

# **FACULTY OF ENGINEERING AND TECHNOLOGY**

## **DEPARTMENT OF WATER RESOURCES ENGINEERING**

### **FINAL YEAR PROJECT REPORT**

#### **PROGRAM: B.Sc. WATER RESOURCES ENGINEERING**

#### **TITLE: DEVELOPING FLOOD RESILIENCE FOR KYABAMBA WATERSHED IN KISIIZI THROUGH FLOOD WATER HARVESTING TECHNOLOGY**

**BY**

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*A final year project report submitted to the Department of Water Resources Engineering as a partial fulfillment of the requirements for the award of a Bachelor of Science degree in Water Resources Engineering.*

## **Abstract**

Flooding is the second natural disaster that affects numerous communities worldwide, causing substantial damage to infrastructure, livelihoods, and human lives. Globally, floods have recently become rampant which many writers have attributed to climate change as a result of increased human activity that produces greenhouse gases. The same factor of climate change poses a threat of increased water scarcity in diverse regions especially the Sub-Saharan African region. For this reason, flood water harvesting technologies have been developed to mitigate adverse impacts of flooding and as well enhance flood resilience. This study thus presents a process taken in Kyabamba Catchment looking at the possibility of employing flood water harvesting technology to bring about flood resilience in the community.

In this study, data was collected from different sources and screening done on the rainfall and discharge datasets using the linear scaling percentage bias and linear regression respectively. Kyabamba Catchment being ungauged, physical similarity regionalization was done with Mitano Catchment as the donor. Rainfall frequency analysis with the aid of HEC-SSP 2.3, Hydrologic modeling with HEC-HMS 4.11 and continuous calibration for Mitano Catchment was done and parameters transferred to Kyabamba Catchment. Through 2-D hydrodynamic modeling using HEC-RAS 6.4.1 and Vulnerability analysis using spatial multicriterial Evaluation, flood risk assessment of Kyabamba Catchment was established. Potential flood water harvesting technologies that is to say Spate irrigation and recession farming, underground tank, valley dam, and surface reservoir were identified and a socio hydrologic approach with the help of a questionnaire was adopted to determine the most suitable technology. SPSS was used to evaluate the questionnaire and analyze the data. Information generated suggested a surface reservoir for the outcompeting technology however the local community of Kisiizi admitted to no water scarcity being rich with springs that continually flow from the hills. However, the neighboring communities of Kisiizi experience water scarcity being at a distance from the sources of water.

A retarding Basin with a broad crested weir was designed on one reach and this caused a flood reduction of 11.1%.

# Table of Contents

Abstract.....	i
Declaration.....	v
Approval.....	vi
Acknowledgement.....	vii
List of Acronyms.....	viii
List of Equations.....	ix
List of tables.....	ix
1 INTRODUCTION.....	1
1.1 BACKGROUND.....	1
1.2 PROBLEM STATEMENT.....	3
1.3 OBJECTIVES.....	3
1.3.1 Main objective.....	3
1.3.2 Specific objectives.....	3
1.4 JUSTIFICATION.....	4
1.5 SCOPE OF STUDY.....	4
2 Literature review;.....	5
2.1 Floods.....	5
2.2 Types of floods.....	5
2.3 Fluvial, or river flood.....	5
2.4 Pluvial, or surface water flood.....	5
2.5 Coastal flood.....	5
2.6 Causes of floods.....	5
2.7 Hydrologic modelling.....	6
2.8 Hydrologic models.....	6
2.9 Classification of hydrologic models;.....	6
2.9.1 Distributed Models:.....	7
2.9.2 Lumped Models.....	7
2.9.3 Physical Models:.....	7
2.9.4 Hybrid Models:.....	7
2.9.5 Soil and Water Assessment Tool (SWAT).....	7
2.9.6 Hydrologic Modelling System (HEC-HMS).....	8
2.9.7 Factors that influence rainfall runoff relationships.....	8

2.9.8	Model Validation.....	8
2.9.9	Nash-Sutcliff Efficiency (NSE) .....	9
2.9.10	Coefficient of determination $R^2$ .....	10
2.9.11	Root mean square Error.....	10
2.9.12	Percentage bias.....	10
2.9.13	RMSE-observations standard deviation ratio (RSR).....	10
2.10	Flood risk vulnerability and Flood risk mapping .....	11
2.11	Spatial Multi-Criteria Analysis.....	12
2.12	Flood water harvesting .....	13
2.12.1	Types of storage.....	13
2.12.2	Identification of suitable floodwater harvesting system .....	13
2.13	Area of Study.....	15
2.13.1	Location.....	15
3	METHODOLOGY .....	16
3.1	Methodology for Objective one.....	16
3.1.1	Data collection .....	16
3.1.2	Data Screening and preparation .....	16
3.1.3	Rainfall frequency analysis.....	18
3.1.4	Regionalization.....	19
3.1.5	Calibration and validation of the model .....	22
3.2	Methodology for Specific objective 2 .....	23
3.2.1	1- D Hydrodynamic modelling.....	23
3.2.2	Vulnerability Analysis .....	23
3.3	Objective three .....	26
3.3.1	Socio hydrologic approach.....	26
3.3.2	Designing of the flood harvesting system.....	26
4	Results and discussion .....	31
4.1	Specific objective one .....	31
4.1.1	Bias correction for rainfall.....	31
4.1.2	Linear regression for Mitano stream flow .....	32
4.1.3	Regionalization.....	34
4.1.4	Mitano catchment.....	34
4.2	Objective Two; .....	40

4.3	Objective three .....	46
4.3.1	Socio-hydrologic approach.....	46
4.3.2	Reliability and correlation analysis .....	52
4.4	Designing of the flood harvesting system.....	53
4.4.1	Designing of an intake open channel.....	53
4.4.2	Designing of a 1D culvert. ....	54
4.4.3	Designing two 1D levees .....	55
4.4.4	Designing the retarding basin storage .....	56
4.4.5	The Weir.....	57
4.4.6	Designing the Reservoir storage .....	58
5	Conclusion, Challenges and Recommendation.....	60
5.1	Conclusion.....	60
5.2	Challenges .....	61
5.3	Recommendations .....	61
6	References .....	62
7	Appendices.....	65

## Declaration

I, MIGADDE LABSON TAMUZADDE, AND ARYAMPWERA HURUSURA, solemnly declare that this final year project report is a result of our efforts, and has never been submitted to Busitema University or any other institution of higher learning for any academic award.

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## Approval

This is to confirm that the project report was completed under my guidance and is prepared for submission to the Department of Water resources Engineering, Faculty of Engineering and Technology, Busitema University.

Supervisor;

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A handwritten signature in blue ink, appearing to read 'Kajubi Enoch', is placed over a light blue rectangular background.

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## **List of Acronyms**

SDG	Sustainable Development Goal
NDP	National Development Plan
GIS	Geographical Information system
USEPA	United States Environment Protection Agency
AGWA	Alliance for Global Water Adaptation
HEC-HMS	Hydrologic Engineering Centre – Hydrologic Modelling System
USGS	United States Geological Centre
DEM	Digital Elevation Model
HRU	Hydraulic Response Unit
LULC	Land Use Land Cover
NDVI	Normalized Deviation of Vegetation Index
TWI	Topographic Wetness Index

## List of Equations

Equation 2-1 Nash Sutcliffe Efficiency .....	9
Equation 2-2 : Coefficient of determination .....	10
Equation 2-3 Root mean square error .....	10
Equation 2-4: Percentage Bias .....	10
Equation 2-5: RMSE-observations standard deviation ratio.....	11
Equation 3-1.....	16
Equation 3-2.....	17
Equation 3-3 : Physical similarity .....	20
Equation 3-4.....	21
Equation 3-5.....	21
Equation 3-6.....	21
Equation 3-7.....	22
Equation 3-8(Continuity Equation).....	23
Equation 3-9(Momentum Equation) .....	23
Equation 3-10.....	27
Equation 3-11.....	30

## List of tables

Table 1 : Nash Sutcliffe Efficiency Index

Table 2: Data use and sources

Table 3: Distribution ranking based on Goodness of fit test

Table 4 : Distribution ranking based on Parameter estimation

Table 5 Table generated for the hydrographs

Table 6: Results for rainfall frequency analysis: where  $R_{f\_dpt}$  is rainfall depth in mm while  $I$  is rainfall intensity in mm/h

Table 7: Performance of the HMS model for Mitano Catchment

Table 8: Flows for the different return periods.

Table 9: Flood inundation for the different return periods.

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# 1 INTRODUCTION

This chapter consists of; background, problem statement, justification, scope of study and objectives of the project.

## 1.1 BACKGROUND

According to Barnard et al., (2019), the US Department of Defense (DoD) pointed out a one ensuring threat multiplier climate change, that stages a risk of geopolitical instability across the whole world. Bevacqua et al., (2019) expresses the Climate change terror as a multidimensional threat but mostly hydrologically. In his study, Tabari, (2020) concludes with evidence of increased extreme weather events especially extreme flooding and precipitation as attributed to climate change and more precisely, global warming. He continues to state that the changes in extreme weather events will even intensify over numerous parts of the globe yet with a decreasing water availability (increasing water scarcity)(WBG, 2021). Human activity that produces greenhouse gases, such as burning fossil fuels, is attributed to the cause of increasing global warming which in turn triggers climate change resulting into increased frequency and intensity of rains and droughts and floods(Christopher, 2022).

Floods are one of the most disastrous natural catastrophes that have caused a high mortality rate, infrastructure destruction, and considerable financial losses. Floods happen when there is an overabundance of water after a heavy rain and the natural drainage systems are unable to transport it (Merz et al., (2021), Delorence-BU, (2017). Landcover, geography, the stream network's poor ability to transport runoff, and climatic conditions brought on by heavy rain events are other factors that contribute to floods (Sholihah et al., 2020).

The most intense floods recorded in northeastern South America from 2015-2016 caused thousands of deaths and losses of millions of dollars in terms of property(Papaioannou et al., 2018). Cerrado region of Brazil, on 19<sup>th</sup> February 2023 and Turkish provinces of Anlurfa and Adyaman on March 15, 2023 are one of the fresh victims of in terms of deaths and loss of property.( *Turkish Floods*, 2023). The average annual economic loss due to flooding is about 18 billion US dollars for the last 30 years according to the International Disaster Database. Trambly et al., (2020) states that over 27000 fatalities during the period 1950–2019 have been recorded in Africa. Uganda has faced a large economic set back as many of her major rivers have been flooding severely.

While floods are devastating the world, on the other hand is the increasing hydrological drought which has put forth a water scarcity crisis. Water scarcity has been placed among the top three

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