FACULTY OF ENGINEERING

DEPARTMENT OF WATER RESOURCES ENGINEERING

FINAL YEAR PROJECT REPORT

A SOCIO HYDROLOGICAL APPROACH TOWARD RIVERINE FLOOD ALLEVIATION FOR RIVER MANAFWA

A case study of the Butaleja district

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A final year project report submitted to the Department of water resources engineering in partial fulfillment for the award of the Bachelor of Science in Water Resources Engineering of Busitema University

ABSTRACT

River Manafwa sub-catchment tends to experience dramatic flooding events, the worst being the most recent one which occurred May 17th,2019. Its frequent flooding is attributed to the current climatic changes characterized by intense precipitation, unsustainable human activities in the upstream of the catchment sedimentation of the river course resulting into reduction in River capacity. This has led to several socio-economic impacts to the nearby communities, such as loss of lives and destructions of physical infrastructure. The study was conducted to build a hydrodynamic model in combination with Geographical Information System (GIS) for flood inundation mapping in River Manafwa Catchment basin. HEC-HMS and HEC-RAS models were employed for the 50-, 100-, 200-, and 500-year return periods to achieve the overall specified objective.

A sensitivity analysis of the hydrological model parameters used in this study showed that the model out puts are more sensitive to curve number compared to other parameters. The HEC HMS model was simulated, calibrated and validated using both Manual and automatic methods and the Nash- Sutcliffe Efficiency (NSE) obtained showing that the model was satisfactory.

The simulated peak discharges of 285.5m^3 /s,362.2m^3 /s,416.8 m^3 /s,531.3m^3 /s magnitudes of the respectivee 50,100,200, 500-year return periods produced maximum channel flood depths of 7.11, 7.17, 7.230 and 7.237m respectively as observed from the gauging station. Flood hazard maps were generated for the return periods in the Ras Mapper environment. From the results of the hydraulic model, it was observed that, the flood plain inundated areas increase with the magnitude of flow within the modelled network indicating a high flood risk level for activities and settlements adjacent to the river banks.

The existence of the structural flood mitigation measures, their possible improvements and Community Willingness and ability to pay for adaptation strategies, etc were assessed through field surveys in the majorly affected sub counties of Mazimasa and Himuntu.

This study findings are relevant for planning the development of sustainable flood risk adaptation pathways given the established destructions within the sub-catchment due to flooding.

DECLARATION

We, Okodoi Moses, and Odongo Jasper, hereby certify that this report is our original work and has not been previously submitted to any university or other higher education institution for consideration of any academic award. We take full responsibility for the information in this report

Name: ODONGO JASPER	**Name**: OKODOI MOSES
SIGN:	SIGN:
DATE:	DATE:

APPROVAL

This is to certify that this final year project report was written under my guidance on the topic **"A Socio Hydrological Approach Toward Riverine Flood Alleviation for River Manafwa"**

Name: **Mr. KAJUBI ENOCK**

Signature: Date....13/09/2023..

DEDICATION

Firstly, we would wish to thank the Almighty God for enabling us to successfully finish our final year research, then our loving parents OKWARE ANTHONY SEBASTIAN, OPIO TOM(late), NAMAROME BIIRAH and AKULLU FLORENCE, OWORI GEOFREY,OPIO ISAAC, who have been a great inspiration in our lives , they have really supported us so much not only in this research but also throughout the entire academic life.

May the almighty God grant you all your heart desires and to the late father(opio tom), may your soul continue to rest in eternal peace.

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We also express our gratitude to our classmates for their support and suggestions.
Lastly, we thank all those who were involved directly or indirectly during our research study
MAY THE GOOD LORD REWARD YOU ALL.

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LIST OF ACRONYNMS

DWRM……. Directorate Of Water Resources Management

MWE…… Ministry of Water and Environment

UNMA……. Uganda National Meteorological Authority

UBOS…….. Uganda Bureau Of Statistics

HEC-HMS…… Hydrological Engineering Centre-Hydrologic Modelling System

HEC-RAS…… ...Hydrological Engineering Centre-River Analysis System

GIS…… Geographical Information System

UNDP……. ……United Nations Development Program

WTP ……. Willingness-To-Pay

CVM……... ...Contingent Valuation Method

TIN……Triangular Irregular Network

DEM……. Digital Elevation Model

m.a.s.l……meters above sea level

CN…… ..curve number

Gps ……global positioning system

LULC…. Land use /landcover

HH……House Hold

SDF……Spatial data format

UNFA……Uganda national forest authority

1.0 CHAPTER ONE

1.1 Introduction

This chapter addresses the back ground of the project, problem statement, objectives, justification and scope of the study.

1.2 Background

Floods are water induced disasters that lead to temporary inundation of normally dry land and cause serious damages in the affected location such as loss of lives and properties and destruction of infrastructures.(Onuigbo et al., 2017)

Globally, floods are increasingly among the most devastating natural disasters affecting human life than any other natural disasters (IFRC, 2020). Floods have caused nearly US 386-billion-dollar economic loss in the last three decades of the twentieth century. The United Nations (UN) states that approximately 2.3 billion people were affected and 157,000 died by floods 1995-2015 worldwide (Hoque et al., 2019).

In Uganda, the geo-hazards report for the year 2013 shows that 21 districts in the eastern region, 13 districts in the North and 10 districts in the central region are prone to floods and thus for the period between 2005 to 2013, it shows that around 40 people have been killed by floods and over 300000 displaced by floods. The highest number of recorded deaths and people affected being in 2007 when Mount Elgon and Karamoja regions were hit by extreme high rainfall events(Martin et al., 2012).

Butaleja District is a low-lying and flat area, located at the far bottom of Mount Elgon. The location of the district makes it a drainage area for the Elgon region rendering it susceptible to floods.(*Butaleja Report*, n.d.).

Over the past 60 years, at least 8 major flash floods have affected catchments of mountain Elgon (Doocy et al., 2013).on 7th may 2021, the Elgon mountains were hit by flash floods due to heavy rains causing river manafwa to burst its banks, destroying homes, burying villages in mud and displacing thousands of people.(WBG, 2021) However, one of the most devastating of these events occurred on 9th October 2010, in the manafwa catchment.. This was considered the worst flood event which had last been observed in 1997(DREF, 2010).

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