BUSITEMA UNIVERSITY
Pursuing Excellence

FACULTY OF ENGINEERING.

DEPARTMENT OF MINING AND WATER RESOURCES ENGINEERING

DESIGN AND SIMULATION OF A WATER DIVERSION PIPELINE FROM ELGON ZONE TO KARAMOJA

CASE STUDY; NAMALU SUB COUNTY NAKAPIRIPIRIT DISTRICT

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A final year project report 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

Throughout the human history floods have been an integral part of the civilization. Still men have not quite coped well to live with floods. Flooding is the most frequent global natural disaster; rural areas are becoming more vulnerable to flooding due to effect of climate change. Flash flood is one of the most prominent phenomena caused by heavy rains. In developing countries drainage channels is the most common strategy employed for flood control. The failure of preventive measures has led to most authors and researchers to advocate a shift in thinking from preventive measures to flood risk and structural management measures. On the other hand, areas on the lee ward side of the mountain like Karamoja experience water scarcity and basing on the flooding conditions, this excess water causing flooding can be diverted. Recently, the advancement in computer-aided technology has been extensively used in formulating models used for flood calculation and hazard analysis. This study focuses on using a hydraulic model HEC-HMS and HEC-RAS in a GIS environment for the affected areas of Elgon zone i.e. Bulambuli and Kween, generates the inundation area and the return period for the specified flood events. The research involved studying various literatures and collecting data in form of journals and reports. This helped to formulate the methodology for the whole project.

It was followed by the modelling stage. This started with data collection from various sources i.e. from offices. Data collected included: - DEM, discharge flow data, land use/land cover data, rainfall data and soil data. These datasets were conditioned and processed in the GIS environment using the ArcGIS software. Land use and soil data was used to generate Curve number grid and later GeoHMS was used to set up a project which involved basin characteristics and processing and exported into HMS to generate hydrograph (peak discharges) to be used in the HECRAS. The GeoRAS file was exported to the HEC-RAS program to compute for a steady flow simulation. The RAS mapper export from HEC-RAS program was then imported in to ArcMap to delineate a flood plain map which was overlaid to a Google image to determine flood prone areas. The villages included among others like Chepsikunya, Ngenge, and along Mbale Moroto road. This was followed by design of the system components like pipes, reservoir tank, trapezoidal flood channel and sluice gates and there after simulating the flow in Epanet.

DECLARATION

I, Adikin Helen, registration number BU/UP/2014/555 declare that the entirety of work contained in this project proposal is my original work except where explicit citations have been made.

Therefore, it has never been submitted to any institution of higher learning for any academic award.

Sign: .....

Date: 1ST JUNE 2018

APPROVAL

I affirm that Adikin Helen, registration number: BU/UP/2014/555 compiled this project proposal under my supervision, and it can be submitted to the University management for an academic award.

Mr. Oketcho Yoronimo

Main Supervisor

Sign.....

Date.....

Mr. Maseruka Bendicto

Co-supervisor

Sign.....

Date.....

DEDICATION

This report is dedicated to my family and supervisor Mr. Maseruka S. Bendicto for the great guidance, constructive remarks and support rendered to me during the research and compilation of this report.

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ACCRONYMS AND ABBREVIATIONS

MWE Ministry of water and environment

UNDP United Nations Development Programme

WHO World Health Organization

MOH Ministry of Health

NEMA National Environment and Management Authority

DAF Dissolved Air Floatation

CDC Center for Disease Control

EPA Environmental Protection Agency

UN United Nations

UV Ultra violet

DDPS District Development Plans

PV Photo voltaic

CSP Concentrated Solar Power

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CHAPTER ONE

1.1 BACKGROUND

Water scarcity in Karamoja is still a very big challenge that needs great attention. The Karamoja region consists of seven districts in north eastern Uganda (Kaabong, Kotido, Abim, Moroto, Napak, Amudat, and Nakapiripirit). The region boarders Kenya to the east, South Sudan to the north, and the districts of Kitgum, Pader, Lira/Agago, Amuria and Katakwi to the west, and Kumi, Sironko and Kapchorwa to the south. Overall population in Karamoja is estimated at about 1.2 million people, with about 70 percent residing in rural areas(Burns, Bekele, & Akabwai, 2013)

With more than 27,000 square kilometres, this arid expanse of savannah and bush forms the northeast edge of Uganda where it borders Kenya and the Sudan. To its east stands the Rift Valley escarpment towering over the Kenyan plains and scrubland. To the north lie the pristine basin of Kidepo National Park and also a mountainous vastness that leads into the Sudan. Similarly, to the south, there are the rugged peaks of Mount Elgon National Park. In the west, abundant swamps enter into the Acholilands. Karamoja is more than 1,000 metres above sea level, and four main mountains overlook the region's savannah, highlands and river valleys: Mount Morungole in the north, Mount Moroto in the east, Mount Kadam in the south and Mount Napak in the west(Profile, 2016).

In many areas, rains do not often exceed 800 millimetres per year, sometimes hovering around a mere 500 millimetres. The precipitation that does fall usually comes sporadically between June and October with the desert winds and the hot dry season taking over the land from November to March. Karamoja is an agro-pastoralist area; the economy is based on cattle herding: this is considered by the Karimojong to be the most sustainable type of livelihood in which they live, therefore water is needed adequately. Due to the climate change in this region, there has been drought that has led to the drying of rivers; water scarcity; transhumance, low productivity, decrease in the water table levels, high levels of evapo-transpiration in the valley dams and crops(Mubiru, 2010).

The water shortage has been attributed to the persistent dry spell that has affected the water table. About 4,000 people have migrated from their

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