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MEANDER PLAN, SINUOSITY AND BANK EROSION ALONG RIVER SEMLIKI IN NTOROKO DISTRICT, WESTERN UGANDA

BY

ESTHER OSIKOL

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SUPERVISORS:

1. **DR. MOSES ISABIRYE**
2. **DR. ALICE NAKIYEMBA**

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DECLARATION

I, Esther Osikol hereby declare that the information given in this report is entirely mine, valid and it has never been forwarded to any institution or organization for award of any degree.

Signature:..... Date: 18th Sept. 2017

APPROVAL

This dissertation is submitted with the approval of the undersigned supervisors

Dr. Moses Isabirye

Busitema University

Faculty of Natural Resources and Environmental Sciences

P.O. Box 236, Tororo Uganda

Signature: ..... Date: 19/09/2017

Dr. Alice Nakiyemba

Senior Lecturer

Busitema University

Faculty of Natural Resources and Environmental Sciences

P.O. Box 236, Tororo Uganda

Signature: ..... Date: 19/09/2017

DEDICATION

I dedicate this thesis to my family, friends, and relatives; to them I give my deepest expression of love and appreciation.

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LIST OF ACRONYMS

DRC	Democratic Republic of Congo
FAO	Food and Agricultural Organization
GIS	Geographic Information System
NEMA	National Environment Management Authority
SAR	Sodium Adsorption Ratio
TSS	Total Soluble Salts
UNEP	United Nations Environment Programme
UNMA	Uganda National Meteorological Authority

ABSTRACT

The study was conducted on River Semliki in Ntoroko District on the Ugandan side of the River. This River has severally burst its banks and is characterized by bank erosion which results into loss of land and the associated side effects. This study was therefore designed to (i) demonstrate changes in the plan and stream sinuosity over the periods between 1986-1990, 1990-2000, 2000-2010, 2010-2016, (ii) quantify the amount of land lost in the cut banks of the River (iii) examine the vegetation and soil characteristics along the River banks. This study used 30m resolution ortho-rectified Landsat TM/ETM images of the study area to map out the meander plan of the River, identify the hotspots of land loss and quantify the amount of land lost in those areas using ArcGIS software version 10.1. Vegetation and soil sampling was carried out in the hotspots of land loss and a control site all within four villages in Ntoroko District.

The results obtained showed that River Semliki has continuously changed its meander plan (course) over the time series examined. The sinuosity of the River was majorly meandering. There was a glaring evidence of land loss on the Ugandan side of the River. The loss of land ranged from 10.06 ha in Nyakasenyi village, Butungama Sub-County to 22.53 ha in Bweramure village, Bweramure Sub-County. The Riverine vegetation was mainly woodlands and grasslands with the major plant species being *Phragmites mauritianum, Typha domingensis, Sporobolus pyramidalis, Echinochloa pyramidalis, Cynodon dactylon* while the soil type was mainly the red brown loam soil.

In order to safeguard the River, its bank and the adjacent land, communities surrounding the River should be sensitized on the protection of River banks; enforcement of the recommended 100m free zone along the River bank; reduction of land use pressure along the River banks especially that resulting from livestock by creation of valley dams for watering livestock; restoration of the degraded sections of the River using native plant species; riprapping meander bend walls with stones to stabilize and reduce the scouring effect of water on channel walls.

CHAPTER ONE: INTRODUCTION

1.1 Background

Rivers are systems in dynamic equilibrium that continuously balance water flow and sediment transport (Das et al., 2014). Das et al., (2014) further assert that diverse bank erosion processes occur throughout the River network starting from upper reach to lower reach. In the upper reach, near its source, the River has a huge amount of material to cut through to reach base level, so it primarily erodes downwards, creating a steep-sided v-shaped valley. In the middle reach, the River continues to cut downwards but it is also starting to cut sideways or laterally. Once the River has reached the lower course (lower reach), it has almost reached its base level, so most of its erosive energy is concentrated on cutting laterally and creating features such as meanders. This inherent activity of Rivers has made flood and River bank erosion become almost regular phenomena throughout the world (Das et al., 2014).

The process of River meandering, bank erosion and deposition are accelerated by anthropogenic activities such as deforestation, gravel mining, over grazing, construction of dams and bridges, artificial cut offs, bank revetment and land use changes (Kondolf, 1997, Das et al., 2014). These activities interrupt the equilibrium of the River dynamics and accelerate the rate of bank erosion since they are much stronger in terms of changing River dynamics than natural events such as floods, droughts and landslides (Yamani *et al.*, 2011). For example, deforestation and inappropriate land use upstream leads to excessive sediment load into the Rivers (Davinroy *et al.*, 2003; Arohunsoro *et al.*, 2014) while the presence of riparian vegetation stabilizes River banks by increasing shear strength of the soil, reducing water velocity and armoring the bank (Ott, 2000). However, this stabilization is dependent on plant vigor, density and rooting depth (Ott, 2000).

The loss of land due to River bank erosion is permanent and has far reaching impacts on the economy (Das *et al.*, 2014). For instance, it results into displacement of the local communities thereby subjecting them to economic insecurity (unemployment, erosion of capital and indebtedness) and social insecurity (deprivation of civic rights, health insecurity) (Das *et al.*, 2014). In addition, it also affects the River's ecology (Das *et al.*, 2014). According to the Atlas of Our Changing Environment by NEMA (2009) although River Semliki is in its old stage, it has

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