BUSITEMA UNIVERSITY
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P.O. Box 236, Tororo, Uganda
Gen: +256 - 45 444 8838
Fax: +256 - 45 4436517
Email: info@adm.busitema.ac.ug
www.busitema.ac.ug

FACULTY OF ENGINEERING

DEPARTMENT OF WATER RESOURCES

PROGRAMME

FINAL YEAR PROJECT REPORT

PROJECT TITLE

PERFORMANCE IMPROVEMENT OF AN URBAN STORM WATER MANAGEMENT SYSTEM: A CASE OF KASESE MUNICIPALITY.

BY:

NAME: NUWAHEREZA ANGELLA

REG.NO: BU/UG/2019/0042

EMAIL: aknuwahereza256@gmail.com

SUPERVISED BY:

MR. KAJUBI ENOCK

A final year project 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

The hydraulic incompetence of storm water drainage systems in developing towns like Kasese municipality is the problem at hand. This is mainly due to increased paved surfaces, under designing of some sections, inadequate maintenance and poor solid waste management. Therefore, rainfall frequency analysis has been carried out as well as the hydraulic competence of the existing drainage structures in Kasese municipality. Rainfall frequency analysis was carried out using the Gumbel distribution after best fit tests and the design storms that correspond to the 10, 25, and 50-year return periods were computed. Using a high-resolution Digital Elevation Model (DEM) of 12.5m, a watershed delineation was carried out and the sub-basin parameters calculated accordingly. A total of eighty-two (82) watersheds fourteen and sub watersheds were obtained in project area. Using the watershed parameters obtained, the design storm and the hydraulic properties of the existing drainage network collected from the field as inputs to PCSWMM, runoff simulations were caried out. This simulation was carried to assess the hydraulic competence for the existing drainage structures for 10-year and 25-year return period for all drains and 25-year and 50-year return periods for the culverts. Some sections of the network were found to be hydraulically competent, along the Kamulinkwizi, others incompetent; most part of the Kasese primary drain while some sections were under designed. Integration of sustainable development options in the drainage design, use of silt traps, better solid waste management and regular maintenance of the drainage system have been recommended

KEY WORDS: Stormwater drainage systemHydraulic competence, PCSWMM

DECLARATION

I NUWAHEREZA ANGELLA solemnly declare that this final year project is a result of my effort, and has never been submitted to Busitema University or any other institution of higher learning for any academic award.

Signature: …….

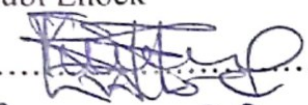
Date: ……/……/…...…

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;

Mr. Kajubi Enock



Date: 13./.12./.2023

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I express my gratitude to my supervisor, Mr. Kajubi Enock for his guidance, supervision, and support throughout this work. May God bless you

DEDICATION

I dedicate this report to my parents and siblings for their unending support rendered unto me right from the proposal stage to the final implementation of this great project.

I also dedicate it to God for all the ideas and help He gave to me through the Holy spirit, May His name be glorified.

And finally, to the Busitema University society of Engineers that is the Water and Mining

Engineering Department and to all my friends who helped in all ways.

Thank you

LIST OF ACRONYMS

SDG – Sustainable Development Goals

GIS – Graphic Interface System

DEM – Digital Elevation Model

PCSWMM- Personal Computer Stormwater Management Model

CN- Curve Number

GPS -Global Positioning System

IDF -Intensity Duration Frequency

UNMA- Uganda National Meteorological Authority

FAO- Food and Agriculture Organization

UBOS- Uganda Bureau of Statistics

HSG-Hydrologic Soil Groups

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1.0 INTRODUCTION

This chapter offers the background of the project, the problem statement, objectives of study, the justification of study and finally the scope of study including geographical scope, technical scope and time scope.

1.1 BACKGROUND

Climate change is the a shift in the global or regional weather patterns (Abbass *et al.*, 2022). Globally, Climate change (CC) is an inter-governmental complex challenge with implications for various ecological, environmental, political, social and economic disciplines (Setti *et al.*, 2021);(Feliciano *et al.*, 2022). Human-induced climate change is already affecting regions across the globe with observed extreme weather events including heatwaves, heavy precipitation, droughts, and tropical cyclones(IPCC, 2021). Global warming of 1.5°C and 2°C are projected to be exceeded during the twenty-first century unless drastic reductions in carbon dioxide(CO2) and other greenhouse gas (GHG) emissions occur in the coming decades (Burke, Davis and Diffenbaugh, 2018). In East Africa, climate change is projected to increase median temperature by 1.4–5.5°C and median precipitation by −2% to 20% by the end of the twenty-first century (Adhikari, Nejadhashemi and Woznicki, 2015).

Average temperatures in Uganda have increased by 1.3°C since the 1960s and Rainfall is predicted to increase significantly and consistently for the western shores of Lake Victoria and the central western region; the Mount Elgon region; and the region extending from Mount Rwenzori to the southern parts of Lake Kyoga (WBG, 2021). This is evident from the increase in frequency of extreme climatological events, climate change has become unequivocal, impacting water resources systems through increased peak discharge from the erratic rainfall, and this in turn affects the urban drainage designs to cope up with the discharges (Schweikert *et al.*, 2014).

The relationship between climate change and infrastructure development is particularly critical in developing urban centers. These regions face unique challenges in both adapting to the impacts of climate change and reducing their contribution to global warming through infrastructure development(Balk *et al.*, 2011). This is worse in developing countries like Uganda with a high population growth rate, inadequate funding and politicizing technical problems,(Andrić, Koc and Al-Ghamdi, 2019) which are more vulnerable to the extremes of

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APPENDIX 1(a) Hydrographs showing flooding at the nodes of different drains.