FACULTY OF ENGINEERING

DEPARTMENT OF MINING AND WATER RESOURCES ENGINEERING

FINAL YEAR PROJECT REPORT

FLOOD MODELLING OF RIVER NYAMWAMBA USING HEC HMS/RAS.

A Case study of Kasese District

BY

AWORI EVELYN LYDAH

BU/UP/2016/536

evelyndah20@gmail.com

0777399313/0705413135

SUPERVISORS: MR ENOCK KAJUBI

MR OKETCHO YORONIMO

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

ABSTRACT

Floods are the most frequent type of natural disaster occurring all over the world. This research project shows that since 1966, River Nyamwamba floods three to four times a year with the most severe event in May 2013 and May 2020. Those floods caused death, destruction of property and displacement of over 10,000 people. flood forecasting, Flood hazard mapping and flood risk zoning are quite effective non-structural procedures in managing floods that lower the risks floods may cause. The study was conducted to build a hydrological and hydraulic model in combination with Geographical Information System (GIS) for flood inundation mapping in Nyamwamba Catchment basin. HEC-HMS and HEC-RAS models were employed to achieve the overall specified objective. Time series analysis of hydrological data has been done using Log Pearson type III frequency analysis method to obtain the rainfall intensities for different return periods such as 10yr, 25yr, 50yr, and 100yr, Results of the rainfall frequency analysis which were the point depths of 83.44mm, 103.44mm, 121.89mm, 139.31mm for the respective return periods were used as an input for the hypothetical storm method in the hydrological model to generate the corresponding catchment discharges which was then used in the hydraulic model to develop the flood inundation maps, Water surface elevations and flow velocities in HEC-RAS. 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 (percentage of imperviousness and lag time). The HEC HMS model was calibrated and validated using both Manual and automatic methods and the Nash- Sutcliffe Efficiency (NSE) obtained was 0.756 showing that the model was satisfactory. 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 simulated peak discharges of 107.4m^3/s, 158.7m^3/s, 209.1m^3/s, and 258.4m^3/s, of the respective 10, 25, 50-, and 100-year return periods produced maximum channel flood depths of 8.428m, 8.684m, 8.927m, and 9.165m respectively as observed from the gauging station near Kasese-Fort portal bridge. Flood hazard maps were generated for the return periods in the Ras Mapper environment. Most parts of Kilembe sub county and Kasese municipality were found to be affected by high flood depths which has led to the destruction of property and displacement of people.

DECLARATION

I **AWORI EVELYN LYDAH BU/UP/2016/536** solemnly declare that this final year project is a result of my efforts and tremendous work done during the research period and it has never been submitted to Busitema University or any other institution of higher learning for any academic award.

NAME: AWORI EVELYN LYDAH

REG NO: BU/UP/2016/536

SIGNATURE ……

DATE ……..……/……. /…….

ACKNOWLEDGEMENT

I would like to thank the Almighty God for the far that He has brought me, the gift of life, knowledge, hope, protection and his provision to me during and throughout the writing and implementation of this research project.

I extend my deep sense of gratitude and indebtedness to my academic supervisors, Mr. Kajubi Enock, Mr. Oketcho Yoronimo as well as Mr. Maseruka Benedicto for their kind attitude, keen interest, immense help, inspiration and encouragement which helped me throughout this study period. My heart pulsates with the thrill for tendering gratitude to the entire staff of the department of Mining and Water Resources Engineering Busitema University for providing all kind of possible assistances throughout this final year research study.

Special cordial thanks go to my dad Mr. Ochieng Hannington, my mams Miss Aremi Dorothy and Miss Naiga Monica, my brothers and sister for their unconditional love, care and guidance.

It would be great injustice if I omit the role played by my dear friends in directing me, their tremendous tireless support and guidance given to me during the course of my study.

Lastly, I thank all those who were involved directly or indirectly during my research study

MAY THE GOOD LORD REWARD YOU ALL.

APPROVAL

This is to certify that this final year project report was written under the guidance of my supervisor on the topic **"Flood Modelling of river Nyamwamba using HEC HMS/RAS."**

MAIN SUPERVISOR: MR KAJUBI ENOCK

SIGNATURE……. DATE ...……/……/……

CO-SUPERVISOR: MR OKETCHO YORONIMO

SIGNATURE……. DATE ...……/……/……

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AMS	Annual Maximum Series
ARF	Area Reduction Factor
CN	Curve Number
DEM	Digital Elevation Model
DWRM	Directorate of Water Resources Management
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FAO	Food and Agricultural Organization
GIS	Geographical Interface System
HEC- HMS	Hydrological Engineering Centre- Hydrologic Modelling System
HEC-HMS	Hydrologic Engineering Centre, Hydrological Modelling System
HEC-RAS	Hydrological Engineering Centre- River Analysis System
IDF	Intensity Duration Frequency
m.a.s.l	Meters above sea level
MWE	Ministry of Water and Environment
PDS	Partial Duration Series
SCS	Soil Conservation Service, USA
Tc	Time of Concentration
UH	Unit Hydrograph
W. S. E	Water Surface Elevation