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FACULTY OF ENGINEERING

DEPARTMENT OF WATER RESOURCES AND MINING ENGINEERING

WATER RESOURCES ENGINEERING PROGRAMME

APPLICATION OF GIS TO DELINEATE FLOOD PRONE AREAS

CASE STUDY KAWEMPE, UGANDA

BY

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ABSTRACT

Many cities in the world, particularly those in Africa are faced with growing problems associated with flooding. Increased rain frequency and intensity alongside other factors such as settlement in flood plains, poor waste management, and increased surface run off exacerbate the situation. In Uganda, Kawempe is exposed to frequent flooding during the rainy seasons because it is in a low lying area with a high water table and it is characterized by poor drainage thus making a significant number of people, households, infrastructure, livelihoods and social services exposed to severe impacts of destruction, damage, dampness and health challenges whenever it floods.

The aim of this study is to delineate areas in an urban setting with a high potential for flood during, or after, extreme precipitation events. This is to be done using GIS-based analysis to create an impervious surface analysis and a runoff model using HEC HMS software.

Some of the objectives are to perform rainfall runoff for the flow contributing area and determining the extent of flood impact. However, the research will mainly be restricted to Kawempe where drainage is a major problem.

At the end of this project, a map of different areas in Kawempe with high potential of flooding will be obtained. This will help the concerned authorities to formulate the development strategies according to the available risk to the area i.e. making the process of resource allocation simple resulting in a smooth and effective implementation of the adopted flood risk strategy. The simulation model properly imitating the practical behavior of the flood hydrograph will be generated. The model will be tested and verified.

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DECLARATION

I **Nakkomo Joanitah** declare to the best of my knowledge that the work presented in this project is my own and has never been presented to any University or higher institute of learning for any academic award.

Signature.....

Date.....30th/5/18.....

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APPROVAL

This project report on delineation of flood prone areas in Kawempe using GIS has been written under the supervision of;

Main supervisor

Mr. OKIRYA MARTIN

Signature .....

Date.....

Co-supervisor

Mrs. NJUKI NAKABUYE HOPE

Signature .....

Date.....

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DEDICATION

With great pleasure I dedicate this project report to my lovely mother MRS. MUSISI DIANA MUKWABA for all the support she has given me to make me a better person in future.

Thank you so much dear mother

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LIST OF ACROYNMS

DWRM	Directorate of Water Resources Management
MWE	Ministry of Water and Environment
KCCA	Kampala Capital City Authority
DEM	Digital Elevation Model
NRSC	National Resources Conservation Services
HEC-GeoHMS	Geospatial Hydrologic Modelling Extension
HEC-HMS	Hydrologic Engineering Centre's Hydrologic Modeling System

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CHAPTER 1: INTRODUCTION

This chapter outlines the relevant information about the project: background, problem statement, justification, objectives of the study, purpose of the study and the scope of the study

1.1 BACKGROUND

In 2015, 376 natural disasters occurred worldwide, compared to 380 for the 2005-2014 average. Africa suffered from 62 natural disasters in 2015, compared to 68 for the 2005-2014 annual average, but climatological and meteorological disasters appeared more frequent in 2015, compared to their 2005-2014 annual average(Guha-sapir, Hoyois, & Below, 2015)

Floods are the most common natural disasters, most devastating, widespread and natural hazard that affect societies around the world causing considerable personal injury and property damage. (Dilley M, 2005) estimated that more than one-third of the world's land area is flood prone affecting some 82 percent of the world's population. About 196 million people in more than 90 countries are exposed to catastrophic flooding,(Papaioannou, Vasiliades, & Loukas, 2015) and that some 170,000 deaths were associated with floods worldwide between 1980 and 2000 (Programme-UNDP, 2004). These figures show that flooding is a major concern in many regions of the world The largest known floods of the Quaternary Period had peak discharges of nearly 20 million m3/s and resulted from breaches of glacial-age ice dams that blocked large midcontinent drainage systems during ice ages (Costa, 2004). Globally, the economic cost of extreme weather events and flood catastrophes is severe, and if it rises owing to climate change, it will hit poorest nations the hardest consequently, the poorest section of people will bear the brunt of it

The number of major flood disasters in the world has risen relentlessly over recent time. There were six in the 1950s; seven in the 1960s; eight in 1970s; eighteen in the 1980s; and twenty-six in the 1990s (UNDP, 2004). Problems related to flooding and vulnerability of the population have greatly increased in recent decades due to several factors including changes in land-use in the hinterlands, urbanization of flood-prone sites, squatter settlements and sub-standard constructions, and increased household density.(Guarín, Westen, & Montoya, 2004) The rapid urbanization in developing countries and world over has led to the massive increase in human settlement which is growing faster than the rate at which the drainage network is being enhanced causing a mismatch between service and urbanization. This leads to health, social and economic problems which affect the urban settlers especially the poor.(Paul, 2011)

Uganda is considered one of the world's most vulnerable and least climate resilient countries. Changing climate patterns, such as increased droughts, floods and variable precipitation cycles have a serious impact on systems essential for human livelihood, including water and other natural resources, food security and health. Floods are becoming a more pronounced disaster in Uganda. (Goretti, 2013). Floods struck in many parts of the suburbs of Kampala, Uganda on Tuesday 3rd September 2013 and the worst affected areas were Nateete, Bwaise, Kalerwe, Kireka, Katwe and

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