabbage, tomatoes, and green vegetables. Other activities include small-scale and medium-scale businesses including retail shops, food kiosks, restaurants, bars, and transportation. (Rwabwogo and Karibije 2007).

2.3.3. Historic Landslides in Bududa District

The Office of the Prime Minister (OPM) in Uganda defines landslides as rock, earth and debris that flow down a hill due to gravity. Landslide flows are always from a higher to a lower altitude. Landslides are triggered by rains, floods, earthquakes and other natural causes as well as human-made causes like grading the landscape, deforestation, over cultivation, terrain cutting/alteration and filling, and excessive development (OPM 2010).

Available literature from Kitutu et al. (2004) and Kitutu et al. (2009) suggests that the landslide of March 2010 was not the first in the district. Bududa District and other districts around the Mt. Elgon region have experienced several landslides since 1989. Below is a brief history of landslides in Bududa since 1989.

In 1989, a landslide hit Bubiita 3 Sub County and 11 people lost their lives. The landslide was, however, said to have been less destructive because the slopes were still covered by forests and were not heavily inhabited by people. A District official revealed in an interview that, this landslide caused flooding in the low lying areas, which caused diseases such as malaria and cholera attracting the attention of the Uganda Red Cross Society.

From 1970 to 1999, various landslides were reported in different parts of Manjiya County (Figure 6), which is present day Bududa District. The landslides were accelerated by the El Nino rains, which caused a lot of flooding and landslides across the country. In this period, it is reported that, 48 people lost their lives and 10,000 others were displaced (Kitutu et al. 2004).

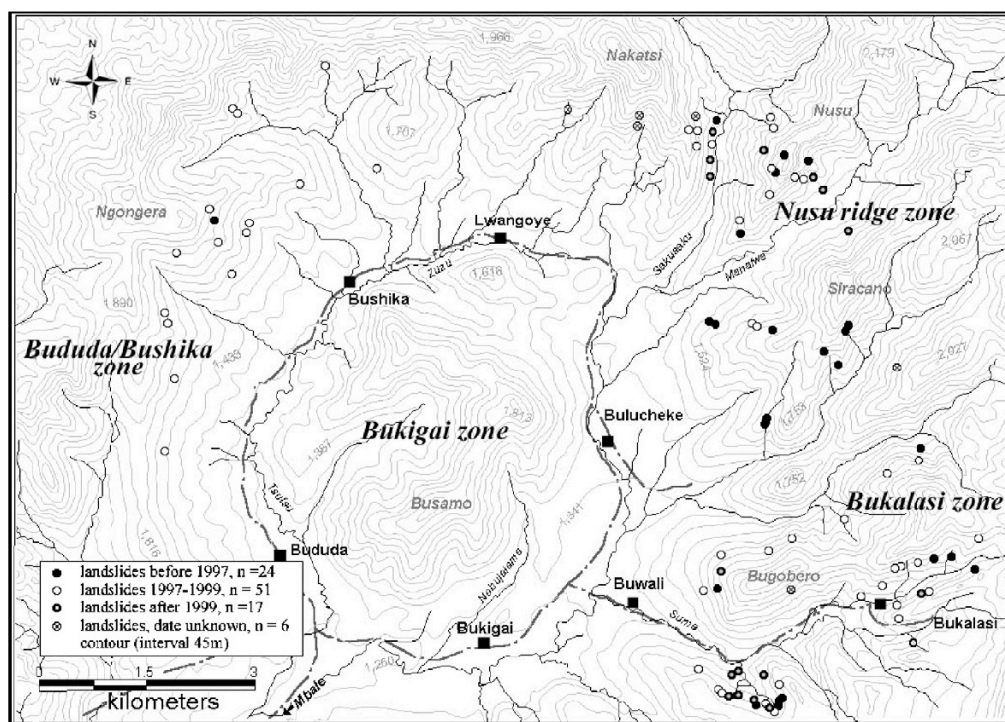


Figure 6. Reported landslides in the area between 1970 and 1999 (Source: NEMA, 2010)

In March 2010, another landslide took place in Nametsi and Ulukusi Parishes of Bukalasi and Bumayoka Sub Counties respectively. This was the most devastating landslide ever recorded in the history of landslides in the Bududa. The mudslide, mixed with rocks and vegetative debris, swept down mountain slopes and houses taking with them hundreds of people, household property and livestock (see figure 7).

The landslide buried a health centre, a primary school, a church, and an unspecified number of houses claiming approximately 300 lives. According to UN-OCHA, (2010), the three villages in Nametsi Parish were highly populated with about 3,000 people in households spanning up to nearly the top of Mt. Elgon.



Figure 7. Images of the March 2010 landslide in Nametsi Village (Source: NEMA, 2010)

2.4. Summary

This chapter has presented compressed background information to the study area by briefly outlining Bududa's profile with a brief history of landslide occurrences, physical location and Physical characteristics in Uganda's context setting a precedent for the study as a whole. Because the study is inspired by a landscape related disaster and also geographically diverse, this chapter has highlighted the physical characteristics of the study area and concepts considered to be central to landslides and justification for the presence of vulnerability. This provides a solid anchor for the proceeding chapters in this study.

CHAPTER THREE

3. METHODOLOGY

3.1. Introduction

This chapter describes the methodology used in this study and discusses the choices I made regarding methods and types of data. The chapter is divided into seven subsections. The first section defines the general approach to the research. The second section presents the decision to follow a qualitative approach and a case study design. The third defines why I select certain methodological tools over others. This section also describes how I used these tools to gather the necessary data. The fourth section presents the methods of data analysis, describing the qualitative mapping approaches used. The fifth section discusses the trustworthiness of this research. The sixth presents some of the limitations that either complicated the fieldwork or contributed to the success of the fieldwork and the study in general. The seventh and final section summarizes the chapter.

3.2. Research Design

The initial idea for this study was to use both quantitative and qualitative methodologies by triangulation of numeric and descriptive data from primary and secondary sources. However, due to limited availability of numeric data and time constraints and the desire to explore perceptions of vulnerability to landslides, I decided to adopt a qualitative research approach. A deeper reading into my main subject of study led me to realize that there was a lot more to explore on the subject of perceptions of vulnerability to landslides alone. I also realized it would be more enriching to the mapping process and the study at large. I then split my subject of study into two and placed “perception of vulnerability to landslides” on one side and “mapping” on the other. The intention was not to look at them as separate entities but to undertake a thorough qualitative analysis on perceptions of vulnerability to landslides in the area. The perceptions would then be mapped with a rich set of variables spatially referenced using numeric data collected from the field for mapping purposes. I considered this approach appropriate for this thesis because qualitative forms of investigation are based on recognition of the importance of the subjective, experiential lived world of the respondents. Whereas quantitative research often is characterized through an emphasis on causal "explanation and control" (Stake

1995:37), qualitative research is grounded on advocacy, constructivist and participatory knowledge claims, and is concerned with the description and interpretation of the social world. Qualitative research also seeks to understand the context of a situation, organization or group of people, of a relatively small scale, from the perspective of those involved. According to Orum et al. (1991: 23), the purpose of qualitative research is to describe "a world of complexity and plurality", Miles and Humberman (1994: 3) suggest that a key feature in qualitative research is the intense contact with the research setting. In this study, I am searching for 'the social meaning that people attribute to their experiences, circumstances, and situations'(Hesse-Biber and Leavy 2011: 4). Figure 8 below shows a schematic layout of the research design.

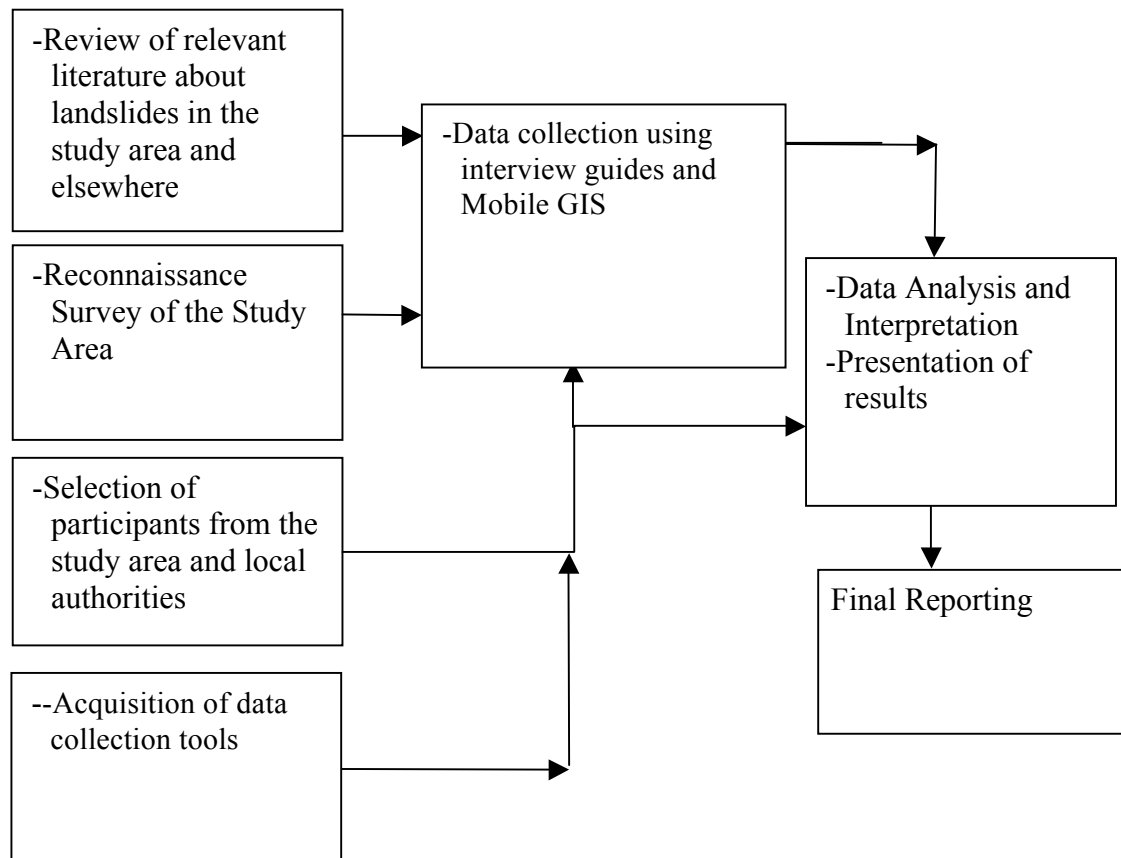


Figure 8. Schematic layout of the study design

3.3. Data Collection Methods adopted (and Justification)

The qualitative research approach applied here allows for the capture of how people themselves understand their setting (Gillham 2000a), and aims to provide a holistic overview of the context under study. Another advantage of qualitative research is the flexibility and openness in the methods applied, allowing to choose the methods suitable to the setting and to the people involved, and to adapt them if necessary. Creswell (1994) states that the choice of a qualitative research design rests on the lack of theory and previous research on the area in general, the need to explore a new area (in my case mapping perceptions), and the focus on the process and not only the outcomes. The aim is to capture aspects of the social world for which it is difficult to develop precise measures expressed as numbers. As stated above, qualitative research is understood as being more concerned with describing the characteristics and properties of a process like participation over a period of time, than with interpreting the data and information available in order to make statements concerning the nature and extent of the process which has occurred (Oakley and Marsden 1990).

My work took on a multi-method approach; in a sort of non-positivist perspective, and it was non-linear in nature. I was alternating between observations, interviews, document reviews; empirical data capture using mobile GIS and informal discussions. I did not follow a systematic or precise order of steps, but I leveraged most of the available sources of information to answer my research questions. Ultimately, I was more interested in understanding why in spite of their tragic experiences, people continued to settle in this potentially disastrous location.

3.3.1. The Case study

For the purpose of this thesis, Creswell's definition of case studies is adopted as "...case studies, in which the researcher explores in depth a program, an event, an activity, a process, of one or more individuals. The case(s) are bounded by time and activity, and researchers collect detailed information using a variety of data collection procedures over a sustained period of time" (Creswell 2003:15).

There are some disagreements in the literature about the definition and place of a case study as expounded in Blaikie (2000:215-218) but in my understanding, Creswell's definition makes more sense.

According to Robson (1993: 143), if a researcher's main concern is understanding, what is happening in a specific context, and if one can get access to and co-operation from the people involved- then a case study is best suited. This is majorly why I chose to do case study research.

Bearing in mind that each research strategy has its advantages and disadvantages, I had to choose strategies in terms of their applicability to my research as suggested by Yin (1994). The case study is a strategy for doing research, which involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence (Robson 1993). My study was inspired by a recent landslide in the study area and I knew from the beginning that I wanted to find out from the settlers themselves why they haven't moved in spite of the potential risk of death. Yin (2003), suggests that case studies are the most relevant form of research strategy when the investigator has little control over events, when the focus is on a contemporary phenomenon in a real-life context and when the research is exploratory in nature. Also, most importantly, unlike other methodological strategies, case studies embrace methodological integration and do not limit the researcher to specific methodological tools.

3.3.2. Choice of study area

I selected Bukalasi and Bumayoka sub-counties as my study area because of the area's proximity to the most recent landslide disaster and its long standing history of landslides since 1989 as expounded in section 2.3. This area is not different from all other mountainous areas in the country but was selected for its uniqueness and suitability to the study: first, because it had the most recent landslide disaster with the highest death toll ever recorded. Second, because the area still had human settlements within close proximity to the landslide site. The initial study area was intended to be the entire Bududa Town. A reconnaissance survey of the study area while in the field however led to the realization that the area was too large to be covered within the limited time available for the field study. As the intended objective was to get people's perceptions of their vulnerability to landslides, proximity to a real high-risk area was important. Consequently, I narrowed down the study area within Bududa Town boundaries as follows; the area needed to be located near a known landslide

site; be inhabited by people and accessible at least using the most common green mode of transport in the area (walking). The study area was then modified to cover an area within close proximity to the most recent landslide site at Nametsi Village and its surrounding villages and parishes falling within Bukalasi and Bumayoka Sub-counties. This was based on the assumption that the result from such an area would give a better representation of perceptions of vulnerability to landslides based on personal experiences from the recent disaster and looming threats and warnings about future landslides. There was also an assumption that people living over two kilometres from the mountain slopes wouldn't consider themselves to be at risk of any landslides from the mountain since no landslide from the past has ever come close to their homes. The new study area therefore covered the named two sub-counties, within which residents were identified to be more vulnerable to future landslides.

3.3.3. Validity and Reliability of the data

Validity is described as “soundness, legitimacy and relevance of a research theory and its investigation” (Kitchin and Tate 2000: 34-35). It refers to the mechanism that ensures that the process implemented to collect data has collected the intended data successfully (Welman and Kruger 2001). According to Babbie (1995), validity refers to the extent to which an empirical measure adequately reflects the real meaning of the subject under investigation. To ensure validity in the data that I collected, I took the following steps. First, I carried out an extensive literature review to understand how best in-depth interviews were to be conducted, after which, interview guides were generated. I then consulted officials on ground before commencing data collection and received valuable information, which was useful in my approaches. Second, I explained the purpose of the study to participants in order to resolve likely problems pertaining to misconception of my topic and purpose of the study, especially given the fact that the government had established a military base in the area after the disaster, which was still active at the time of data collection (3.5). Third, respondents were assured of anonymity and confidentiality. This ensured trust and openness during the interview process. These steps helped in ensuring that interviews were conducted in an agreeable environment conducive to each of the respondents. This way, the possibility of fear and mistrust was highly minimized.

Reliability on the other hand is described as repeatability or consistency of findings. It's a condition in which the same results will be achieved whenever the same technique is repeated to do the same study (Babbie 1995). However, repeatability is often impossible in qualitative studies such as this one, which is why my aim is to try to achieve the highest degree possible of reliability. To achieve reliability, the following steps are used. First, the anonymity and confidentiality of respondents and their households were ensured, (especially because I was capturing geographic coordinates of their houses) such that they were able to provide information that was to be used purely for academic purposes. During the informal interviews that I carried out, especially with political and technical officials, I was introduced to the lower local leaders. I then developed a rapport with respondents through which a number of them helped in identifying other respondents with particular information regarding issues that I wished to discuss with them, key among them being elders. Through this, I built some trust with respondents reinforcing at same time credibility of the study. Second, the use of a research assistant, who also happened to be a local defence unit official (responsible for keeping law and order in the area) also helped to gain entrance to people's homes and ease shy respondents. This significantly improved the discussions with respondents.

3.3.4. Tools selection

a) Qualitative tools

An important element of this research was the desire to understand historic and current landslide occurrences underlying the dynamic social context of settlements in this area. (This was intended to provide a solid base for anchoring this research.) Initially, a review of documents pertaining to vulnerability, perceptions and landslides was conducted, especially those relating to landslide disasters in the area of study. Informal interviews with district officials, key informants among local communities were undertaken. A review of District Strategic and Policy documents was done to identify the kind of preparedness and intervention measures in place, as well as major local and outside threats to these objectives. These informal interviews, along with continuous direct personal observation contributed to an initial rudimentary identification of respondents within the community. It is partly through this process that the sample group was identified. An interview guide was then used to collect data

from the sample group in line with the research questions.

b) Technical tools

Mobile GIS technology was adopted to capture spatial field data. A GPS hand-held device and a Google-maps application on an iPhone-4 were used inter-changeably to capture latitude and longitude coordinates of households that were interviewed. This was done to enable data analysis for mapping purposes at a future stage. 58 coordinate pairs of interviewed households were successfully captured and used for analysis and mapping of perceptions (section 3.3.2).

3.3.5. Sample group selection

The process used to identify the sample group of participants was purposive random sampling. This is a process often used in case studies where the researcher uses their judgment as to typicality or interest (Robson 1993). First, the sample group was selected purposively based on my perceived conception about what I thought was the most vulnerable group of people using the epicentre of the recent landslide site as a reference point. This was also in line with the criteria I had developed to delineate the study area (3.2.2). Second, interviewed households were then selected randomly stopping at every third house in dense settlements and house after house in sparse settlements. The data collection methods involved close contact between me as the researcher and the key research participants and their surroundings, which were interactive and developmental and allowed a number of emerging issues to be explored. It further allowed me to reformulate and specify my research questions throughout the research process.

3.3.6. Document Review

A collection of documents were collected, summarized and subsequently reviewed and analysed to enrich my empirical findings. Document review was done right from pre-fieldwork preparations through analysis to final presentation of the findings of this study. These texts provided important background information about landslide disasters in general, the history of landslides in the area and how government, NGOs, and local people have dealt with landslide disasters in the past. The documents reviewed to obtain specific information regarding the 2010 landslide in Nametsi

included, the UN-OCHA's Situation Report (7th March 2010), O.P.M Report (2010), and the NEMA Report (2010), all of which were written after the landslide.

According to Merriam (1998: 70), the data collection techniques used, as well as the specific information considered to be 'data' in a study, are determined by the researcher's theoretical orientation, by the problem and purpose of the study, and by the sample selected. In line with this, I started by obtaining documents specifically about landslides and people's perceptions about vulnerability in general so that I could check the accuracy of my information from the field by way of interviews, observations, and personal reflections, visualization and reminiscences. I collected journal articles, local government reports, a report from the office of the prime minister about the March 2010 landslide, and newspaper articles about the same landslide. I was able to use all these documents freely and to secure information in its natural state. Merriam (1998: 126) argues that, "...one of the greatest advantages in using documentary material is its stability. Unlike interviewing and observation, the presence of the investigator does not alter what is being studied'. The collected documents helped me to contextualize the participants' responses and views of the key research participants.

3.3.7. Interviews

An interview guide was used to interview 58 residents from eight villages within a radius of about two square kilometres from the landslide site in Nametsi village. Most of them were found to have been affected either directly or indirectly by the recent disaster. As mentioned earlier, a number of informal interviews were also conducted with officials from government and the Uganda Red Cross Society. Some of the interviews were scheduled and done by telephone after fieldwork because of time constraints. Since many of the respondents were sceptical and didn't want to be recorded in voice, I was unable to utilize this method. Semi-structured lasted between 20 to 45 minutes. The interviews were not conducted in a particular order as I was trying to fit in everyone's schedule but the free-style enabled me to gather information from important sources. This allowed the participants to feel informed about the type of questions that would be asked and how they would be presented. The first informational interview was carried out at district headquarters of Bududa district with the district planner. This had the dual purpose of introducing me to the sub-

county chiefs of the study area (Bukalasi and Bumayoka sub-counties) as well as gathering preliminary information to assist in understanding the study area and further modification of the semi-structured interviews, which was deemed necessary.

An interview guide comprising of open-ended questions designed to occasion talk about the main theme was used (Appendix A). Using this format, key informants were given a chance to discuss a range of issues central to this research project. Participants had the freedom to express and expound their individual attitudes on the subjects of study. The semi-structured interview guide enables the interviewer to frame the topics and keep the participants on track, while giving the participant freedom to express observations, perceptions, and attitudes. Howe (1988: 308) asserts that, 'the qualitative structured interview affords the researcher the ability to adjust to the respondent while still covering the research concerns, areas, or questions'. Since a qualitative interview's pace is largely influenced by the interviewee's willingness and degree of involvement, the amount of prompting and probing from the interviewer also differed from one interviewee to another.

Interviewing is a "Primary means through which ethnographic researchers have attempted to get to grips with the contexts and contents of different people's everyday social, cultural, political (...) lives" (Crang 2007: 60). Yin (2003) also acknowledges the importance of in-depth interviews and states that they can play a crucial role in case studies. My interviews lasted for about 20 to 45 minutes, which allowed for fairly in-depth discussions and information gathering. Howe (1988) offers a range of interviewing styles from the most structured to the least structured. For instance, her definition of a qualitative semi-structured interview falls between the two extremes of Marshall and Rossman's (1999: 108) definition of in-depth qualitative interviews as a conversation in which a researcher 'explores a few general topics to help uncover the participant's views,' while remaining faithful to how the participant 'frames and structures the responses.' Charmaz (1991) refers to it as a 'directed conversation.' As suggested by Kvale (1983: 176), my intention was to keep focus upon and guide the interviewee towards chosen themes rather than guiding the interviewee towards certain opinions about these themes.

One of the challenges associated with such face-to-face interviewing is the effect of personal interaction. Often, respondents may be unwilling or unable to articulate what is most important or relevant for understanding their motives, actions or emotions. Respondents may be unaware of the patterns in their lives, may not be asked the right questions, or may have reasons not to be fully cooperative or truthful during the interview situation (Taylor & Bogdan, 1988).

Sharlene & Leavy (2011: 100) however stress the importance of ethics in in-depth interviews suggesting that ethics be put at the forefront throughout the research process. Communication of confidentiality to the respondents and obtaining their informed consent was keenly taken care of before commencing each of the interviews.

3.3.8. Observation

The role of the observation I made in the field was to first, help me reflect upon my own perception and feeling of risk or dangers in the area and second, to familiarise myself with the areas as a help to get the conversation flowing during the interviews. But I did not carry out a systematic observation study.

Making observations with context sensitivity was used further as recommended by Merriam (1998: 94). According to her, ...‘first, observations take place in the natural field setting instead of a location designated for the purpose of interviewing; furthermore, observational data represent a first-hand encounter with the phenomenon of interest rather than a second-hand account of the world obtained in an interview’. Furthermore, in line with Merriam’s (1998) proposition, during my reconnaissance field study on the first day, while visiting the landslide site, I spoke to a number of people with the aim of identifying key informants for the interview process. I also used this opportunity to make my first observation of the study areas and visualize how I would move from one household to another. At this point, I was able to experience how challenging it would be to move when it rained and the clay-loam soils became slippery and sticky.

3.4. Methods of Data Analysis

3.4.1. Analytical Framework

Yin (1994) points out the importance of a general analytic strategy, however simple it might be, prior to collecting case study data. One of the most desirable modes of analysis is to compare an empirically based pattern with a predictable one (Yin 2003: 116; Bui 2009). Yin (2003) however notes that the precision of pattern matching, is far from well developed, so simple pattern matching is recommended, especially for the novice investigator. Bui (2009: 153) concurs. According to Erlandson et al. (1993), what distinguishes scientific approach from superficial conjecture is a thoroughly prepared, rigorously researched and documented analysis. Yin (2003: 111) suggests three general strategies for analysing case study data. The first is to follow the theoretical propositions that led to the study. Second, to define and test rival explanations and third is to develop a descriptive framework for organizing the case study.

In this study, I adopt the first and second general strategies to qualitatively analyse the data collected. The data is analysed and interpreted based on the proposed theoretical propositions discussed in chapter 4. The analysis and synthesis follows a development process continually evolving and emerging through constant comparison of newly, acquired data with previously acquired materials. This is done in line with the objectives and research questions, which I had set and consistently restructured based on this framework. I also disassembled and reassembled data time and again to draw out uniqueness in pattern of behaviour of the respondents. I then coded the data based on responses from each household to make it possible for me to trace such data back to the interviewee (through the transcript), document, or re-observation for purposes of a conformability audit to verify the process and research method used (see schematic representation of the Analytical Framework in Figure 9).

I am aware that there are alternative ways of presenting qualitative material. Because of the GIS component in my study, I overstep the conventional qualitative analysis methodology by bringing in statistics (chapter 5) to report results relating to key aspects central to the mapping of people's perceptions. This is mainly because to some extent, I use the interviews to fill in a questionnaire (which is almost a 'pure'

quantitative design), but I also collect people’s perceptions, in different forms, where the data is text. I then present patterns from the interviews in the analysis as well as stating how many people said what in relation to the said perceptions. This study does not particularly use systematic statistical analysis and presentation methods.

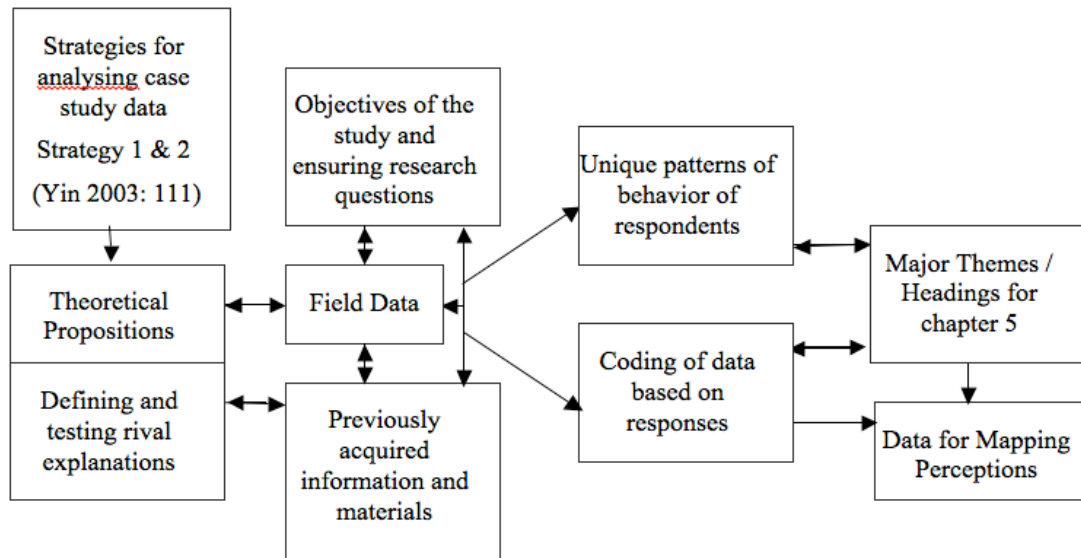


Figure 9. Schematic representation of the Analytical Framework for this study

3.4.2. Mapping

Today GIS-based tools give many opportunities for mapping and there are different approaches that may be used to study landslide related issues. Digital terrain modelling for instance can be combined with vertical aerial photographs and quaternary geological maps, to identify areas where new slides could be a problem (Solburg 2007). This may, together with other data, lead to zonation of an area’s susceptibility or hazard, and to assess the consequences and analyse risk. The approaches and methods are often quantitative in nature. However, this study seeks to map people’s perceptions of vulnerability to landslides but there is no documented clear-cut method for mapping perceptions using geographic information systems. Available methods are those that are used to map a person’s mind using hand drawn diagrams and pictures commonly known as mental maps (Geography. about, 2012).

Applications within the ArcGIS Desktop Software were adopted for spatial analysis. Four shapefiles were obtained from the department of surveys and mapping in Uganda (table 1). These were used as base mapping data.

Table 2. Inventory of acquired secondary spatial and non-spatial datasets

Dataset	Type	Source
Administrative Boundaries	Shapefile	DSM
Existing Roads	Shapefile	DSM
Contours	Shapefile	DSM
Rainfall	Statistics	EMS
Population	Statistics	UBOS
Drainage / Rivers	Shapefile	DSM

A file geodatabase was created using ArcCatalog to serve as the central storage place for all spatial and non-spatial information obtained for mapping purposes. Household coordinates were downloaded from the GPS into an excel spreadsheet to commence spatial data analysis. Five preliminary layers were produced using ArcGIS Desktop 10. The excel data table was imported into the file geodatabase, loaded into ArcMap as a non-spatial table and subsequently mapped by displaying the x, y coordinates of each household (Figure 9). In Figure 9, the excel spreadsheet shows x, y coordinate decimals as “xxxx” to protect the interviewees’ privacy. Using the points, a convex hull was generated to curve out the minimum bounding area for the households in order to delineate my effective study area. The convex hull was then buffered by 200 meters to enclose the sample group. Sight lines from the location of the recent landslide to each individual household location were generated to determine the distance of each participating respondent to the (would be) fear factor. This was done to find out if there was a relationship between distance from the disaster area and the participants’ responses. To increase anonymity of the respondents’ locations for purposes of confidentiality, and to enable regionalisation of the responses at a later stage of analysis and the mapping process, thiessen polygons were also generated from the household points. Consequently, instead of relating information from interviews to point locations, it has been related to areas.

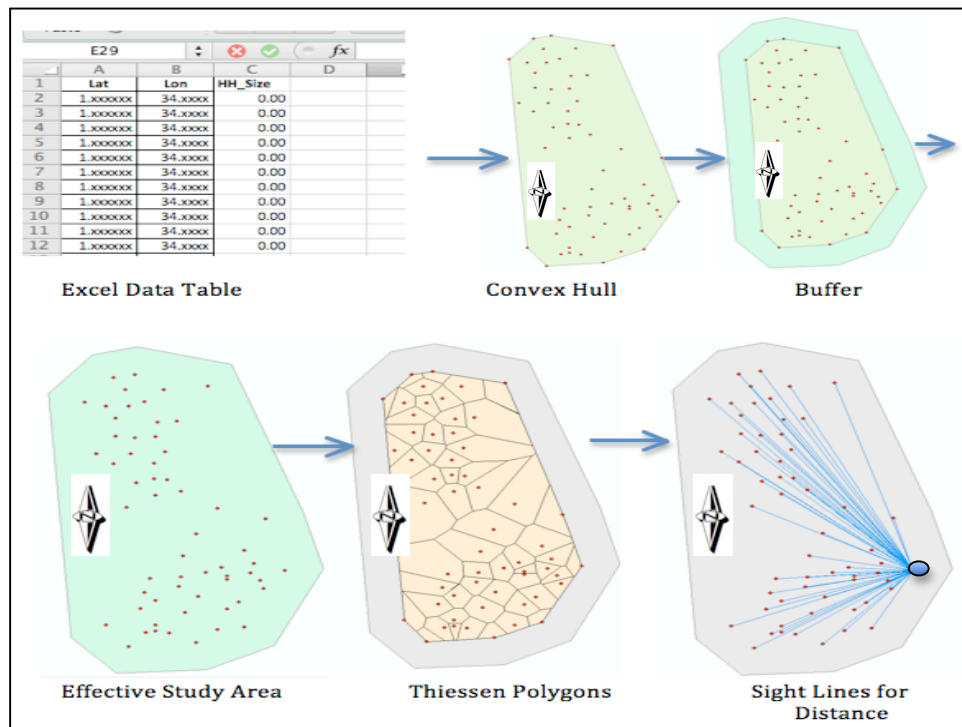


Figure 10. Preliminary mapping methods

The output table for the thiessen polygons was then populated with the coded responses from each household for further analysis and mapping of perceptions.

In addition to the conventional mapping methods, I adopt some non-conventional mapping methods because there is no standard data format for perceptions as non-spatial and non-numerical data. For instance, a conventionally symbolized layer to communicate the inherent nature of the data is superimposed on a Triangulated Irregular Network (TIN) background layer as opposed to using a hill shade background layer. This is done to simplify map interpretation for a layperson without any map reading skills. People’s perceptions are aggregated and tabulated to form perception themes in relation to participant responses by location in the form of thiessen polygons. The themes are then **coded**, **classified**, **reclassified** and consequently geocoded to the household spatial dataset, and mapped. The dataset is then converted to a raster format, then mapped and symbolized in 3D using basic tools in ArcMap, ArcScene and ArcToolbox. A Triangulated Irregular Network in 3D and a Digital elevation model of the study area is produced as a basis for further 3D mapping.

Map representation in 3D³ is preferred in this research because it graphically simplifies complex spatial inter-relationships, which are difficult to visualize by a layperson in 2 dimensional representations (see chapter 5). The realistic effect of the map is optimized to the reader. For instance, the map in Figure 10 shows a layer of household points overlaid on a TIN surface. The TIN was generated from height values of contour lines of the study area. From the map, it is easy to see the low lying and highland areas even to an ordinary person without map reading skills⁴. This method further simplifies reporting of mapped results related to the physical landscape of the area.

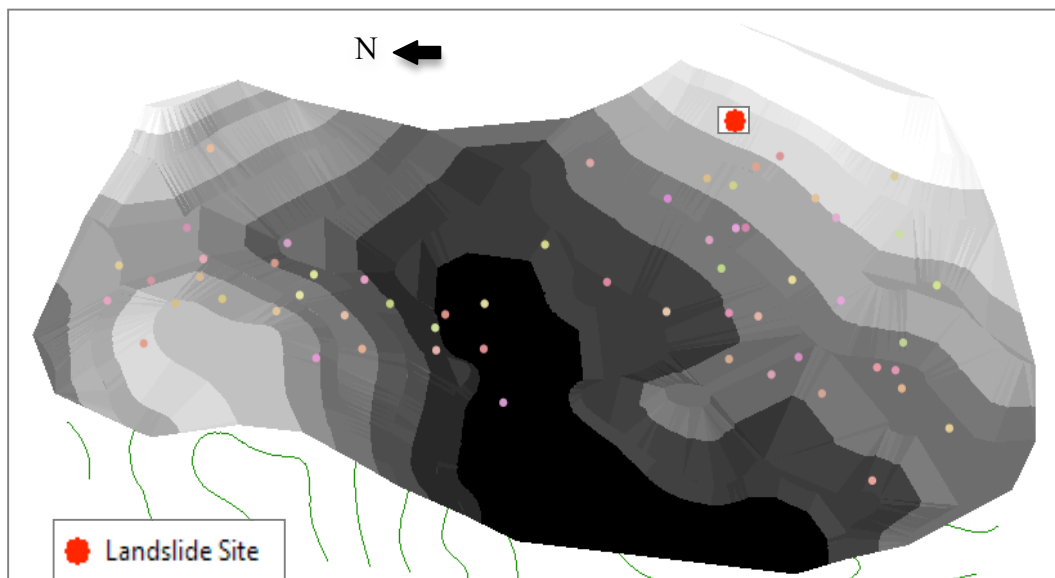


Figure 11. 3D map showing digital elevation and distribution of settlements in the study area

To map perceptions, four variables were selected including: level of fear or “afraidness”, perceived cause of landslides, perceived safety of household, and reasons for not moving. These emerging themes from the analysis were coded for mapping as shown in Table 3.

³ In this thesis 3D maps refer to outputs technically know as perspective views, which are products of a 3D mapping process presented on a 2D surface.

⁴ Conventional elements such as a linear scale are not used in mapping for this study. The maps generated are based on data derived from qualitative information and therefore are intended for qualitative use.

Table 3. Coding of perceptions

Level of fear or 'afraidness'	Perceived Cause of landslides	Perceived Safety of household	Reasons for not moving
1- Very Afraid	1- Rain	1- Not Safe	1- Poverty
2- Less Afraid	2- God	2- Safe	2- Fertile Land
3- Not Afraid	3- Witchcraft		3- Beliefs
	4- Farming (Crops and animals)		4- Old Age

3.5. Trustworthiness

A central concern in a study like this is to reduce the gaps between what the study participants perceived and what was interpreted and reported by the researcher. Lincoln and Guba (1985) suggest four criteria for achieving this, which I adopt for estimating the trustworthiness of a qualitative research. These include; credibility, dependability, transferability, and confirmability. They believed that these four criteria adequately reflect the underlying assumptions involved in most qualitative research.

With reference to criteria suggested by Lincoln and Guba (1985), trustworthiness in my study addresses the degree to which the findings could be transferred or generalized to other areas. Transferability here implied whether my study findings could be useful outside the context of Bukalasi and Bumayoka sub-counties. Marshall and Rossman (1998), advise that the researcher should take the responsibility to either generalise or not. The advantage of qualitative research is that the depth of data collection techniques allows rich details of the study area to emerge, which was the case in my study. It is therefore not the objective of this study to generalize the findings to other contexts, though the findings of my study could shed some light on other communities living in landslide-prone mountainous areas.

Just like validity, credibility, is critical to my study. The criterion poses one significant question, "are the data interpretation truly a function of real world phenomena and not the researcher or data collection procedures?" According to Henderson (1991), in order to ensure credibility in a study, the researcher needs to be explicit about what he or she is studying and to leave a paper trail along his way. To comply with this critical criterion, I took relatively extensive field notes during data collection, transcription, organization, and interpretation. To substantiate my interpretations for instance, I repeated data checks and participants' verification.

Because the social systems and phenomena of interest were not studied directly in this study, the accumulated knowledge of the local communities in the study area was used. This therefore means that reality has been translated through several layers before reaching this level of the thesis. Furthermore, reality might have been distorted to a certain extent through; first, the perceptions of the study participants about their vulnerability. Second, my interpretation of those perceptions held by the participants and third, my ability in conveying such perceptions that people held in the study area to a wider audience. Giddens (1987: 20), refers to this process as ‘double hermeneutic’ in interpretation or understanding. This is because I am not only studying people but also how they understand their world and how that understanding shapes their practices.

The confirmability criterion refers to the degree to which the results could be confirmed or verified by others. I conducted my research activities with one research assistant unable to write but nevertheless able to follow each step of the field activities. I discussed with him each day’s findings and received his valuable inputs as a middle-aged resident of the study area. I then incorporated his views in the final notes for each day. This helped to maintain the study’s confirmability.

In dependability, I ask the question, ‘can the study be repeated?’ Since the study was context specific both spatially and temporally, changes over time could in this regard be reflected in any second study. My study findings and the process may always evolve with physical changes in the study area and changes in people’s activities and way of life. I made some changes to my research objectives and questions along the way and the notes that I took during fieldwork served as an archive reference point throughout the writing of this thesis. The study plan remained flexible and allowed for some changes in data collection techniques and even changes in research questions.

3.6. Limitations of the study

According to Marshall and Rossman (1998: 42), ‘...there is no such thing as a perfectly designed study.’ The narratives and the study findings were from the viewpoints of the local inhabitants of the study area, whose perceptions are the focus of this study. The perceptions were subjective in nature because I believe the responses were opinionated and driven by emotion. Nonetheless, the perspectives

presented herein are only one category in the general perceptions of risk. The second category is anchored in the perspectives of district technical officials and the third category lies in the political leaders at local levels. Yin (2003: 33) goes further and suggests four commonly accepted criteria for judging the quality of a research design in the social sciences including; internal validity, external validity, construct validity, and reliability.

The landslide disaster had attracted several researchers to the area prior to my study to carry out studies on varied themes. Most of these studies as I established were interview based and some participants were reluctant to participate in answering what seemed to them as repetition of the same questions. On a sad note, some participants became very emotional during the interviews because it was traumatising for them to verbalise some of the tragic incidents during the study. Furthermore, there was a general feeling of scepticism among participants because data collection took place shortly after presidential elections and the set up of a military camp to aid rescue efforts after the disaster. The military camp was still in place at the time of data collection and photography was restricted around the disaster site. The atmosphere was quite tense even for me, seeing men with guns watching me closely.

The hilly terrain, slippery and sticky soils and heavy rains were a major hindrance during data collection grossly leading to time wastage and exhaustion.

To overcome some of the qualitative limitations, triangulation was used in this study involving reactive (interviews with multiple informants) and non-reactive (documentary evidence from numerous publications) sources of information regarding each issue as discussed at section 3.2.7. Knowledgeable informants increased construct validity by the use of multiple sources of evidence, the review of analytic findings, and the establishment of a 'chain of evidence'. According to Yin (1998: 253), there are also four approaches to improve internal validity of case studies. These include; pattern matching, time-series analysis, logic modelling, and explanation building.

This study used explanation building, and pattern matching. Yin (1994: 21) meanwhile refers to external validity in a single case design as being based on what he terms 'the logic of replications,' in which each issue is chosen to serve a specific

purpose within the overall scope of inquiry. Reliability too was a primary concern for this study as previously discussed (in section 3.3.3).

3.7. Summary

This study focuses on people's perceptions to the risk of landslides, particularly those exposed to a potential landslide hazard, based on physical location and proximity to a known landslide disaster site. This is why little attention was accorded to government officials at national level during data collection although they had initially been cited as potential participants. Because of time and scope limitations, the study concentrated at the community level with the exception of government officials at the district level. From the data collection, organization, and interpretation, various themes and patterns for interpretation and mapping purposes emerged. Emerging associations were also subsequently highlighted. These are the themes that form the frame of chapters 5 and 6 on presentation and mapping of the study's findings as well as conclusions and recommendations respectively.

CHAPTER FOUR

4. THEORETICAL FRAMEWORK

4.1. Introduction

As described in chapter one, landslide disasters are a global phenomenon in mountainous regions. Uganda's mountainous areas are no exception. However, people continue to settle in these mountainous areas. This study aims to *explore and map people's perceptions of vulnerability to landslides around parts of Mt. Elgon*. In accordance to this problem, the sections that follow examines the theoretical and conceptual perspectives of vulnerability and people's risk behaviour. Vulnerability can be theorized in different ways and this chapter present a sample of the available literature on this subject as well as risk perceptions. A review of literature highlighting characteristics that influence people's capacity to anticipate, cope with, resist and recover from the impact of a natural hazard, acts as a starting point to help in developing themes from concepts underlying the empirical work. Overall, the focus is on research that discusses the vulnerability paradigm and existing theoretical and conceptual perspectives on vulnerability. Furthermore, theory relating to the use of geographic information systems in landslide disaster management and mapping social vulnerability is presented.

4.2. The Vulnerability Paradigm

This study uses the vulnerability paradigm⁵, which draws on various studies and schools of thought. Vulnerability is commonly understood as being prone to or susceptible to damage or injury (Wisner 2004). However, vulnerability goes further to mean the characteristics of a person or group and their situation that influences their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard (Wisner 2004). This is what forms the primary focus of this study. Social scientists tend to perceive vulnerability as representing the set of socio-economic factors that determine people's ability to cope with stress or change (Allen 2003), while engineers often view vulnerability in terms of the likelihood of occurrence of

⁵ Because vulnerability is a 'fluid' concept, I do not go into the debate around what constitutes a paradigm but I use Gaillard's (2010) description of main understandings and definitions of vulnerability and his conceptualization of vulnerability as a paradigm.
The term vulnerability is commonly associated with the works of Susan Cutter, University of South Carolina, USA.

specific process scenarios, and associated impacts on the built environment (Varnes, 1984). Thus, the consequences of natural hazards are generally measured in terms of damage or losses, either on an ordinal scale based on social values or perceptions and evaluations, or on a metric scale using for instance monetary units (Fuchs 2009). Vulnerability is something that exists within systems independent of external hazards (Brooks 2003). For many human systems, vulnerability looked at as an inherent property of a system arising from its internal characteristics may be termed ‘**social vulnerability**’ (Adger and Kelly 2001). For vulnerability arising purely from the inherent properties of non-human systems or systems for which the term “social” is not appropriate the term ‘inherent vulnerability’ might be used. **Social vulnerability is determined by factors such as poverty and inequality, marginalisation, food entitlements, access to insurance, and housing quality** (Blaikie et al. 1994; Adger and Kelly 1999; Cross 2001). It is social vulnerability and vulnerability perceptions mapping that is the primary focus of this research, mainly looking for the various determinant factors in the context of this study. Previous research in this domain has been generally concerned with identifying the most vulnerable members of society, and examining variations in vulnerability between or within geographical units that may experience similar hazards (Downing and Patwardhan 2003). Interaction of hazard with social vulnerability produces an outcome that is generally measured in terms of physical or economic damage or human mortality and morbidity (Brooks and Adger 2003, in Brooks 2003). Hence social vulnerability may be viewed as one of the determinants of biophysical vulnerability (Brooks 2003). However, a person may belong to a group having a high score on a social vulnerability index without being exposed to a hazard (biophysically vulnerable). But often, perhaps more so in developing countries, were the poor cannot freely settle where they like to; they choose to settle in more hazard prone areas. Even though authorities try to regulate settlements, when there is high population pressure, there will be squatter population who may have to set up their poor-quality houses in less safe environment (Rød et al. 2012).

The emergence of the concept of vulnerability in the 1970s, and later that of resilience, reflects a critical fruition in the way disasters have been considered and faced (Torry 1979). Drawing on cases from the developing world, scholars such as O’Keefe et al. (1976) and Hewitt (1983) emphasised people’s vulnerability in the face

of natural hazards. This coined the vulnerability paradigm (Gaillard 2010). Vulnerability in facing natural hazards reflects people's marginalisation within society. Disaster-affected people are often disproportionately drawn from the sections of the society, which are chronically marginalised in daily life (Wisner, 1993; Wisner et al., 2004; Gaillard 2007 as cited in Gaillard 2010).

Disaster-affected people are marginalised in a number of ways: geographically because they live in hazardous places (e.g. squatter settlers); socially it could be because they are members of minority groups (e.g. ethnic or caste minorities, disabled individuals, prisoners and refugees); economically perhaps because they are poor (e.g. homeless and jobless); and politically because probably their voice is disregarded (e.g. women, non-heterosexuals, children, and the elderly). They are often marginalised by those with political power (Gaillard 2010). People's vulnerability varies in time and space and is determined by hazard independent, structural constraints (Gaillard 2007; Watts and Bohle, 1993; Wisner et al. 2004).

Gaillard (2010) asserts that, disasters hit individuals with limited and fragile incomes (i.e. low wages, informal jobs, lack of savings), which reduce their capability to deal with natural hazards (in terms of location of home, type of housing, knowledge of protection measures), thereby inhibiting development processes. He goes further to state that, vulnerability and marginality also result from inadequate social protection (that is to say, health insurance, health services, construction rules, prevention measures, etc.) and limited solidarity networks. However, the failure of entitlement does not denote that means of protection are unavailable locally. In many instances, such as for famines (Hartmann and Boyce 1983; Sen 1983; Watts and Bohle 1993), lack of capacity does not reflect the lack of food, knowledge, technologies or financial capital, but rather an unequal distribution of available resources and the nature, strength and diversity of people's livelihoods.

Assets and resources essential in the sustainability or un-sustainability of livelihoods are conversely crucial in defining vulnerability and such an intimate relationship between livelihood and vulnerability justifies that many people have no other choice but to face natural hazards to sustain their daily needs (Gaillard 2010). However, the fact that people are incapacitated to safely face natural hazards therefore results from their inability to control their daily life and to choose the location of their home and their livelihoods (Blaikie 1985). In that context therefore, as Baird et al. (1975) and

Maskrey (1989) rightly note, disasters highlight or amplify people's daily hardship and everyday emergencies.

In light of the overall purpose of this study this literature sheds light on the concept of vulnerability. Important to note also is the fact that disastrous events cannot be considered as accidents beyond the usual functioning of the society. Rather, disasters reflect development failures where the core causes of vulnerability combined with the genesis of other development-related catastrophes (Hewitt 1983; Wisner 1993).

4.3. Risk Perceptions and Principles of Risk Behaviour

The ability to sense and avoid harmful environmental conditions is necessary for the survival of all living organisms. Whereas technologically sophisticated analysts employ risk assessment to evaluate hazards, the majority of citizens rely on intuitive risk judgments, typically called "risk perceptions" (Slovic 1987). Generally, lay people have the tendency to define vulnerability and benefits in a complex, multidimensional manner, but their definitions differ from those used by professional risk managers and other technical experts (Rundmo 2009). Accordingly, the first objective of this study seeks to find out if people in the area are aware of their vulnerability to landslides. Risk perception is often coupled with over-optimism, which involves predicting that favourable events are more likely or more positive than they actually are (Ziedonis 2006). Often over-optimism arises when individuals are confronted with too much or overly complex information, preventing them from making rational decisions. Overoptimistic individuals therefore estimate events beyond their control to be terrifically positive. Often they are likely to attribute bad outcomes to external forces such as bad luck rather than to their personal bad choices of action.

Social scientists focus on how people and societies perceive danger and how they adjust to rare and extreme threats. Individuals and societies with a low perception of risk allegedly adjust poorly to the threat whereas people and societies with a high risk perception are assumed to adjust well to threats (Gaillard 2010). The factors, which affect people's perception of risk are hazard related too. Gaillard (2010) asserts that hazard magnitude, duration, frequency and temporal spacing, plus the recentness, frequency and intensity of past personal experiences with hazards underlines that

those factors are independent from the socio-economic environment. According to Slovic (1984: 4), “it is extremely hard for people to think about uncertainty, probability, and risk.” Indeed, repeated demonstrations have shown that most people lack an adequate understanding of probability and risk concepts (Kahneman & Tversky 1984, cited in Shanteau 1992).

A number of studies have attempted to describe how people think about probability and vulnerability or risk. For instance, Weber (2006) asserts that it is no surprise that the governments and citizenries of many countries show little concern about climate change and its consequences. This he says is because behavioural decision research over the last 30 years provides a series of lessons about the importance of affect in perceptions of risk and in decisions to take actions that reduce or manage perceived risks. Worry drives risk management decisions and when people fail to be alarmed about a risk or hazard, they do not take precautions (Loewenstein et al. 2001). Evidence from cognitive, social, and clinical psychology has been converging on the observation that risk perceptions are influenced by association- and affect-driven processes as much or more than by analytic processes. People have been shown to process information in two distinct ways, mediated by different neural substrates when making judgments or arriving at decisions. The first system teaches us, for example, to dislike food eaten just prior to symptoms of food poisoning and to avoid foods of similar taste or smell in the future (Slovic et al. 2002; Weber 2006). The associative system is intuitive, automatic, and fast (Weber, 2006). It maps uncertain and adverse aspects of the environment into affective responses (e.g., fear, dread, anxiety) and thus represents risk as a feeling (Loewenstein et al. 2001). This system requires real world experience as input (i.e. experienced decision makers make better decisions using it than novices), but its basic mechanisms are hard-wired (Weber 2001).

The second processing system works according to analytic algorithms and rules, including those specified by normative models of judgment and decision making (e.g. the probability calculus, Bayesian updating, formal logic, and utility maximization). It is slower and requires conscious awareness and control. Its algorithms need to be taught explicitly and its appropriateness of use for a given situation needs to be obvious, i.e., it does not get triggered automatically (Weber 2006). There is a notion that people, in many choice situations, do not have firmly established preferences but

instead construct them when they need to make a decision (Payne et al., 1993; Slovic 1995). This analogy will be examined, in relation to objective 2 of this study; in particular to answer the ensuing research question on why people continue to live in such a risk prone area. Trope and Liberman (2003) suggest that people construe future events differently from events in the present. They in particular state that events in the distant future are construed in abstract terms, whereas events close to us in time are construed in very concrete terms. One difference between the abstract vs. concrete representation of the consequences of possible actions lies in their discrepancy in affective strength and impact. Abstract representations of consequences in the distant future lack the concrete associations that are connected to emotional reactions, essentially by definition (Mischel et al. 1969; Laibson 1997). In contrast, concrete representations of choice alternatives in the present or the immediate future tend to be saturated with affective associations. This difference in the richness and concreteness of the representation of temporally close vs. distant consequences may well lie at the root of observed problems of self control, be they impatience and impulsivity in obtaining desirable outcomes (Mischel et al. 1969; Laibson 1997). The strong negative affect associated with the concrete, immediate costs and sacrifices and the absence of feelings of worry about possible abstract and distant consequences of climate change (in this case landslides) in the absence of such actions may well drive damaging decisions and actions (Weber 2006).

Kitutu et al (2011) carried out a study about farmers' perceptions on landslide occurrences in Bududa District and found that, out of the experience accumulated over time, most farmers have developed knowledge about causes of landslides. In this study, many farmers expressed knowledge of characteristics of areas with landslides. They identified the causes as; steep slopes, water flowing from underground, concavities, low and prolonged rainfall and sandy and stony soils. Farmers in Bubiita and Bulucheke Sub-counties identified deforestation and slope undercutting to make terraces and flatlands/levelling for house construction as great contributors to landslide occurrences. This indicates that the farmers acknowledge that their own activities and the activities of others form part of the major causes of landslides. Although the findings of this study are limited to a specific group of people (farmers), it gives insights into the scientific causes of landslides in the area and the role played by farmers since they form part of the sample group of my study. Their perceptions

on landslide occurrences present a good starting point towards the understanding of perceptions of vulnerability to landslides for the rest of the community in my sample group.

With regard to factors that influence people's perceptions, Alexander (1993: 571) argues that, severe and intense events can provoke responses that are highly influenced by the personalities of the respondents such as inherent fatalism or ability to face up to danger. This may happen even though people who have had recent or frequent experience of disasters tend to be more knowledgeable about the causes and risks involved, and are presumed to be sensitive to disasters.

People's economic status influences their sense of judgment and leads them to choose convenient interpretations of hazards. Poor people tend to explain the cause of disasters in relation to some sort of magical power. This is common, especially in third world countries where people perceive the role of God in disasters to be direct and responsive to accumulated sins. This therefore implies that they see disasters as an act of God rather than a consequence of their actions on the environment. To the poor, natural disasters are beyond human control and cannot be predicted, prepared for or even prevented; it is only God "the almighty" who can prevent disasters on behalf of people (Alexander 1993). This analogy fits well in the social context of my study because the sample group is heterogeneous.

Alexander (1993) further asserts that the level of perception depends on the ability to estimate risk and perceive its causes, the level of experience with hazards, propensity to deny that risk exists and the level of access to appropriate information.

James Shanteau (1992), in his research about decision-making under risk presents some valid principles of risk behaviour and how people think about risk and discusses them in detail from a psychological perspective. However, because his emphasis was mainly on insurance purchase, and the issues he raises are based on literature that is over 20 years old, they cannot be generalised and applied directly to contemporary situations but it does offer some useful insights, reflections and concepts. The principles discussed in his study, though psychologically anchored, are valuable in the quest to understand why people think and act the way they do in risk situations (vulnerability perceptions). According to Shanteau (1992), humans have limited

cognitive capacity to process low probabilities. They focus more on loss probability than the magnitude of loss; are risk averse for gains but risk seeking for losses; misperceive randomness of runs the “gambler's fallacy”⁶; seek an optimal level of risk, i.e., “risk homeostasis”. He goes on to state that people show wide individual differences in risky decision making; are resistant to changing attitudes and beliefs about risks; exaggerate their decision making ability (i.e. overconfidence); are influenced by subtle shifts in problem wording; and cannot conceptualize losses they haven't experienced. With reference to section 1.1 (especially figure 1), it is clear that the community in the study area have recently experienced a landslide disaster first hand. The lingering question is ‘how people in this area conceptualise the losses caused by such a disaster’. Could it be true that they actually choose to seek an optimal level of risk? Or are they risk averse for gains and risk seeking for losses? And so on.

He expounds on each of the characterisations and says, people's beliefs often change slowly and show extraordinary persistence in the face of contrary evidence. Consequently, people have a tendency to deceive themselves about how well they can handle risk. *Inability to Conceptualize Losses that have not occurred*, he says, is a key limitation to people’s capacity to react to low probability risks. Thus it may be possible that people have already forgotten about the losses they suffered in the past landslide disaster and are now reluctant to conceptualise future losses.

On *Misperception of Small Probabilities*, he says people can only respond to the risks they perceive. Furthermore, quoting Slovic, Fischhoff, & Lichtenstein (1982: 463), “If their perceptions are faulty, efforts at personal, public, and environmental protection are likely to be misdirected”. Thus, people's limited processing capacity often restricts attention for rare events such as landslides. Shanteau further asserts that People tend to *Focus on Probability of Loss* because they do not like to lose money. This dislike of losing, however, according to him focuses more on the probability than the amount of loss and such focus on the likelihood of losing, can certainly lead to irrational behaviour.

Risk Averse Vs Risk Seeking: It is usually assumed that a person's propensity to seek or avoid risk is consistent over gains and losses (Shanteau 1992). A risk-averse

⁶ Gambler’s Fallacy is the belief that if deviations from expected behaviour are observed in repeated independent trials of some random process, future deviations in the opposite direction are then more likely (Wikipedia: Gambler’s Fallacy 2012).

individual, therefore, should avoid nearly all types of risk. Empirical evidence, however, suggests that most people are risk averse for gains and risk seeking for losses (Kahneman & Tversky, 1979 in Shanteau 1992). This tendency reflects the dislike people have for sure losses. Many people have a strong, but false, belief that random events are self-correcting. The inability to appreciate the independence of random events also shows up in low probability situations (Hogarth 1987 in Shanteau 1992). If an unlikely event occurs once, people believe that it is less likely to occur again – “lightning can't strike twice” Thus, the perceived likelihood of future events changes because of prior outcomes (Shanteau 1992).

Slovic (1984 in Shanteau 1992) extends the concept of **homeostasis** to risk settings and says general principle of behaviour is that people want to remain at equilibrium levels, of for instance, motivation. There is “an optimal level of risk that people are comfortable in accepting (p. 9).” Efforts to decrease risk, therefore, may be met by riskier behaviour. He notes that, for instance, when improved design made farm tractors more stable, farmers used them on steeper slopes and the accident rate remained constant. This suggests that risk reduction measures may be offset by subsequent riskier behaviour. In some cases, its just *Individual Differences* that bring about differences in risk behaviour.

Over confidence and *Context effect* are also highlighted noting that even when people are wrong, they tend to be confident in their opinions and underestimate their own vulnerability to risks. Given such expectations, it shouldn't be surprising that many people refuse to take personal actions to reduce risk (Kunreuther & Slovic, 1978 in Shanteau 1992).

It can also be argued that some people would deny existence of risk and attempt to attribute a natural disaster and its effects to God because they lack adequate information to enable them to explain the occurrence in a different way.

4.4. Use of Geographic Information Systems in mapping social vulnerability

In spite of its limitations and challenges, GIS is tremendously important because it is such a powerful mediator of spatial knowledge, social and political power, and intellectual practice in geography (Shuurman 2000). Scientists, policy makers, developers, engineers, and many others have used geographic information system

(GIS) technology to better understand a complex situation and offer some tangible solutions. Technology offers a means to assess, plan, and implement sustainable programs that can affect us many years into the future (Jack & Baker 2010).

GIS is an information technology that has transformed the ways geographers conduct research and contribute to society. In the past two decades, this information technology has had tremendous effects on research techniques specific to geography, as well as on the general ways in which scientists and scholars communicate and collaborate (Kenneth and Margaret 1995). This study seeks to use GIS for mapping people's perceptions. A geographic information system integrates hardware, software, and data for capturing, managing, analysing, and displaying all forms of geographically referenced information. Perceptions however are not georeferenced phenomena but when linked to spatial data with location information as described in section 3.4.2, it is possible to map them. GIS allows us to view, understand, question, interpret, and visualize data in many ways that reveal relationships, patterns, and trends in the form of maps, globes, reports, and charts (ESRI 2011). This calls for a comprehensive GIS. A comprehensive GIS requires a means of data input, from maps, aerial photos, satellites, surveys, and other sources; data storage, retrieval and query; data transformation, analysis, and modelling, including spatial statistics; and data reporting, through maps, reports, graphs, charts and plans (ESRI 2011).

Most published literature on landslide hazard mapping with GIS mainly deals with likelihood of future landslide events and the extent of anticipated damage. Susceptibility mapping of landslide zones has also been done with GIS. There are numerous studies involving landslide hazard evaluation. Landslide susceptibility may also be assessed through heuristic, deterministic and statistical approaches (van Westen 2000; Lee and Min 2001; Dai et al. 2001; Zezere et al. 2004; van Westen et al. 2003; Saha et al. 2005). Heuristic approach is a direct or semi direct mapping methodology, in which a direct relationship is established between the occurrence of slope failures and the causative terrain parameters during the landslide inventory.

Technologies such as GIS have raised great expectations as potential means of coping with natural disasters, including landslides (Carrara et al. 1999). Diffusion of the technology is still hampered by factors such as the difficulty in acquiring appropriate raw data, the intrinsic complexity of predictive models, the lack of efficient graphical

user interfaces, the high cost of digitalisation, and the persistence of bottlenecks in hardware capabilities (Carrara et al. 1999).

Hazards such as floods have been predicted, warned against and mapped by combining morphological information derived from digital terrain models (DTMs) with traditional or innovative hydrological models (Consuegra et al. 1995; Kovar and Natchnebel 1995, in Carrara et al. 1999). Lava flow pathways have been simulated using digital elevation models (DEMs), and volcanic hazard maps are currently being developed using GIS. (Thumerer et al. 2000) In addition, seismic hazards have been investigated with the aid of expert systems based on historical records, geodynamic models and data derived from GIS manipulations (Carrara et al. 1999). Spatial distribution of landslide hazards have been studied using GIS's capabilities to model multiple variables such as; slope, aspect, stream proximity, and land cover type, generated from available topography and remote sensing data. Recent studies on landslide vulnerability, slope instability assessment among others have utilised GIS as a tool (Saha et al. 2005).

To the best of my knowledge, there is no literature specific on how to map people's perceptions of vulnerability to landslides using GIS.

4.5. Summary

The vulnerability paradigm has been explored as well as literature on risk behaviour and people's perceptions. Furthermore, literature on the application of GIS in previous research on landslide disasters has been reviewed to conceptualise this study's research problem in a wider context. Two issues are clear at this point: first, there are numerous factors contributing to the way people respond to severe and intense events. The second issue is that, in as much as GIS has been used as a tool in various natural hazard studies, its use has been geared mainly towards modelling and mapping vulnerability assessment, social resilience and adaptation, human response to disasters, hazard monitoring for mitigation, hazard proneness, and vulnerability reduction mostly in relation to flooding, landslides and climate change. GIS use for mapping 'non-tangible' phenomena such as people's perceptions of vulnerability of risk to landslides remains a pioneering activity.

CHAPTER FIVE

5. RESULTS, ANALYSIS AND DISCUSSION

5.1. Introduction

Chapter five presents the empirical findings analysis and ensuing discussions in relation to the reviewed literature. The chapter is organised according to: first, the main objective of the study, which was to explore people's perceptions of vulnerability to landslides and map them using GIS in order to show how maps can be used to communicate people's perceptions. I chose to analyze the content of the interviews as wholes, triangulating findings from interviews and document reviews. I then report the recurring themes as transcribed, while using direct quotes in order to allow participants' voices to be heard. In this chapter, on perceptions, I analyse five broad themes: 5.2) Perceived causes of landslides; 5.3) Highlight of the effects of the 2010 landslide on livelihoods; 5.4) Government Intervention in light of the 2010 Nametsi landslide; 5.5) How people in Bududa interpret their vulnerability to landslides; 5.6) Factors influencing perceptions of vulnerability and coping capacity; and 5.7) Derived Perceptions of Vulnerability. These discussions illuminate participants' characteristics and the situations that influence their capacity to anticipate, cope with, resist and recover from the impact of a landslide disaster as presented in the vulnerability paradigm and available literature on social vulnerability (sections 4.2 and 4.3). I further discuss these local people's perceptions in light of the vulnerability paradigm and principles of risk behaviour as presented in chapter 4.

This chapter also addresses the objective of finding out how GIS generated maps can be used to communicate people's perceptions of vulnerability to landslides. The ensuing questions as to whether it is possible to communicate how people perceive risk through GIS and how maps of perceptions can improve preparedness and management of landslides are henceforth addressed.

The results presented in this chapter are based on findings accruing from 58 households that were interviewed, out of which 40 participants were male and 18 were female aged between 19 and 72 years. Those married were 48, six widowed,

while four were single⁷. The main economic activity in the area is agriculture followed by trade in agricultural produce. Key informants included three village elders, two district officials, one of whom was interviewed via telephone, and one sub-county official.

Documents reviewed for additional empirical data regarding the 2010 landslide include the UN-OCHA's Situation Report (7th March 2010), O.P.M Report (2010), and the NEMA Report (2010), all of which were written after the landslide. The terms participants and respondents are used interchangeably to refer to interviewees from within the study area and also government officials and officials from NGOs in different contexts.

5.2. Perceived Causes of the 2010 landslide in Nametsi Parish

One of the objectives of this study was to find out people's perceptions of risk to landslides, within which I sought to establish if people are knowledgeable about landslides, their causes and the associated dangers. I also wanted to find out if people living near the recent landslide disaster site were afraid of landslides and whether they considered landslides to be a threat to their lives.

To help explain such perceptions, Gillard (2010) asserts that people generally tend to describe causes of disasters differently based on prevailing circumstances and past experience, religion, and education, among other factors. The differences in reason by individuals and within communities present challenges in finding lasting solutions to reduce the effects of disasters. It is therefore important to understand how people construe events around them as well as the implications that these interpretations hold for disaster management and mitigation efforts.

Through interviews, participants expressed full knowledge of landslides but presented divergent views regarding causes of the 2010 landslide. The causes can be basically categorized as locally perceived non-scientific and perceived scientific causes mainly influenced by level of literacy. Most community members also based their arguments on their experiences as well as their belief systems particularly on how they perceived the role of God, traditional doctors or healers, ancestors, and other divine and invisible forces. These responses are consistent with the principles of risk behavior as

⁷ Explanation for the use of statistics in this chapter is given in the methodology chapter (section 3.4.1)

presented in section 4.3. The literate respondents mainly identify scientific causes as perceived according to their level of literacy. The explanations offered for the occurrence of landslides differ widely depending on experience, class, race, religion, and education.

When asked about how long they had lived in the area and if they had ever seen or experienced a landslide, all participants expressed full knowledge of landslides and the 2010 landslide had directly or indirectly affected each one of them. I categorize people affected directly to include those, who lost relatives, friends and personal property during the landslide while those affected indirectly are the people who experienced secondary effects of the disaster such as disease outbreaks, lack of health services, among others. Out of the 58 respondents, 32 were born in the area, while the rest had lived in the area for 6 to 20 years. The majority also indicated that their continued stay was mainly influenced by the fact that they were born in the area and did not have any exposure to other places. Only seven participants answered no when asked if they were afraid of landslides.

The known scientifically proven causes of landslides are commonly categorised as Geological, Morphological, Physical and Human causes as described in Cruden (1996). The causes of landslides identified by participants can be generally categorised as scientific and non-scientific.

5.2.1. Non-scientific Causes

Although landslides were well understood amongst participants, a large section of the participants exhibited limited knowledge of scientific causes of landslides and preferred to attribute the disaster to doom, witchcraft and religious factors. Elders believed that from their experience, landslides were **natural occurrences** that were bound to happen every after an unspecified **time interval**. One pointed out that he had witnessed two landslides and that all of them fell almost in intervals of 20 years. In his words, the elder explained: *'...I think it is just a matter of time that landslides occur...there was no special cause for his particular landslide because I know it usually happens in intervals of 20 years. In about 20 years' time, am sure it will happen again, just wait, you will see.... you are till young but I will be dead when the next one happens.'* Another elder asserted that *'...another landslide may happen again in 30 to 50 years time...by then I will be dead already'*

The elders had varied views about causes but they all concurred on the issue of intervals even though one placed the interval at 10 years and another at 30 years. The above accounts confirm Gaillard's (2010) assertion that hazard magnitude, duration, frequency and temporal spacing, plus the recentness, frequency and intensity of past personal experiences with hazards influences the way people interpret disaster occurrences. From their experiences as quoted above, it is clear that village elders believe that they understand landslides well enough.

Witchcraft was cited as another cause of landslides in the area. Some respondents blamed one self-professed rainmaker in Nametsi Parish known as Womaniala for purportedly causing the landslide. He was particularly believed to have caused too much rain in a contest with another so-called rainmaker for supremacy. Some of the affected people asserted that Womaniala confessed to have largely contributed to the landslide disaster. At the time of data collection, he had relocated to Kiryandongo resettlement camp because community members had vowed to lynch him had he stayed. An Old man in Nametsi Village bewailed: *'...if I had the powers, I would have personally killed Womaniala to prevent future disasters! ...people like him are a curse to our community and he is not the only one!'* As observed by Alexander (1993), poor people often tend to explain the cause of disasters in relation to some sort of magical power. This is common, especially in third world countries where people perceive the role of God in disasters to be direct and responsive to accumulated sins. This therefore implies that they see disasters as an act of God rather than a consequence of their actions on the environment. To them, natural disasters are beyond human control and cannot be predicted, prepared for or even prevented; it is only "the almighty" God, who can prevent disasters on behalf of the people.

One of the participants interviewed argued that the landslide was **caused by the government of Uganda**. In his explanation, he said, *'this landslide was planned by government to kill people and get space for soldiers... and an army base in this area... see what happened after the landslide, a full battalion of UPDF soldiers are now camped here with guns.... They have even converted two primary schools into barracks! ...now our children have to walk long distances to access education.'* This participant later revealed that he was a supporter of one of the opposition political parties. This explains his rather bizarre politicization of the landslide disaster.

Contrary to popular belief by community members, the literate (local officials) in the area maintained that there was nothing like ‘a rainmaker’ and that if it were true that ‘Womaniala’ agreed to have caused the rain, he needed mental examination. In the same vein, some respondent (local inhabitants) associated the landslide with angry gods and ancestors who decided to punish them for their inability to appease the ancestors through regular ritual ceremonies and not offering enough sacrifices.

Religious respondents believed that the disaster was **God’s punishment** for people’s so many sins as one of them explained:

‘...Only God knows where this landslide came from and why he permitted it... God is directly punishing us for sins like witchcraft, worshipping small gods, disunity in our community, fornication, theft, hatred for one another, and many more... I know God has a better explanation for everything... I don’t feel good when I hear those educated people saying that we the uneducated villagers are the cause of such a big thing like a landslide...how can we even start to influence such a natural thing?...’

This partly gives us a sneak peak into the reasons why some people do not want to leave this area. The failure to understand that their daily interaction with the environment contributes a great deal to the causative factors of landslides.

Generally, because landslides in this region are common, these findings suggest that greater public awareness and education about landslides are warranted. This can be accomplished through landslide hazard safety programs, community risk reduction workshops, and increased media coverage of existing landslide hazard areas and events as suggested by Sattler et al., (2000).

5.2.2. Perceived Scientific Causes

Officials identified **continuous deforestation** by communities in search of land for cultivation and wood products such as firewood and timber as the major cause of landslides. They said, in as much as government has tried to restrict agricultural and lumbering activities in the Mt. Elgon forest reserve, people still sneak and find their way into the forest. As one official noted: *‘.... such activities have rapidly degraded the forest resources, which is why landslides are beginning to happen at such deadly scales...’*

The other problem was said to be **over cultivation and use of fertilizers**. Officials asserted that Nametsi Parish was once a forest hub with a beautiful landscape covered

by a healthy green vegetation of trees, coffee plants, bananas and enough grass to feed animals. However, with the rapidly growing population, pressure on the limited natural resources has increased due to increasing demand for more land for settlement, cultivation, firewood, and charcoal among others. Such demand has led to indiscriminate deforestation and land reclamation, over cultivation, use of fertilizers to increase production, consequently weakening the soils.



Figure 12. **Effects of human activities on the natural vegetation cover in Mulwelwe Village**
Source: Field Photo (July, 2011)

People have also turned to commercialized agriculture, engaging in horticulture, thereby increasing the need for greater yields to maximize profits. As one official explained: ‘...farmers in this area are now more interested in making money....they don’t care about the environment... when they plant onions for instance, which fetch high prices in the markets they have to use a lot of locally manufactured fertilizers such as NPK and CAN, which contain nitrates to get good yields..... these fertilizers infiltrate the soils up to the bedrock making it weak to hold soils...’ he further noted that he did not trust the named fertilizers because they are manufactured in Uganda and Kenya. He explained that Fertilizers manufactured in Uganda and Kenya are known to be of poor quality.

Bush burning during the dry season was another cause presented by officials. One explained that: ‘...during the dry season, farmers in this areas like to burn bushes leaving the soil bare and exposed.... so when rains come, there is increased run-off, taking away all the fertile soils before cultivation begins.... but even if you tell them not to do this, they can’t listen!’

Residents of the area also reported that, before the landslide, the area had received heavy rains for about five consecutive days from 27th February to 2nd March 2010. This was believed by the officials to have been the major cause of the 2010 landslide.

This adds weight to Kitutu et al.'s (2011) findings that out of the experience accumulated over time, most farmers have developed knowledge about causes of landslides. In Kitutu et al. (2011), findings showed that, many farmers expressed knowledge of characteristics of areas with landslides identifying the causes as; steep slopes, water flowing from underground, concavities, low and prolonged rainfall and sandy and stony soils. Some farmers also identified deforestation and slope undercutting to make terraces and flatlands/levelling for house construction as great contributors to landslide occurrences. Owing to the fact that majority of the residents interviewed are engaged in agriculture as their main economic activity, this underpins the fact that farmers acknowledge the contribution of their own activities and the activities of others to the causes of landslides.

Development activities such as building construction have also caused modification of the natural slopes and emergence of human settlements on steep slopes. I observed during field data collection that several settlements were situated on steep slopes of the mountain.

In figure 12, I have mapped the classified perceived causes according to the categorised and classified responses obtained from interviewed households for mapping purposes. Four causes have thus been mapped: Rain, God, Witchcraft, and Farming.

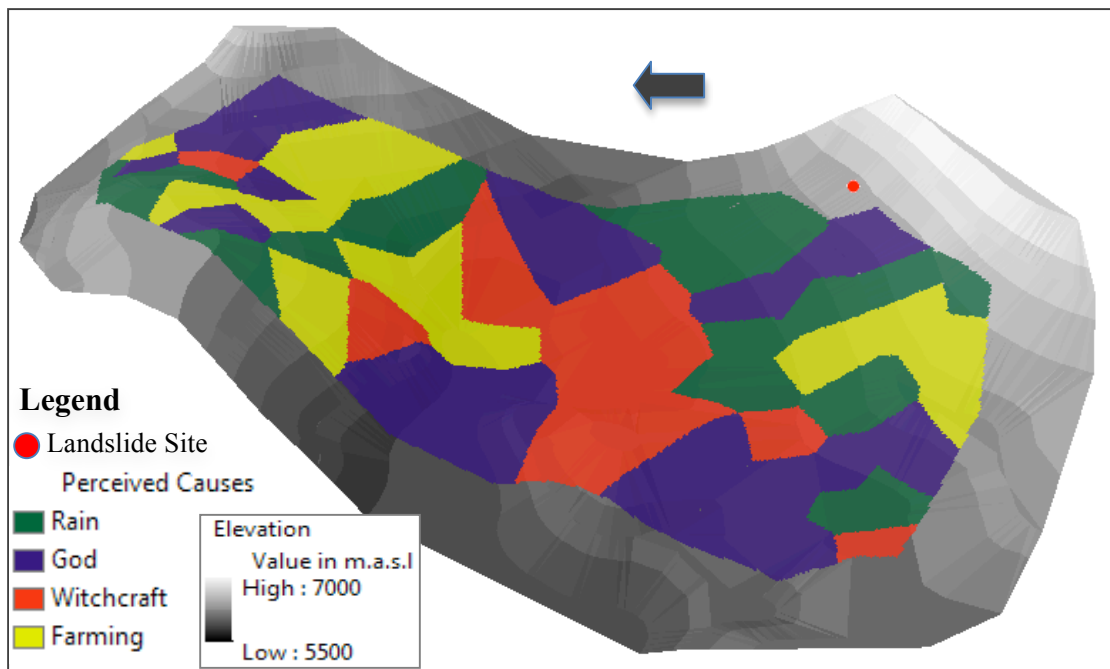


Figure 13. Perceived causes of landslides by respondents

As represented in figure 12 above, majority of the respondents believe that landslides are caused by natural and religious factors (i.e. Rain and God). What stands out here as earlier mentioned, is the fact that, amongst the different groups of people, there is a fair understanding of the concept of landslides and what causes them.

5.3. Highlight of the effects of the 2010 landslide on livelihoods

Unlike other natural disasters where restoration can occur, landslides usually create permanently unstable sites that often are suitable only for designation as undevelopable open space. As a result, the economic and social effects on families, neighborhoods, and communities can be severe (Fleming and Taylor 1980; Olshansky and Rogers 1987; Schuster and Fleming, 1986, cited in Tara et al. 2002). Like any other disaster, the 2010 landslide in Nametsi had devastating effects on livelihoods. The effects were mainly socio-economic, physical and psychological.

First and foremost, ***Death and Injuries took a toll on the community:*** One month after the landslide, the Uganda Red Cross Society reported that: *“It is one month since the landslides covered three villages in Bududa, killing about 350 people. All these are believed to be covered under the rubble. To date, the rescue team comprising of the UPDF and Uganda Red Cross Society has recovered 96 bodies. 46 people have*

since been rescued. 17 of the survivors are still hospitalised...” Many people lost their lives comprising of young energetic men and women as well as children most of whose bodies were never recovered for a decent burial, as is the practice by tradition. Respondents pointed out how some of the energetic men who died had left a gap in the local economy because they would physically transport products from the village to the markets on foot as a result of the inaccessibility of the area by motorable road. Families were broken and the community at large was utterly disintegrated leaving a lasting psychosocial effect on those who survived.

As a tribute to the departed, a wooden cross was planted at the site turning it into a ‘memorial site’, occasionally visited by relative and friends to commiserate and commemorate their departed loved ones (figure 13).



Figure 14. A cross planted at the site - now regarded by the community as a memorial site.
Source: Uganda radio network (2011)

Displacement of people and loss of property: Some of the survivors who lost their homes and other belongings had to be temporarily be hosted by relatives and friends and then later relocated to resettlement camps. Businesses were destroyed and people’s livelihoods were adversely affected.

According to the URCS, ***Outbreak of waterborne diseases*** such as cholera was

another registered effect of the disaster resulting from flooding in the disaster area and the poor sanitation in resettlement camps. Other diseases such as malaria and tetanus were reported also resulting from water stagnation and poor sanitation amidst lack of medical facilities.

A Health Centre, school and a church were destroyed: The only health centre in the area (Nametsi Health Centre III) was buried in the rubble, while the only Primary School in the area was closed and later occupied by the UPDF. This left only Bukalasi Health Center III and Bududa Hospital located 3km and 15km away from the disaster site respectively (URCS 2010).

Loss of livestock and destruction of livestock: According to the URCS, Farmers lost their livestock, crops and farmland during the landslide as everything was buried under the mud during the disaster. Coupled with loss of manpower, there was food shortage in the area shortly after the landslide and there were fears of famine and high food prices.

In spite of all these losses and recovery challenges, some participants reported a few elements of personal growth because of experiencing the landslide, especially reflection and re-evaluating life priorities, an increased sense of closeness with others, and appreciating each day. This finding is consistent with posttraumatic growth theories in Calhoun and Tedeschi (1999) and cognitive adaptation in Taylor (1983). They suggest that, people who experience a disaster may generate thoughts and ideas that enhance their self to counter feelings of loss. For example, to regain a sense of meaning, an individual might re-evaluate his or her attitudes and life priorities in relation to the event and to re-establish or maintain a sense of control and mastery, an individual might focus on areas in which he or she has control (Updegraff and Taylor 2000). In summary, the findings suggest that individuals may learn from their experiences and exercise resiliency and useful coping strategies, clarify values and life priorities, and experience some positive outcomes that may help to offset the negative outcomes.

5.4. Government Intervention in light of the 2010 Nametsi Landslide

According to interviewed authorities, government played a big role in the search, rescue and retrieval efforts. The Department of Disaster Preparedness, management and Refugees under the OPM was government's agent on site. They together with the

UPDF helped the community in excavating to retrieve survivors and bodies of the dead. As reported by respondents, two days after the disaster, the OPM delivered coffins, cement and bed sheets to aid the burial of the deceased. Other essential items such as food, drinking water, beddings and clothing were also provided. The government later procured land in Kryandongo District and set up a resettlement camp, where about 1869 survivors were resettled (OPM 2010). Respondents also confirmed that the president personally visited the site to offer moral support to the survivors and the bereaved. Bududa District local government set up a Disaster management committee immediately after the disaster but the district planner reported that this committee was not functional at the time of field work (i.e. July 2011). It's however important to note that all activities were hampered by the mountainous landscape, lack of motorable access, heavy rains and slippery soils as earlier noted under limitations of the study (Section 3.6).

Interviewed officials were knowledgeable about GIS and confirmed that GIS has been used in disaster response mainly as a mapping tool to display location information, population as well as socio-economic information. Some of the maps were seen in the office of the district planner and in the district strategic planning document for 2010/2011⁸.

The role played by the government before the disaster struck is particularly central to this study. The study confirmed that prior to the disaster, the area was served by a government health centre and a government-aided primary school. The health centre was buried by the landslide including all patients and their caretakers, health workers and school children who had take refuge in the health centre for shelter against the heavy downpour. At the time of data collection, the site was over-grown with vegetation and partly buried rocks. The question that arises is 'why was there a health centre if government was aware of the risk of landslides?'

It is therefore possible to assume that government had not taken necessary precaution while providing services to the people in this area. Responsible officials should have known that such a noble act of responsibility could not only encourage existing settlers to stay but would also attract others to come and take advantage of the services. In the long run, that oversight may have contributed greatly to the number of

⁸ It was not possible to obtain copies of the maps because of lack of photocopying facilities at the district.

fatalities in the 2010 disaster.

5.5. How people in Bududa interpret vulnerability to landslides

Further to the above findings, participants were asked if they were afraid of landslides and whether they considered their households to be at risk of future landslides. 45 out of 58 participants acknowledged that they were afraid of landslides. However, when asked if they considered their households to be at risk of future landslides, 49 did not consider their households to be at risk of future landslides citing various reasons. Seven respondents were less afraid, while six were not afraid of future landslides and strongly believed that their households were not at any risk of future landslides for various reasons as expounded later in this chapter. Important to note is the fact that all the 18 women interviewed were very afraid of landslides and were worried that they would be the next victims of future landslides mainly citing their experiences from the recent landslide disaster as a triggering factor for their fear. Only eight men expressed fear for future landslides and were quick to admit that their households were at high risk of future landslides because heavy rains were still falling.

Expert judgements (including my own) on vulnerability to landslides in Bududa would lead to expectations that living close to a recent landslide disaster site and having witnessed and experienced the disaster in recent times, people would be afraid of landslides. But as Siegrist et al. (2006) observes, there are differences between expert and lay judgments of risks. Experts' assessments correlate strongly with expected mortality, whereas 'qualitative risk characteristics'⁹ determine risk perception for lay people (Slovic 1999). Differences in risk perception between lay people and experts have been observed for various domains, including toxicology (Kraus et al., 1992), ecological risks to water environments (McDaniels et al. 1997), computer technology (Gutteling & Kuttischreuter 2002), and aviation (Thomson et al. 2004) (cited in Siegrist et. al. 2006). Other factors such as gender are also known to influence risk perception (Rowe & Write 2001).

The results in this study are consistent with suggestions by Loewenstein et al. (2001)

⁹ Renn (2008: 109) identifies qualitative risk characteristics as: **personal control** (Increases risk tolerance), **institutional control** (Depends upon confidence in institutional performance), **voluntariness** (Increases risk tolerance), familiarity, (Increases risk tolerance), **dread** (Decreases risk tolerance), **Inequitable distribution of risks and benefits** (Depends upon individual utility and strong social incentive for rejecting risks), **artificiality of risk source** (Amplifies attention to risk; often decreases risk tolerance), and **blame** (Increases quest for social and political responses).

that worry drives risk management decisions, and when people fail to be alarmed about a risk or hazard they do not take precautions. Furthermore, Trope and Liberman (2003) suggest that people construe future events differently from events in the present. They in particular, state that events in the distant future are construed in abstract terms, whereas events close to us in time are construed in very concrete terms. This fits in the context of these results because respondents were asked about a future landslide threat considering that one year had passed since the most recent landslide occurred. It was surprising to hear majority of them claiming that their households were safe from future landslides even after they had already expressed fear for landslides (Figure 15). In my opinion, the respondents might have thought that by declaring that their households are not safe, they would be forced to vacate the area. This assumption can be backed by the overall scepticism noted among respondents due to military presence in the area. Otherwise, I strongly believe that the ideal situation (as I was anticipating) would be a positive relationship between level of afraidness and perceptions of household safety. Thus those who expressed high and medium levels of fear for landslides would also consider their households to be unsafe and accordingly be willing to relocate.

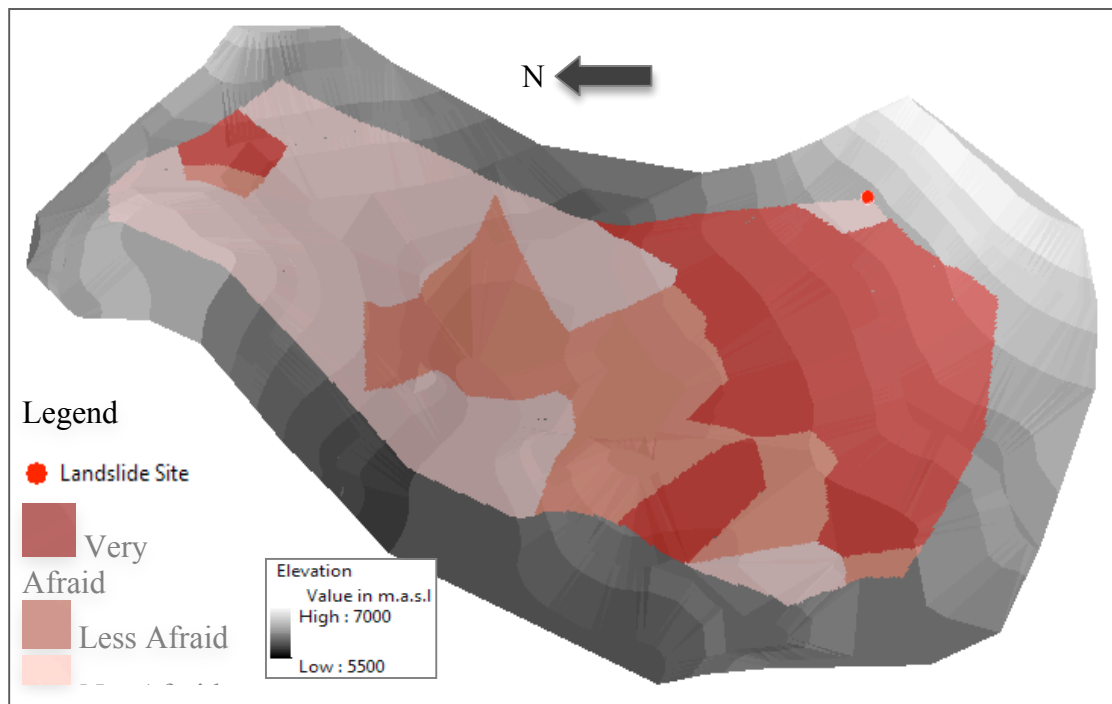


Figure 15. **Level of fear for future landslides in the study area**

With reference to the map above (figure 14), it can be noted that the 49 respondents who expressed fear of landslides were located within a radius of about 900 meters from the 2010 landslide site, save for a few who expressed fear even though they were located far away. Furthermore, respondents located furthest from the landslide site expressed no fear for landslides and believed that they were safe from future landslide threats. This highlights the role of distance and proximity in influencing people's perceptions of risk. Drori and Yuchtman-Yar's (2002) study of three municipalities in Israel/Palestine—Jerusalem, Tel Aviv, and Haifa found that environmental perceptions correspond predictably with environmental risks. Persons residing in higher-risk areas express higher levels of environmental concern, even when adjusting for subjective values and demographic characteristics (Brody et al. 2007). According to Loewenstein et al. (2001), one of the systems that people use to process information, mediated by different neural substrates when making judgments or arriving at decisions is an associative system, which is intuitive, automatic, and fast. It maps uncertain and adverse aspects of the environment into affective responses (e.g., fear, dread, anxiety) and thus represents risk as a feeling (Weber 2006).

Majority of the participants associated the landslides with fate, influenced mainly by their **religious beliefs** and cultural inclinations. For instance, about 30 participants said, ‘...the landslide was a punishment from God for our sins...’ Others said, ‘...the landslide was a curse....our ancestors are not happy because we have not been performing rituals according to tradition...’ The few officials who had a clear understanding of the scientific causes of landslides believed that all households within a 2-kilometre radius of the Nametsi landslide site were highly vulnerable to future landslides and they needed to move. Their reasoning was that, ‘...as long as rains are still falling in this area and people’s activities have not changed, more mudslides are bound to happen...its just a question of time.’ This partly explains why they were not residing in the area of study at time of fieldwork. Accordingly, as noted earlier, majority of the respondents believed that their households were safe from future landslides as shown in Figure 15. This is a ‘recipe’ for misdirected efforts aimed at personal, public, and environmental protection as argued by Shanteau (1992).

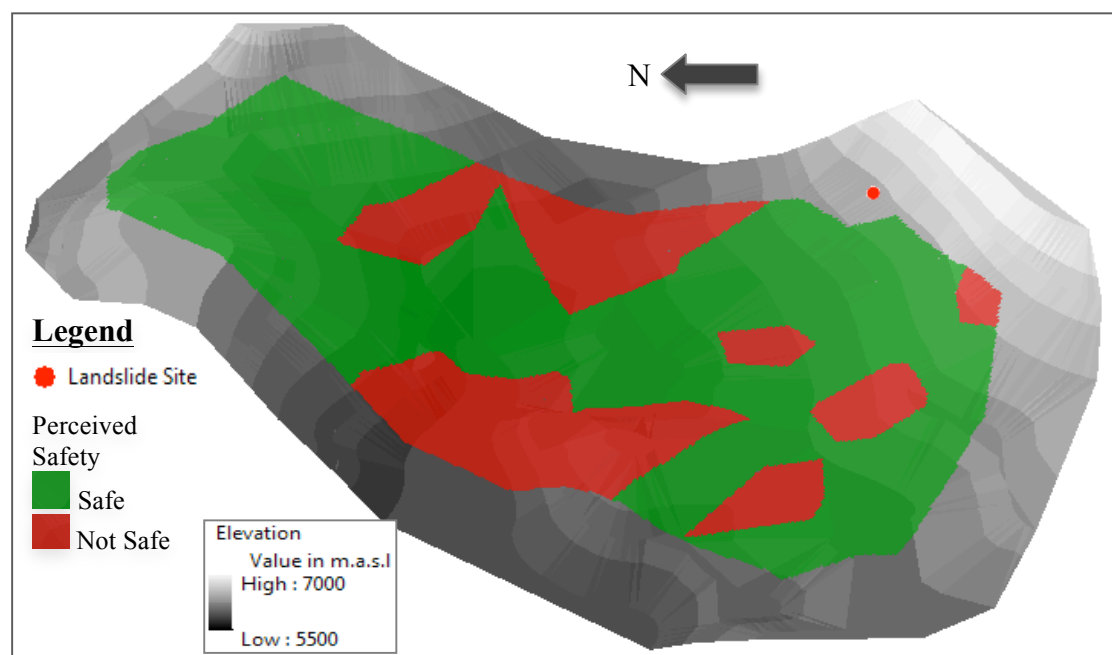


Figure 16. **Perceived Safety of Households by respondents**

There is close relationship between perceived safety of households and willingness of respondents to move to safer locations. Both cases defy obvious expectations. In spite of their fear for landslides, they consider their households to move and they are not willing to move to safer locations. Figure 16 below shows willingness to move.

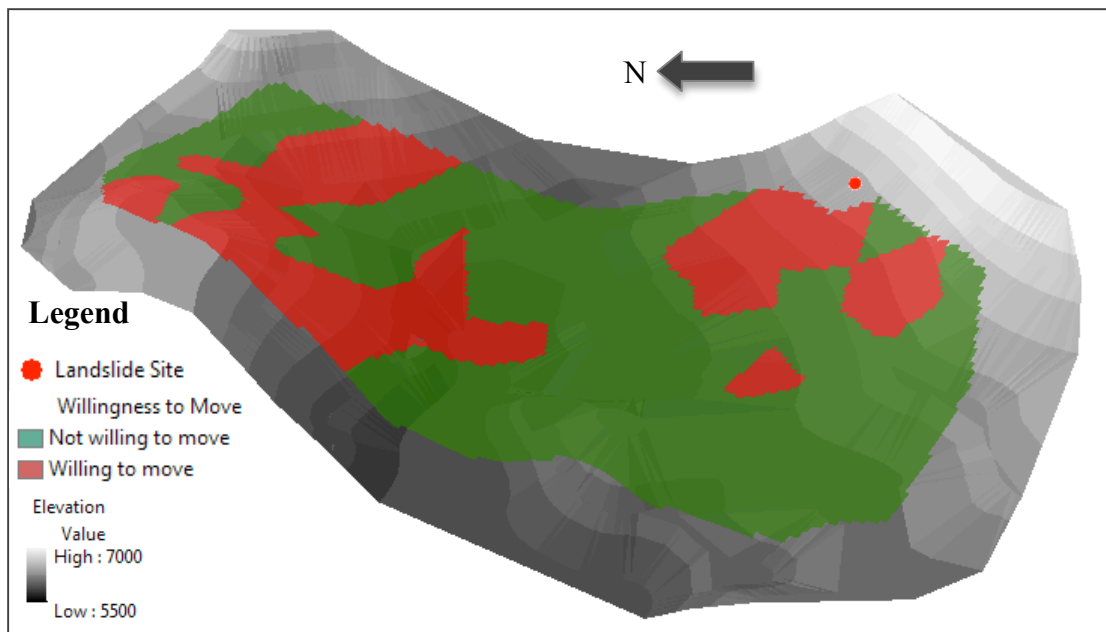


Figure 17. Willingness to move to safe locations

5.6. Factors influencing perceptions of risk and Coping Capacity

In spite of the fact that policy makers seek to be responsive to citizens' demands and concerns as disaster preparedness and response interventions are deployed, often, little attention is given to understanding individuals, household and community perceptions that may enable or impede citizen preparedness for natural disasters.

Although from the findings, it is clear that lay people's risk perceptions and experts' risk assessments are interrelated, the strength of the relationship differs across sections of people. In some areas, people overestimate the risks associated with landslides and as a result, are more afraid of landslides than others. Some people show prevention behavior that may seem superfluous but are incapacitated to act accordingly thus prefer to believe that their households are not vulnerable. However, in other areas people underestimate the risks associated with landslides and therefore do not show prevention behaviour. I assume that such people are most likely to be comfortable with the current status quo by virtue of their beliefs.

Asked if they would be willing to move away from their current locations, those who were afraid of landslides and considered their households to be at risk, especially women were ready to move. They mainly wanted to secure their families from the threat of death. For instance, one participant said; *'...I want to raise my children so that they can complete their studies and have a bright future that I never had... I*

really fear death at this time...I want to protect my children'. Some were just tired of being warned about death all the time. Others wanted to move away from the area so that they could forget everything and start all over again as one of the participants lamented; *'so many people have died here! ... I want to forget all the bad memories in this place and start a new life*'. Majority of the participants (local inhabitants) indicated no willingness to move from their current locations.

5.6.1. Poverty and Marginalisation

When asked for reasons why they had not moved to another location including the resettlement camp provided by government at Kiryandongo, participants presented numerous reasons ranging from personal to external. As Gaillard (2010) rightly observes, vulnerability in facing natural hazards reflects people's marginalisation within society. These people are indeed disproportionately drawn from the sections of the society, which are chronically marginalised in daily life because they have limited and fragile incomes (i.e. low wages, informal jobs, lack of savings), which reduces their capability to deal with natural hazards because of their status in society.

Most of the participants cited poverty as the main reason why they could not move. They presented circumstances, which they considered intricate to overcome without money such as exhuming and transferring remains of the dead, acquiring new fertile land elsewhere, building, finding new schools for their children, among others. As one gentleman explained; *'Because of poverty, I have no money to move from here and start a new life elsewhere... I would need a lot of money to buy land, build a new home and take my children to new schools. I was not lucky to be one of those chosen to relocate to Kiryandongo.'* This is further manifested in a related scenario, where five families were allegedly disenfranchised from a relocation exercise simply because they could not afford to bribe their way through. Five participants interviewed from within half a kilometre of the disaster site maintained that they really wanted to move immediately after the landslide happened but did not get the opportunity to relocate. They blamed corrupt officials for their predicament. They said officials accepted bribes and prioritised relatives in the relocation exercise hence disenfranchising them. Quoting one of the frustrated participants: *'When the landslide happened, I really wanted to move away from here. My name was registered for relocation to Kiryandongo but when time came for moving, I was told the list was full*

and that I had to wait until another opportunity comes around....later I discovered that other people from other places like Manafwa had been taken after paying bribe to the officials... some of them were taken because they were related to the officials who were in charge of the relocation exercise! That is why am still here...because of corruption!' Gaillard (2010) further notes that, disaster-affected people are often marginalised socially because they could be members of minority groups, which could be ethnic or caste minorities, disabled individuals, among others. They are marginalised economically, perhaps because they are poor or politically because probably their voice is disregarded, (in this case women, children, and the elderly).

Some participants had a strong attachment to their past, especially to the dead and maintained that they would be abandoning their ancestral home if they moved: *'...because all my ancestors are buried here... I cannot abandon them.'* The principal sources of resilience are often entrenched in the way individuals and communities perceive disasters as well as how they choose to respond to them (Gaillard 2010).

5.6.2. Fertile Land

Another section of participants chose to remain in the area because the land is generally fertile. Some said they were sceptical to move because they had heard that land in Kiryandongo is not fertile. Those engaged in animal farming said they could not imagine themselves leaving behind their cows and goats, gardens with crops because there was limited space being provided at the camp as one elderly man explained. *'...we were told there was no space at the camp to accommodate us with all our animals... I was advised to sell off my animals, my land and crops if I wanted to move to the camp... I better remain here with my things because for me, my business is farming'*. Vulnerability studies have shown that many people have no other choice but to face natural hazards to sustain their daily needs because there is often an intimate relationship between livelihood and vulnerability (Gaillard 2010, Blaikie 1985). However, in most cases as noted by Blaikie (1985), the fact that people are incapacitated to safely face natural hazards often results from their inability to control their daily life and to choose the location of their home and their livelihoods.

5.6.3. Religious and Cultural beliefs, Tradition and Socio-economic ties

It was observed that some of the interviewed participants, who associated the recent landslide with non-scientific factors, had stronger reasons to believe that somehow they were responsible for the disaster and therefore it was within their means to prevent it from happening again. This can be seen from statements such as '*...our God will not let this happen again... the reason why he left us alive was because he wanted us to be a testimony of his glory... we are safe here... we don't have to move.*' Those aged above 40 years believed that the next landslide would not find them alive and they were confident to say, '*It will not happen again in my lifetime*'. Those aged above 56 claimed to have experienced more than 3 landslides and were convinced that '*...another landslide may happen again in 30 to 50 years time...by then I will be dead already.*' Gaillard (2010) and Solvic (1984) assert that in most cases, hazard magnitude, duration, frequency and temporal spacing, plus the recentness, frequency and intensity of past personal experiences with the hazards influences people's resilience. I agree with Gaillard and Solvic because in separate accounts, a number of participants who confessed their fear for landslides went ahead to state that their fear would only manifest during heavy rains and every time they heard warning messages about looming landslides on radio. Recent studies further reveal that it is extremely hard for people to think about uncertainty, probability, and risk especially because most people lack an adequate understanding of probability and risk concepts (Kahneman & Tversky 1984 cited in Shanteau 1992). This is possible because majority of the respondents were illiterate.

District officials rejected the corruption allegations¹⁰ presented by some residents of the area and contended that some residents were simply not willing to move because of their strong attachment to the area. The District Planner stated that, '*some people are so attached to that place because they were born there and everything they treasure is there. However, others are just stubborn.... They just refused to register when the process started and now they complain after realising that their colleagues, who left are living happily.*' Nonetheless, the issue of strong attachment was confirmed by the various revelations given by interviewed participants residing in the

¹⁰ The corruption allegations cannot be independently verified in this study. However, from personal experiences, even if it were true, I would expect authorities to defend themselves to protect their image under such circumstances.

area. For instance, there was a section of the participants who contended that they would be forsaking their cultural norms, values and beliefs if they moved to a new distant location from where they could not easily travel back. Some said it was meaningless for them to shift because they had lost their immediate family members in the disaster and their bodies had not been recovered for a proper burial, so to them, the area was treated as a memorial site. For those who lost their loved ones and were lucky to give them a descent burial, the graves were considered '*a new home for the dead*'. They believe that the dead are not actually dead but alive in some other world. '*I lost my wife and children and they are all buried here... there is no way I can leave them here to go somewhere else! I have to stay here with them and if another landslide comes, I will be happy to also die and join them!*' in other words, there is some belief in 'life after death', typical among Christians. Others were opposed to the idea of moving to a very distant place claiming that their community was being disintegrated. They were quick to suggest alternative areas within Bududa District, where they could safely resettle without causing them to start learning a new way of life. Findings in Billig's (2006) study on Jewish settlers in the Gaza region affected by hostilities incurring risk to the settlers' lives, revealed how religion can influence people's perceptions about risk. The study evaluated the variables related to the settlers' risk perception and their tendency to stay or leave their homes. Findings showed that in spite of the dangerous environment, the settlers had a strong tendency to stay in the area, holding on to profound religious faith, strong place and home attachment, and low risk perception of their situation.

The religious participants highlighted prayer as a strong tool for overcoming landslides. They claimed that it had worked for them in the past and they had so much faith in the power of prayer. According to their beliefs, nothing in this world happens without God's hand in it and that as long as they continued to pray and trust in God, they were safe.

Interestingly, some individuals chose to remain in the area because of the desire to stay connected with friends and addiction to a local brew (malwa), which they presumed was not available elsewhere in the right quantities. One said, '*...my life runs on malwa and there is not enough malwa in Kiryandongo and all my friends are here; even if some of them died, others are still here and I need their company*'.

5.6.4. Old Age

The elderly used age to justify their lack of fear for death. Two elderly respondents in their late 60s clearly stated that they were not afraid of death because there is nothing they have not seen in this world. They went ahead to emphasise that they were not responsible for what happens to their lives because they believed that God was in charge of that. One of them sarcastically said '*... If another landslide comes, that will be how God wants it to be. I will die and end my life here on earth to start a new life either in heaven or in hell.*' They further compared relocation to Kiryandongo at their age with '*taking a fish out of water, throwing it on the sea shore, and expecting it to stay alive*'...It would be suicidal for them to relocate, they said. Alexander (1993: 571) argues that severe and intense events can provoke responses that are highly influenced by the personalities of the respondents such as inherent fatalism or ability to face up to danger. This may happen even though people who have had recent or frequent experience of disasters tend to be more knowledgeable about the causes and risks involved, and are presumed to be more sensitive to disasters, in this case, the renowned elders.

5.6.5. Limited Knowledge about the extent of risk

The existence of a government health centre and a government aided school in the area before the landslide occurred casts doubts on government's sensitization about landslide risk in this area. Unfortunately, the health centre and all its occupants at the time of the landslide were reportedly buried alive. The community was well serviced and supported by government in spite of purported warnings about landslides, which certainly explains why people were reluctant to migrate to safer locations before the disaster struck. It is assumed that those who have chosen to remain are hopeful that government will soon come to help them again.

Maps showing landslide risk areas in the district were available at in district documents and others were seen hanging on walls in offices but respondents said they were not aware of such maps. This shows a gap in the sensitisation approach. Officials attributed this to lack of resources to support the use of such maps in sensitisation. Ordinary illiterate people need to be informed about the risk of landslides using visual aids to reinforce the message because this could positively

impact on their precautionary behaviour. According to Siegrist et al. (2006), stimulating precautionary behavior is important because this is one of the underused strategies for reducing the economic costs associated with disasters.

In general, the reasons given by respondents for their continued stay can be grouped in four broad categories: *poverty, old age, fertile land and beliefs*. As mentioned earlier, majority of the respondents said they chose to stay because they were poor. The map below shows the proportionate areas covered by respondents in the above categories.

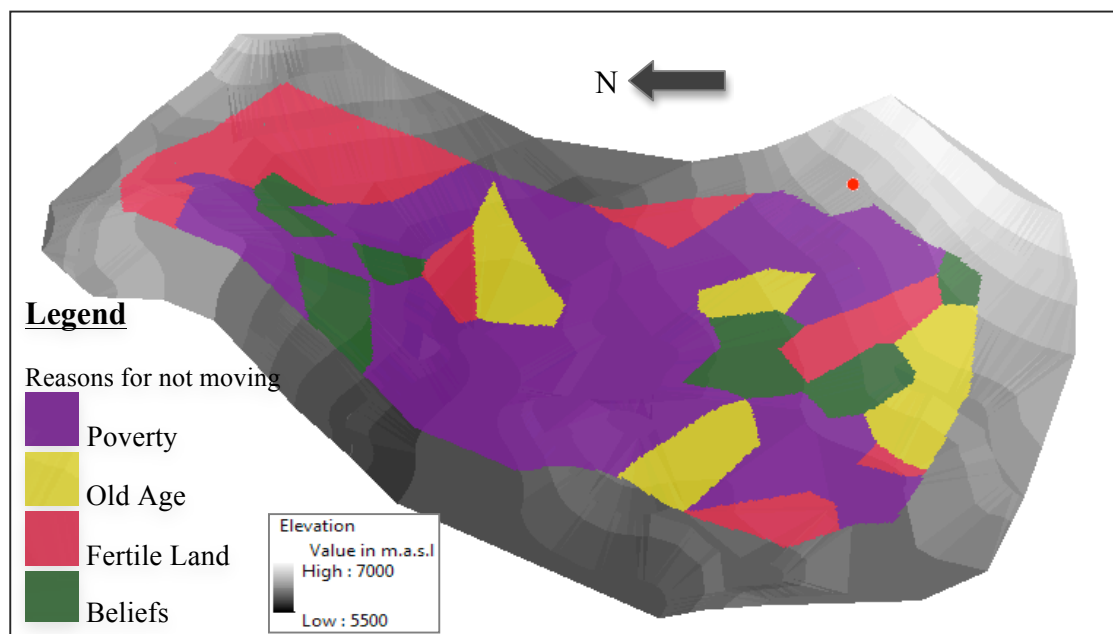


Figure 18. **Reasons for not moving**

With reference to figure 17, poverty as mentioned earlier was cited by majority of the respondents as the main reason why they had not moved to a safe location. This can also pass as a valid reason for their perception that their households are safe from threats of future landslides consistent with Gillard's (2010) assertions about poverty, vulnerability, marginalisation and perceptions.

5.7. Derived Perceptions of Risk

According to this study, perceptions of risk to landslides can be categorised as **High Risk Perception, Low Risk Perception** or **Medium Risk Perception** based on perceived knowledge of causes of landslides, level of risk fear, perceived household safety and willingness to move to safer locations. People with a high risk perception

according to this study are those who are aware of the causes of landslides and inherent dangers having witnessed a catastrophic landslide disaster less than two year ago; are afraid of landslide threats; consider their household to be at risk given the fact that they are living in an area declared risk prone and unsafe for human settlement and; are willing to move to a safer location (See table 4). People with a low risk perception are those who are aware of the causes of landslides and the associated dangers but express no fear for landslide threats; continue to believe that their household is safe (figure 15) from future landslides in spite of a government declaration that the area is unsafe for human settlement and are not willing to move to safer locations (figure 16). As shown in figure 17, majority of the respondents have a low risk perception.

Table 4. Derived scale of risk perception

Scale of Risk Perception	Variables			
	Aware of causes of landslides	Fear landslides	Consider household to be at risk	Willing to move to a safer location
<i>High Risk Perception</i>	Yes	Yes	Yes	Yes
<i>Medium Risk Perception</i>	Yes	Yes/No	Yes/No	Yes/No
<i>Low Risk Perception</i>	Yes	No	No	No

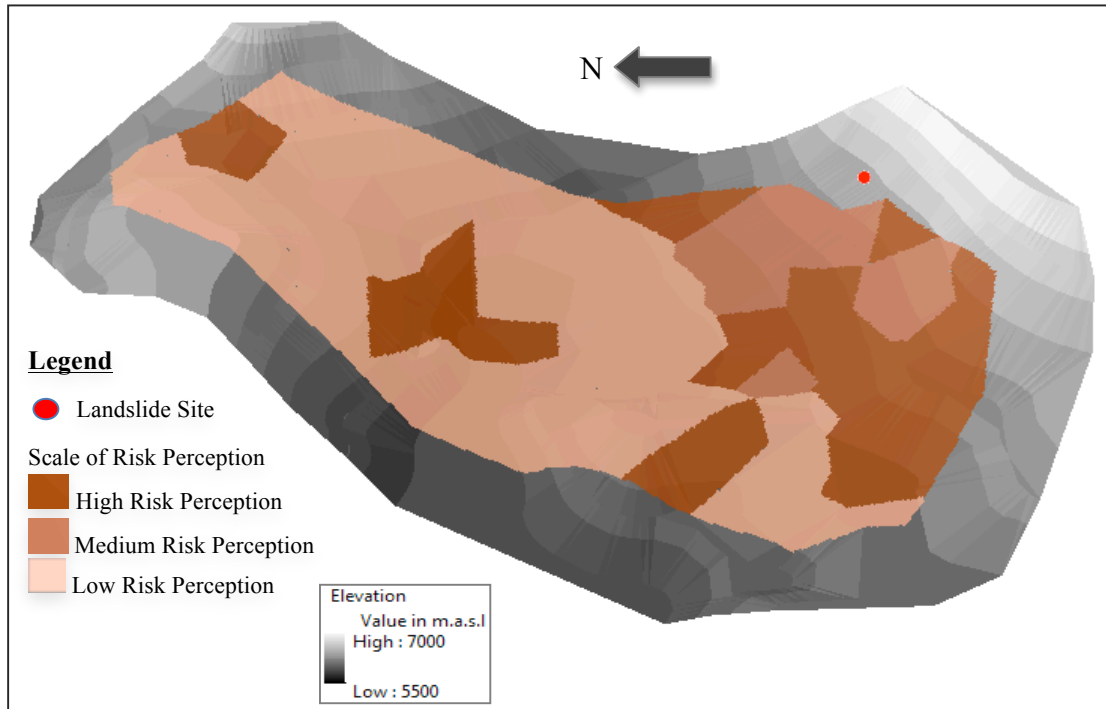


Figure 19. **Scale of Risk Perception**

With reference to figure 17, most of the participants, who were residing within a radius of about 500 meters from the 2010 landslide site, had a high risk perception as opposed to those who were located farther with the exception of one respondent who in spite of being located far away from the 2010 disaster site exhibited high risk perception. The high-risk perception area shown to the north of the map represents only one respondent and is insignificant to change the overall perceptions of risk.

5.8. How maps of perceptions can improve preparedness and management of landslides

All maps generated in this study to communicate people's perceptions through various themes present an intuitive approach towards enrichment of information for disaster preparedness and management. In addition to documenting physical, biophysical and social vulnerability through maps, this study reveals that it is possible to further document people's perceptions about such vulnerabilities using maps (referred to as perception maps in this study) although such data is descriptive and primarily non-quantitative and therefore ordinarily known to be un-mapable using conventional mapping methods. The mapping method adopted in this study combines conventional and non-conventional methods of mapping to produce maps that can

easily communicate the relationship between the physical landscape and other variables such as proximity and place. The maps are presented in perspective form (referred to as 3D maps in this study). The purpose for this approach is to exemplify the possibility of easy visual interpretation of the maps without the need for map reading skills. This is also because the same types of maps are recommended for sensitisation of local communities about the landslides and associated dangers to their lives.

The selected perception themes that have been mapped in this study include: perceived causes of landslides (figure 12), levels of fear for future landslides (figure 14), perceived safety of household (figure 15), willingness to move (figure 16), Reasons for not moving (figure 17), and the final scale of risk perception (figure 18). The scale of risk perception is the ‘flagship’ of this study and its based on four variables i.e. awareness about landslides, fear for landslides, perceived safety of household and willingness to move to safer locations.

Understanding people’s perceptions about their vulnerability to disasters is advantageous towards enhancing landslide disaster preparedness and management efforts. Mapping such perception doubles the benefits thus making this study a valuable addition to the existing stock of knowledge and applied research.

5.9. Summary

In summary, people in the study area are less informed about scientific causes of landslides because of their low literacy levels. They have therefore resorted to alternative interpretations including the use of prediction, religion, and superstition to cope with the situation. People have varying interpretations of vulnerability to landslides underpinned by poverty, their age and experiences, beliefs and practices, social and cultural attachments, education, political inclination, economic activities, location and proximity. The geographic location of the area and its ragged terrain has negatively affected its people in terms of service delivery. Consequently, people’s vulnerability has remained high in the event of future landslides of equal or greater magnitude to the 2010 landslide because people are ill-prepared to deal with large-scale disasters. Men and the elderly are more resilient about vulnerability to landslide disasters as compared to women and the youth. The women and youth are mainly

unable to move because they are incapacitated. Authorities and residents of the study area hold contradicting accounts regarding the continued settlement in the area and factors for resilience although what stands out is the fact majority of the settlements are either by choice, incapacitation or insufficient knowledge of the extend of the inherent danger.

CHAPTER SIX

6. CONCLUSIONS AND RECOMMENDATIONS

6.1. Introduction

This chapter provides an overview of the research aim, objectives, findings, conclusions, and recommendations of this study. I start by summarising the background to the research and the research purpose, methodology, and findings. I then delve into the contribution of this research to the existing stock of knowledge with regard to the discipline of geography in Uganda as well as international academia. This research is equally important to the Office of the Prime Minister and the Ministry of Disaster Preparedness in their efforts to manage landslide related disasters. I also go further to make recommendations, first, for better practices in dealing with affected communities in landslide-affected areas and second, for future research based on the themes that are presented in my findings.

6.2. Review of the Overall Aim and Objectives

The aim of this study was to explore people's perceptions of vulnerability to landslides and map them using GIS in order to show how GIS maps can be used to communicate people's perceptions of vulnerability. I assumed based on existing literature that, first, the area is a disaster risk area and unfit for human settlements yet human settlements still exist. Second, human induced causal factors of landslides are still at play and the population is likely to continue growing in the area. In order to find out more about these assumptions as envisaged in this study I developed three specific objectives to meet the stated overall aim of the study.

6.3. Summary of Findings according to the Objectives

The first objective was to find out people's perceptions of risk to landslides, where I sought to first and foremost, establish whether people know about landslides and the associated dangers. Second, I wanted to know if people, who are living near a recent landslide disaster site were afraid of landslides and if they saw landslides as a threat to their lives in light of the fact that the government had declared the area to be risk prone and unsafe for human settlement. The study found out that local people living in the area are aware of the inherent risk they face as a result of scientifically

predicted future landslides but are reluctant to migrate because of their strong bond to the area mainly by factors perpetrated by poverty, their religious and cultural beliefs, traditional practices and values, old age, interest in fertile land for farming as their only source of livelihood and socio-economic ties especially to family, community and society at large. Prominent among them were poverty, religious beliefs, fertile land for farming and old age (see figure 17). Accordingly, perceptions varied among different groups, presenting a complex set of contradicting accounts. For instance, illiterate and semi-literate respondents expressed strong attachment to culture, tradition and religious beliefs and claimed that their households were safe from future landslides, but at the same time attributed their continued stay in the area to poverty and marginalization. Literate participants blamed illiterate and semi-literate participants for being adamant and non-responsive to government programs to relocate them to safer locations.

The second objective was to identify the factors influencing people's continued stay in areas prone to landslides around the Mt. Elgon in Nametsi Parish, where I was interested in, first, establishing if there existed safer alternatives for resettlement. I also wanted to find out if affected people were willing to move to safer locations. Second, I wanted to find out people's coping capacity. First and foremost, the study revealed that there exists a District Disaster Management Committee, which only becomes active when there is a disaster. After the 2010 landslide, government declared the area to be risk prone and unsafe for human settlement and secured land in Kiryandongo, where they set up a resettlement camp for the victims of the disaster. It was interesting to learn that for various reasons, some people preferred to stay in the high-risk mountain slopes than migrate as discussed in chapter 5. Majority of the respondents were not willing to move because they were poor, others had a strong attachment to the fertile land; another section was reluctant to move because of strong religious and cultural beliefs and traditional values while the rest were too old to move and start all over again. In general, there was a lot of scepticism and uncertainty about starting a new life in the camps. The main coping capacity was found to be in religion, optimism based on past experiences, culture and tradition as well as old age.

The third objective was to find out how GIS generated maps could be used to communicate people's perceptions of risk to landslides. I was particularly interested

in establishing the possibility of communicating how people perceive risk through maps and how maps of perceptions can improve preparedness and management of landslides. Findings revealed that even though descriptive data such as perceptions cannot be mapped directly without quantifying it in numeric form, it is possible to classify and quantify descriptive data by coding and geocoding it for mapping. For best results, the datasets were rasterized and subsequently used in ArcScene for subsequent processes. 3D¹¹ maps were found to produce the best visual impression to emphasize details of the landscape vis-à-vis proximity and location of settlements. They were further preferred in this study to exemplify their effectiveness for the intended purpose. Findings also revealed limited sensitization of affected communities because of the mountainous terrain and inaccessibility by motorable road, but even where sensitization has been done, there is no use of maps showing landslide risk prone areas due to limited resources.

6.4. Conclusions

It was observed that Nametsi Parish is located about 5 kilometres from Bukalasi trading centre and is not accessible by motorable road because of the mountainous terrain. This as confirmed by the sub-county chief of Bukalasi has made community development and sensitisation efforts difficult. For instance, community development officers, who would be frequently sensitising people, are reportedly unable to access the area with ease, especially when it rains. This is certainly a contributing factor to the lack of preparedness exhibited by inhabitants of the area. Participants asserted that there were no prior sensitisations about preparedness for landslide disasters and therefore they did not know how to respond when the landslide hit. Many of them reacted by impulse in response to the disaster; some knelt down and prayed to God, others ran away, some immediately ran to the scene of the disaster unaware of the fact that they would be victims of successive landsliding although non was reported. The lack of preparedness may have exacerbated the effects of the 2010 landslide.

Place and proximity played a significant role in influencing people's perceptions of risk to landslides in light of the 2010 landside disaster at Nametsi. At the time of the study, people's memories were still fresh even though the disaster site had been covered by vegetation. Many said they were afraid of landslides because of what they

¹¹ See sections 3.4.2 and 5.8 for detailed explanations about 3D maps.

witnessed. However, this did not have the same effect on their willingness to move to safer locations because some of the respondents notably said they did not want to move citing various reasons as presented in chapter 5. Some insisted that their households were in safe locations and would not be affected by future landslides.

From the individual accounts in this study, there was an implied voice of hope and optimism among some respondents that there will be no more landslides in their lifetime, which makes them more resilient and adaptive. Ziedonis (2006) showed that risk perception is often coupled with over-optimism, which involves predicting that favourable events are more likely or more positive than they actually are. When individuals are confronted with complex information, preventing them from rational decisions, over-optimism often sets in prompting them to estimate events beyond their control to be terrifically positive. Often, they are instead likely to attribute bad outcomes to external forces such as bad luck rather than to their personal bad choices of action.

Results show that perceptions can be reliably mapped by classifying, coding, and geocoding them as 'high risk perception', medium risk perception or 'low risk perception' based on perceived knowledge of causes of landslides, level of risk fear, perceived household safety and willingness to move to safer locations. It is however important to note that the classes are not clear cut and conclusive but unique based on mapping methodologies that are not purely conventional as described in sections 3.4.2. and 5.8., Level of risk fear for instance was high among individuals who perceived their households as unsafe from future landslides and low among those who perceived their households as safe. But there was some contradiction between perceived household safety and reasons for not moving because some of the respondents who claimed that their households were safe from future landslides also said they were unable to move because of poverty and marginalization. There were also contradictions between levels of fear for landslides and perceived household safety. Many of those, who said they were afraid of landslides, again claimed that their households were safe from future landslides.

It was observed that there exists a dormant Disaster Management Committee in the District comprising of district officials. It does not include representatives from landslide risk prone areas and is only active when there is a disaster. The reason given

for this status quo was lack of resources to keep the committee active at all times.

Few households in this research expressed much concern about the protection of their physical safety or safety of their homes and possessions mainly because they had survived previous landslides including the most devastating 2010 disaster. What stands out, rather, is the desire to protect what Giddens (1991) calls ontological security. According to Giddens, an ontologically secure person is someone who is free from existential doubts and who is able to believe that life will continue in much the same way as it always has – without threat to the familiar representations of time, space and identity.

Because some people are so attached to their fertile land for farming as their only source of livelihood, I would presume that perhaps they would be willing to move if only they could have access to their land to continue cultivating and dealing in farm and animal produce. Although this may not be a perfect solution from an environmental point of view, it is a viable solution in terms of saving lives. This is because if a household is made up of 5 people, they will all move and only one or two will return to cultivate and trade on a temporary basis.

Interestingly, in spite of the fact that landslides have rocked this area and surroundings since 1989, government has been extending social services and facilities such as health centers and schools to the people in the study area. This I believe has been one of the major contributing factors to the relentless settlements. In the 2010 Nametsi landslide, the rocks and mud buried a government health center with all its occupants at the time of the disaster.

There was no early warning system for landslides in the area before the landslide happened in 2010 and there is no intention to introduce one because government has declared the area to be risk prone and unfit for human settlement. Everyone has been ordered to vacate the area and move to safer locations. This implies that there will be no serious preventative efforts by government in future.

6.5. Recommendations

Decision makers and those who promote and regulate health and safety need to understand how people living in risk prone areas such as Bududa think about landslide risks and how they respond to such risks. This information can be easily presented in written reports but using maps presents a valuable supplement to the efforts. I recommend using maps of peoples' perceptions to facilitate disaster planning and management before landslides occur and for quick decision-making processes during and after a landslide disaster. Such maps are capable of summarizing and simplifying descriptive data in times of crisis, where time is critical to saving lives.

The question of why respondents in such a high-risk area did not show substantial concrete risk prevention behavior cannot be adequately answered fully in this study based on the available data because I did not control for the actual risk level that each respondent faced. However, as results indicate, there is a possibility that respondents were not informed enough to decide appropriately. I therefore recommend that hazard maps showing potential landslide locations should be made available to the affected populations as part of the sensitization materials with appropriate symbology in order to stimulate and maximize appropriate risk precautionary behavior. These should be displayed in public places at village level accessible to all members of the affected communities accompanied by explanatory materials in local languages and where possible personnel to give additional explanations to the local people where needed. It is also important to take note of people's skepticism about government programs as reported in section 3.6 and chapter 5 and apply appropriate measures to ensure acceptability and effectiveness of such programs.

The District Disaster management Committee should lobby for funds from multiple sources to carry out routine activities especially vigorous sensitization. Local representatives from affected areas should also be part of the committee because they can help to coordinate activities in their respective areas via telephone.

There is need to improve accessibility to Bukalasi and Bumayoka Sub-counties to ease sensitization efforts and improve interconnectivity of the two sub-counties with business centers in other areas within and outside the district. This will also encourage

settlers to migrate to safer locations and ably commute to their farms in the high-risk areas. In the short-run, lives will be safe and in the long-run, affected people can be convinced to acquire farmland elsewhere so as to allow the natural vegetation in the area to regenerate.

Government should not provide social services and facilities to disaster prone areas. They should instead be situated in the nearest safe locations such that people living in such unsafe areas can feel the need to relocate. In other words, this will serve as a pull factor to attract those living in disaster prone areas. Otherwise, in addition to losing lives, government will continue to incur losses whenever such disasters happen.

6.6. Suggestions for Future Research

There is need for deeper research on the use of GIS in mapping perceptions of vulnerability. The indicators used in this study to categorize perceptions were; *perceived knowledge of causes of landslides, level of risk fear, perceived household safety and willingness to move to safer locations*. I suspect that specific, multidimensional perception indicators, matched with similarly specific and more detailed survey questions, could uncover stronger perception–vulnerability relationships than those observed using very general one-dimensional indicators in my study because of time constraints. Developing multidimensional risk or vulnerability indicators for integration with survey research would in itself be a substantial project, needing more geographical diversity (or degrees of freedom) than the two Sub-counties covered in this study. This case study has some limitations. The sample was limited to a specific geographic region and as such, the findings may not generalize to persons who experience other landslides. However, the response rate of the sample was excellent and suggests that the findings would generalize to persons affected by this landslide. The findings also offer some information about how persons within a specific demographic group responded to such a tragic event.

6.7. Summary

Overall, this study concludes that people’s perceptions of vulnerability to landslides in Bududa are a creation of mixed factors and therefore cannot be considered a permanent characteristic of the people in this area. Understanding these perceptions and communicating them to responsible actors is paramount. Mapping perceptions of

risk and adding this information to the existing stock of knowledge on people's vulnerability to landslides and landslide risk mapping enriches efforts by government and civil society organizations towards better management and mitigation of future landslides before they occur.

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APPENDICES

A) Interview Guide for Households

Interview Guide for the households

Date: _____
Questionnaire No: _____
Household No: _____
Lat. Lon. Coordinates _____ , _____

Introduction and Consent to participate in the study

Dear participant,

My Name is Isaac Wanasolo and I am a Mugisu from Budadiri East. I am a Masters student of Development Studies at the Norwegian University of Science and Technology, currently here in Uganda for my research. I am researching on how people perceive the risk to landslides in this area and the factors influencing their stay in this area. I have a questionnaire that I would like to feel out by talking to you briefly. The discussion may last about 20 minutes or slightly more.

This questionnaire aims to gather information relating to your perception of risk to landslides around Mount Elgon, and the factors that influence your stay in this area, Bududa Town.

This is an academic research and your participation in this study is voluntary. The information you provide will be kept strictly confidential and all answers will remain anonymous.

It is hoped that the outcomes or findings from this study will, (*but not as a must*) inform the decision making process regarding the management of landslide disasters in this area and other mountainous areas in the country.

Do you willingly agree to participate in this study? YES NO

---Thank you for participating in this study---

Highly Knowledgeable Basic understanding No idea

10. Have you ever seen or experienced a landslide or seen an area that has been hit by a landslide?

Ever Seen an area hit by a landslide Ever Experienced (during)
Never seen or experienced a landslide

11. Has any of your relatives or friends ever been affected or injured or killed by a landslide?

Relative (s) ever been injured Relative (s) ever been killed
Relative (s) ever been affected (*e.g. crops destroyed*)
Other (*Please specify*)

12. Are you afraid of landslides?

Very Afraid Less Afraid Not sure Not Afraid

13. Why?

.....

14. Do you consider your household to be prone to landslides?

Yes No Don't Know

15. Why?

.....

16. Have you ever thought about leaving your house here to go and stay somewhere else?

Yes No

17. When did you think about leaving?

.....

18. Why did/would you want to move?

.....

19. Why have you not moved to another location?

.....

--Thank you for your time --

B) Interview Guide for Authorities

Interview Guide for Authorities

Date: _____
Interview No: _____
Portfolio of Respondent: _____

Introduction and Consent to participate in the study

Dear participant,

My Name is Isaac Wanasolo. I am a Masters student of Development Studies at the Norwegian University of Science and Technology, currently here in Uganda for my research. I am researching on how people in Bududa Town perceive the risk to landslides and the factors that influence their continued stay in this area in spite of such risk. I would like to have a brief interview with you in order to get answers to some of my research questions. You are free to choose not to answer any of the questions that you may not feel comfortable to answer (*not that I will ask uncomfortable questions*). The discussion may last about 20 minutes or slightly more.

This interview aims to gather information relating to government intervention in the management of landslides around Mount Elgon, particularly in Bududa Town.

This is an academic research and your participation in this study is voluntary. The information you provide will be kept strictly confidential and all answers will remain anonymous.

I will be going to the field to talk to the residents of Bududa Town in the bid to find out how they perceive landslides and the factors that have influenced their continued stay in this area.

It is hoped that the outcomes or findings from this study will, (*but not as a must*) inform the decision making process regarding the management of landslide disasters in this area and other mountainous areas in the country.

Do you willingly agree to participate in this study? YES NO

--Thank you for participating in this study--

C. Government Intervention in Management of the 2010 landslide

20. Are you aware of any landslides that have happened in Bududa District in eastern Uganda or any other mountainous/hilly parts of the country?

Yes No

21. What do you think is the major cause of landslides around Mt. Elgon?

22. Is there anything that can be done to avert this trend of events?

23. What was the role of government, through your ministry/ department /unit/ organisation etc, in the management of the 2010 landslide in Bududa?

24. What do you think about the recent landslide that happened in Bududa in March, 2010 in terms of government intervention generally? (*Challenges, Milestones, Lessons etc...*)

25. Do you know about Geographic Information Systems? Yes No

(Explanation is provided if there is no knowledge of GIS)

26. If Yes, has government implemented any GIS related solutions to managing landslides in the country? Yes No

--Thank you for your time--

C) Copy of Introduction Letter from NTNU to the Authorities

Norwegian University of
Science and Technology

and Technology Management
Department of Geography



To whom it may concern

May 31st 2011

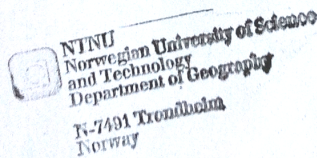
Letter of confirmation

As supervisors of Isaac Wanasolo we confirm that he is undertaking a study of people's perceptions of landslide risk around Mount Elgon, more specifically a case study of Bududa Town. The thesis is part of the programme Master of Philosophy in Development Studies at the Department of Geography, Norwegian University of Science and Technology. Wanasolo will undertake fieldwork during summer 2011 and write up his thesis by the end of the year.

Yours sincerely

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Associate Professor

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