FACULTY OF ENGINEERING

DEPARTMENT OF MINING AND WATER RESOURCES ENGINEERING

FINAL YEAR PROJECT REPORT

APPLICATION OF HEC-HMS AND HEC-RAS IN THE MITIGATION OF FLOODS CAUSED BY INCREASED RAINFALL INTENSITY DUE TO CLIMATE CHANGE IN LOWER SECTIONS OF BANDA AREA.

BY

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A final year project report submitted to the department of water and mining engineering in partial fulfillment for the award of the bachelor degree of science in water resources engineering of Busitema university

DECLARERATION

I **MUGABI BRIAN** solemnly declare that this project report is a result of my own efforts and tremendous work done during the research period apart from the citations and it has never been submitted to Busitema University or any other institution of higher learning for any academic award.

NAME: ……

REG NO: …….

SIGNATURE: …….

DATE: …….

APPROVAL

This project report has been submitted with the approval of my supervisor

Mr. SEMPIJJA BAAGALA BRIAN

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DATE

……..

ACKNOWLEDGEMENTS

I would love to thank my supervisor who has guided me throughout the period I have under taken my final year project.

I thank my friends for the time and guidance they have offered towards this project.

Above all, I would love to thank the Almighty God for giving me wisdom, knowledge, health and patience to learn.

DEDICATION

I dedicate this final year project report to all my family members; my father Mr. KYALIGONZA PETER, my mother Mrs. KARUNGI MARY, brothers and sisters.

My friends, Ssegoma Timothy, Egau John Pascal, Ochii Joseph, Abaliwano Francis, Egau Jacob, Sonko Ernst, Kadoma Margret, Nabulya Rehema and Awori Evelyn for their contribution towards my academic struggle.

ABSTRACT

Flooding is a major problem that has continued to stress both developing and developed countries due to changes in climate change and land use patterns in most affected areas. Banda area located approximately eleven kilometers East from Kampala Central Business District is one of the areas that has been severely affected by floods due to increased rainfall intensity, changes in land use, continued encroachment on wetlands and its topographic characteristics that have exposed economic activities in lower section settlements at great risks of floods. The main objective for the study was to design and simulated a trapezoidal channel to mitigate impacts caused by floods in lower sections of Banda area. In order to provide a solution to the problem, ArcGIS version 10.2.1 with HEC-geoHMS and HEC-geoRAS extensions was used to delineate the watershed, hydrologic modelling was then carried out using HEC-HMS software version 4.3 to model the basin hydrologic processes, HEC-RAS was also used to carry out hydraulic modelling of Kawoya river and HEC- geoRAS was finally used in generating flood inundation maps for the area for return periods of 5-,10-, 25-, 50-.and 100-years. The trapezoidal channel was then designed using the hydraulic tool box software to obtain reasonable channel parameters using the 25-year design storm peak discharge. The hydrologic model performance was tested using the Nash-Sutcliffe Efficient and the Root Mean Square Error Standard deviation objective function. The model was tested by calibration through carrying out optimization trials for the most sensitive parameters got from the sensitivity analysis with the 5-year design storm. The obtained optimized parameters were then used to run the model for the rest of the return periods to get the corresponding peak discharges. The hydraulic model was then developed by using obtained peak discharges from HEC-HMS as input and other parameters such as Manning's n values and setting boundary conditions for the model. Using results obtained from hydraulic modelling, flood inundation maps were then generated. The obtained Nash-Sutcliffe Efficiency and Root Mean Square Error Standard deviation values were 0.919 and 0.3 respectively, indicating satisfactory model performance. The simulated peak discharges for return periods of 5-,10-,25-,50- and 100-years were 32m^3/s, 38.3m^3/s, 45.9m^3/s, 51.7m^3/s, 57.6m^3/s respectively. And the maximum floods depths for the design storms were 10.6m, 10.9m, 11.4m, 11.7m, and 12.3m respectively.

Key words: ArcGIS, HEC-HMS, HEC-RAS, HEC-geoHMS, HEC-geoRAS, Floods and Inundation mapping

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