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FACULTY OF ENGINEERING

DEPARTMENT OF WATER RESOURCES ENGINEERING

FINAL YEAR PROJECT REPORT

MODELLING THE OCCURRENCE OF FLOODS ON MUYEMBE RIVER AND TESTING AN APPROPRIATE STRUCTURE TO MITIGATE.

CASE STUDY: BULAMBULI DISTRICT

BY

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A final year project proposal submitted to the Department of water resources engineering in partial fulfillment of the requirements leading to the Award of Bachelor's degree in water Resources engineering of Busitema University

Abstract

This project research is about Modeling the occurrence of floods on river Muyembe and testing an appropriate structure to mitigate for River Muyembe in Bulambuli district.

This work is presented in chapter form. Chapter one is composed of the introduction to the research problem. Chapter two contains a review of literature which has been produced by other scholars and researchers about flood modelling. The third chapter presents the various methods which were employed to achieve the objectives amongst them were; to develop the hydraulic model of river Muyembe which was done by HEC-RAS software. The fourth chapter presents the findings from the research.

The communities living along Muyembe River found in Bulambuli district experience frequent floods threatening their lives and property. Climate change and anthropogenic perturbations to the natural environment increase flooding frequency.

Recently, the development of models for flood calculation and hazard assessments has made full use of the advancement in computer-aided technology. This study focuses on applying a hydraulic model (HEC-RAS) in a GIS context for the flooded areas of Muyembe subcounty in Bulambuli district, and produces inundation maps, flood depth, and water surface elevation of 15, 25, 50,100, 500, 1000-year Return Period.

The research included reading a variety of literary works and gathering supplemental information in the form of journals and reports. This aided in developing the project's technique as a whole. The stage of modeling came next. The initial data collection process used a number of sources, including DEM, discharge flow, rainfall, and soil data were all collected. These datasets were prepared and processed in the GIS environment using the ArcGIS application. The HEC-RAS program was used to compute for unsteady flow simulation and create geometry data. The area's flood extent was viewed using the RAS Mapper.

Two major hydraulic structures were considered in this research i.e. a weir and a dam to determine the most appropriate for flood mitigation of floods along river Muyembe. Various return periods were run in absence of any structure and then also ran with the presence of a weir and a dam while observing a significant drop in the depth downstream.

Declaration

I **NAMUTOSI CHRISTINE** do hereby declare that to the best of my knowledge and belief this report is my original work and has never been submitted to any other University, college, or Institution of higher learning for the purpose of meeting any academic requirement. It is therefore authentic and where any references or secondary information have been used, they have been given due acknowledgement.

Signed 

NAMUTOSI CHRISTINE

Date. 12th/01/2023

Approval

I **ERIAU EMMANUEL** declare that, I have supervised this study and that in my opinion, it confirms to accepted standards of scholarly report in partial fulfillment for the award of Bachelor of science in water resources engineering in Busitema University

Signed 

ERIAU EMMANUEL

(Project Supervisor)

Date. 12th/01/2023

Dedication

This report is dedicated to my parents Mr. Namukowa Peter and Mrs. Nambuya Margaret for their tireless efforts and sacrifices throughout my education.

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I do greatly acknowledge a number of people whom without their support I would not have made it this far. Great appreciation goes to my project supervisor, Mr. Eriau Emmanuel for his due diligence, parental guidance and competence in ensuring that my work meets the required standards.

My beloved father Mr. Namukowa Peter, My beloved mother Mrs. Nambuya Margaret, sisters; Nabakeni Cate and Kisakye Caro, my brothers; Namukowa Ben and Baraka Daniel. I thank you for your material and moral support. Lastly, I extend my sincere appreciation to all friends including; Massete Solomon, Eng Kadapawo Gerald, Chelangati Jabeth, Wafula Kogan Julius and Amoit kevin for always being there for me and giving me the required support in making it this far. Finally, to all whom I have not been able to mention, please thank you so much and may God reward you for that good work.

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Acronyms

GUI- Graphical User Interface

HTML-Hypertext Markup Language

NARO-National Agricultural Research Organization

UNMA-Uganda National Meteorological Authority

GIS-Geographical Information System

DEM- digital elevation Model

DTM-Digital Terrain Model

DWRM-Directorate of Water Resources Management

HEC-RAS- Hydrological Engineering Centre's River Analysis System

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1 CHAPTER ONE: INTRODUCTION

1.1 Preamble

This chapter entails relevant information about the project, problem statement, purpose, justification, objectives, and the scope of the study.

1.2 Background

Flood is the most frequent type of natural disaster and occurs when an overflow of water submerges land. Floods are often caused by many factors including heavy rainfall, overflowing rivers due to debris in the river that reduces the storage capacity of the river, among others (Pérez Ciria et al., 2019).

Globally, floods are increasingly among the devasting natural hazards affecting human life. Floods have caused nearly US 386 billion dollars economic loss in the last three decades of the twentieth century in the United Nations states that approximately 2.3 billion people were affected and 157,000 died by floods 1995-2015 worldwide (Nolan, 2006).

Over the years, Uganda has been experiencing climate change and environmental related problems with the mountainous sub regions of Rwenzori and Elgon being the most hit. Flood risk is distributed and variable across Uganda but it is expected that on average up to each year, 50,000 people could be affected by flooding, 40 education and health facilities and 40km of transport infrastructure could be exposed to floods. Future changes in Uganda's population and economy, coupled with changes in climate-related hazard, are expected to increase the impacts of droughts and floods.

Bulambuli district being located on the slopes of mount Elgon experiences significant flooding during rainy seasons. Subsistence agriculture and animal husbandry are the two main economic activities in the district. Crops grown include: Matooke, Cassava, Rice, Groundnuts, Sorghum, Millet (UBOS, 2017).

The primary natural factors causing flood on river Muyembe are high intensity and long duration of rainfall and meandering courses of the river. These floods cause massive damage to life and property. People living in flood-prone areas get homeless as a result of devastating floods. Agricultural lands are washed away and often disrupt transport and communication.

In 20th May 2018, Floods ravaged five sub-counties in Bulambuli district, leaving over 680 households and pit latrines submerged by water hence forcing families to resort to open

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