

**BUSITEMA UNIVERSITY**

**FACULTY OF NATURAL RESOURCE AND ENVIRONMENTAL SCIENCES.**

**LANDSLIDE RISK IN MOUNT ELGON REGION, EASTERN UGANDA:**

**'AWARENESS ANALYSIS AND CONSTRAINTS FOR RISK MITIGATION'**

**CASE OF BUDUDA DISTRICT.**

**BY:**

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**RESEARCH REPORT SUBMITTED TO THE FACULTY OF NATURAL RESOURCE AND ENVIRONMENTAL SCIENCES IN PARTIAL FULFILLMENT OF REQUIREMENT FOR THE AWARD OF BACHALORS DEGREE IN NATURAL RESOURCE ECONOMICS OF BUSITEMA UNIERSITY**

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## DECLARATION

I **Eseet Isaac** declare that this research report is my original work and has never been submitted to any University or any other institution for the award of a bachelor's degree. I am responsible for any errors due to omission or otherwise that may arise in this work.

Signed..........

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## APPROVAL

This research report has been done under my supervision and is now ready for submission to the Faculty of Natural Resource and Environmental sciences.

SIGN.....

MR. KIFUMBA DAVID NSAJJU

(SUPERVISOR)

DATE.....

## DEDICATION

I dedicate this research report to my parents and friends who worked tirelessly to ensure that I attain academic excellence.

May God reward the work of your hands.

## ACRONYMS

CDOs: Community Development Officers

GIS: Geographical Information Systems.

NEMA: National Environmental Management Authority

SPSS: Statistical Package for Social Scientists

UBOS: Uganda Bureau of Statistics.

UNEP: United Nations Environmental Programme

UNESCO: United Nations Educational, Scientific and Cultural Organization.

UWA: Uganda Wildlife Authority.

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## ABSTRACT

Mount Elgon has increasingly experienced catastrophic landslide over the years due to heavy El Niño rains there by leading to destabilization of slopes and displacement of large quantities of debris from the crown to the disposal area under the influence gravity.

Bududa is highly mountainous area inhibiting a variety of flora and fauna and experiencing high precipitation turning the area into landslide prone with fatalities like loss of property like social infrastructure including schools, bridges and hospitals, displacement of communities and loss of human lives.

This was carried out in Bududa district, one of the newly created districts in Mount Elgon sub-region in Eastern Uganda, the major justification was explorative assessment of landslide hazard knowledge sharing and information dissemination for landslide risk mitigation in Mount Elgon. The main aim was to analyze awareness and constraints for risk mitigation

Mostly qualitative data was collected through focus group discussions with the help of an interview guide, data was analyzed using Excel and SPSS software to give pie-charts, bar graphs and clustered histograms.

The study revealed that heavy rainfall, soil characteristics, over cultivation and deforestation are the major causes of landslides. Sub-counties of Bulucheke, Buwaali, Bukalasi and Bushiyi had reported the greatest number of landslide whereas Bukigai and Bududa Town Council had reported almost no landslide incidence. Church is the most reliable channel used to receive information relating to landslide. The presence of small plots of land and fear of losing cultural bonds by communities in Bududa if they are resettled at distant places are the major constraints in an attempt to mitigate landslide risk.

In conclusion, landslide occurrence is associated with heavy rain with continued recurrence in specific sub-counties. Landslide always depicts cracks before happening and this information is disseminated through church.

# CHAPTER ONE

## 1.0. INTRODUCTION

### 1.1. Background

#### 1.1.1. Human colonization of mountain ecosystems

Mountain ecosystems are highly productive sites in the world. They are a home to variety of flora and fauna including species that are endemic to these ecosystems (NEMA 1997). These ecosystems are characterized by large forest cover hence generally receive high rainfall which makes them function like “water towers”. Worldwide increased population and economic pressures in mountainous areas have forced human activities to shift to practices such as deforestation, urban development and agriculture into potentially hazardous regions (Guthrie 2002).

In these areas soils are generally fertile for agriculture. Consequently, they continue to attract large human populations from traditional low lying areas which have increasingly become scarce and less productive owing to increased growth in population (Guthrie 2002). This exposes the ecosystem to degradation.

#### 1.1.2. Human settlement in Mountainous areas of Uganda

Human colonization of mountain ecosystems dates as far as 1950s. To date population in these areas is increasing at a high rate and puts pressure on the limited land available. Over the last two decades, this has continued to generate concerns over decreased land for both agriculture and settlement.

In the 1930s all the land eastwards of Bukigai in Bududa was still under forest cover (Hamilton, 1984). Human colonization of Mount Elgon started far back in the 1970s, over population continues to be responsible for the present encroachment on sensitive ecosystems including gazetted natural forests.

Inhabiting communities and societies utilize rudimentary technologies to stabilize the extensively exposed soils and land on which their livelihoods thrive (UWA 2011). Efforts to stabilize land include use of dug terraces, planted/live hedges rows made of shrubs and cover crops which are

## References:

- Aellotti, P., and R. Chowdhury, 1999. Landslide hazard assessment : summery review and new perspective. *Bulletin of Engineering Geology and the Environment* 58(1): 28-44.
- Ayalew, L., 1999. The effect of seasonal rainfall on landslides in the highlands of Ethiopia. *Bull. Eng. Geol. Env.* 58: p. 9-19. Atterberg, A.M., 1846-1916. *Geotechnique*, 3(1), pp. 17-19.
- Claessens, L., Knapen, A., Kitutu, M.G., Poesen, J and Seppe, D., 2007. Modeling landslide hazard, soil redistribution and sediment yield of landslides on the Ugandan footslopes of Mount Elgon, *Geomorphology* 90 (2007) 23-35.
- [http://en.wikipedia.org/wiki/Atterberg\\_limits](http://en.wikipedia.org/wiki/Atterberg_limits)
- [http://en.wikipedia.org/wiki/Causes\\_of\\_landslides](http://en.wikipedia.org/wiki/Causes_of_landslides)
- <http://en.wikipedia.org/wiki/Landslide>
- <http://link.springer.com/article/10.107%2Fs10707-008-0072-1>.on 12/05/2013
- Inganga, S.F., Ucakuwun, E.K and Some, D.K., 2001. Rate of swelling of expansive soils: a critical factor in the triggering of landslides and damage to structures. *Documenta Naturae*, 136: 93-98.
- Kitutu, K.M.G, 2004, Local perception of landslide problems in Manjiya County, Mbale District, Eastern Uganda, mountain ecosystems, resources and development in Uganda, a publication of Mountain Resource Centre, Department of Geography , Makerere University, pages 94-98. isbn 9970-05-017-6.
- Kitutu, M.G., Muwanga, A., Poesen, J and Deckers J. A., 2009. Influence of soil properties on landslide occurrences in Bududa district, Eastern Uganda, *African Journal of Agricultural Research* Vol. 4 (7), pp. 611-620, Available online at 29
- Kitutu, M.G., Muwanga, A., Poesen, J and Deckers J. A., 2010. Farmers' perception on landslide occurrences in Bududa District, eastern Uganda, *African Journal of Agricultural Research* (In press)
- Knapen, A., Kitutu, M.G., Poesen, J., Breugelmanns, W., Deckers, J and Muwanga, A., 2006. Landslides in a densely populated county at the footslopes of Mount Elgon (Uganda): characteristics and causal factors. *Geomorphology* 73, 149-165.
- Muwanga, A., Schuman, A., Biryabarema, M., 2001. Landslides in Uganda – Documentation of a Natural Hazard. *Documenta naturae*, 136: 111-115.
- Nathalie C., 2003. Multiscale participatory Land resource Assessment in Northwest Syria. PhD Thesis 559, Catholic University, Leuven, Department of Land Management, Belgium.
- National Environment Management Authority, 1997. District State of Environment Report, Mbale, 1997, Uganda, 128 pp. 30

- National Environment Management Authority, 2006. State of Environment Report for Uganda.
- NEMA, 2000. The National Environment ( Hilly And Mountainous Area Management )
- NEMA, 2010. Landslides in Bududa district , their causes and consequences. Kampala.
- Ngecu, W.M., and Ichangi, D.W., 1998. The environmental impact of landslides on the Population living on the eastern footslopes of the Aberdare ranges in Kenya: a case study of Maringa village landslide. *Environmental Geology*, 38 (3): 259-264.
- Ngecu, W.M., and Mathu, E.M., 1999. The El Nino-triggered landslides and their socioeconomic impact on Kenya. *Environmental Geology*, 38 (4): 277-284.
- Nicoliene O., and Adrienne M., 2003. Methods and issues in exploring local knowledge on soils, *Geoderma* 111 387-401.
- Nyssen, J., Moeyersons, J., Poesen, J., Deckers, J and Mitiku H., 2003, The environmental significance of the remobilization of ancient mass movements in the Atbara-Tekeze headwaters near HagereSelam, Tigray, Northern Ethiopia, *Geomorphology*.
- Selby, M.G., 1993. Hillslope materials and processes, Oxford University Press. New York.
- Side, R.C., Pearce, A.J and O' Loughlin, C.L., 1985. Hillslope stability and landuse. American geophysical union, Washington DC, USA, 125 pp.
- Smedema, 1983. Land drainage. Batsford academic and education Ltd, London. P. 174-194.
- Statistical Abstract, 2010, Uganda Bureau of Statistics.
- Uganda Red Cross on 25/06/2012.
- UNESCO/UNEP, 1988. Landslides and mudflows UNEP/Unesco, Moscow. 236p.