FACULTY OF ENGINEERING

DEPARTMENT OF MINING AND WATER RESOURCES ENGINEERING

FINAL YEAR PROJECT REPORT

APPLICATION OF GIS IN IDENTIFYING SUITABLE SITES FOR LOCATION OF WATER, SANITATION AND HYGIENE FACILITIES, A CASE STUDY OF BUSIA MUNICIPALITY IN BUSIA DISTRICT

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ABSTRACT

Water and sanitation are fundamental for living, wellness, self-regard, empowerment and prosperity. They are human rights, basic to every child and adult. But in Uganda, poor sanitation and hygiene, as well as unequal access to safe drinking water, make thousands of children very sick and at risk of death. Furthermore, in Uganda, close to a tenth of the population practises open defecation and two thirds of households do not wash hands with soap. Poor people mostly carry the burden of poor sanitation. Like most cities and towns in developing countries, Busia town is experiencing rapid urbanization leading to an increase in the urban population and rapid growth in the size and number of informal settlements. More than 60% of the town's population resides in these settlements, where they experience inadequate and poor-quality urban services including sanitation**.** In terms of sanitation, majority of the dwellers in these settlements use traditional pit latrine technology, which is considered cheap given their level of income. The provision of appropriate facilities for defecation is also an essential response for people's dignity, safety, health and well-being. By understanding geography and people's relationship to location, we can make informed decisions about the way we live on our planet. This research applied geographic information system and Spatial Multi-Criteria Evaluation tools for decision making in the siting of the suitable areas for Water, Sanitation and Hygiene facilities based on the following **criteria;** Slope, lithology, soil, Depth to groundwater table, Population density, Accessibility, and Proximity to Handwashing facilities. In order to achieve this, each of the criterion will have its relevant thematic layer generated and assigned weights that will be calculated using Analytical Hierarchy Process and followed a weighted overlay analysis to ascertain the suitability of the area for the intended use. The study area will be zoned into Four suitability classes; Very, Moderate, suitable and least suitable. Conclusively, the combination of Geographic Information System and Spatial Multi Criteria Evaluation has shown to be a fruitful tool in land suitability evaluation.

Keywords

Water Sanitation and Hygiene, Geographic information systems, Multi Criteria Evaluation, Suitability, Criteria, Weight, Sensitivity Analysis, Analytical Hierarchy Process.

DECLARATION

I…… a student of Busitema University hereby declare that this report is my original work and has not been previously submitted either in part or in whole to any institution of higher learning for any kind of award.

SIGNATURE …….

DATE …….

APPROVAL

This report has been produced under my supervision and has been submitted with my approval for examination and award of B.Sc. Water Resources Engineering at Busitema University.

SUPERVISOR MR OKETCHO YORONIMO

SIGNATURE …….

DATE …….

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DEDICATION

I dedicate this report to my family, friends, and girlfriend

ABBREVIATIONS

WASH	Water, sanitation and hygiene
GIS	Geographical information system
SDGs	Sustainable development goals
NGOs	Non-government organisations
Lpcd	Litres per capita per day
Cfu	Colony-forming unit
WHO	World health organisation
MDGs	Millennium development goals
SMCE	Spatial multi criteria evaluation
UNICEF	United nation children's fund
MOH	Ministry of health
MOES	Ministry of education and sports
MWE	Ministry of water and environment
SWAp	Sector wide approach
UNHCR	United nations high commissioner for refugees

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CHAPTER ONE: INTRODUCTION

1 Background

Water and sanitation are essential for life, for health, for dignity and for empowerment and prosperity (UNICEF, 2015). They are human rights, fundamental to every child and adult. But in Uganda, poor sanitation and hygiene, as well as unequal access to safe drinking water, make thousands of children very sick and at risk of death (UNICEF, 2015). Access to Basic sanitation and appropriate hygiene facilities are essential conditions to create a safe environment which reduces the risk of people's immune system being undermined as a result of chronic exposure to WASH related diseases.

According to Dr Bena Nanyama (DHO), Busia municipality which is famous for poor sanitation, and lack of safe drinking water has been hit by several WASH related epidemics over the years including Cholera, typhoid. In 2014, over seven people died and more than 100 people treated for Cholera, while in 2015, over 241 were treated. Some residents in the town especially Nangwe settlement, practice open defecation according to Mr Kennedy Wanyama the program officer at Africa Water solutions, and this is attributable to the lack of access to safe and appropriately sited Sanitation facilities in the area.

Poor sanitation costs Uganda 389 billion Ugandan Shillings each year, equivalent to US$177 million, according to a desk study carried out by The Water and Sanitation Program (WSP) (Bank, 2012) . It is poor people who carry the burden of poor sanitation. The poorest 20 per cent of the population is 13.5 times more likely to defecate in the open than the wealthiest 20 per cent (UNICEF, 2015). This thus renders WASH programmes less efficient since they don't reach the intended target. Making decisions based on geography is basic to human thinking. However, Uganda is committed to more equitable provision of water, sanitation and hygiene (WASH) services (Com, 2012).By understanding geography and people's relationship to location, we can make informed decisions about the way we live on our planet (Practices, 2011). A geographic information system (GIS) is a technological tool for comprehending geography and making intelligent decisions (Practices, 2011). Land suitability is the fitness of a given type of land for a defined use. The land may be considered in its present condition or after improvements (Study et al., 2013). GIS applications have frequently been used in providing new information by both combining information from different sources and spatial analysis of the existing data (Store & Kangas, 2001). In a Geographic Information System such as ILWIS, the link between spatial and attribute data is

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