BUSITEMA UNIVERSITY
Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF MINING AND WATER RESOURCES ENGINEERING

WATER RESOURCES ENGINEERING PROGRAMME

FINAL YEAR PROJECT REPORT

APPLICATION OF REMOTE SENSING AND GIS IN GROUND WATER PROSPECTING

Case Study: Busitema Sub County, Busia District

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ABSTRACT

Since last decade, the value per barrel of potable ground water has outpaced the value of a barrel of oil in many areas of the world. Hence proper assessment of groundwater potential and management practices are the needs of the day. Establishing relationship between Remotely Sensed data and hydrologic phenomenon can maximize the efficiency of water resources development projects.

Present study focuses on ground water potential assessment in Busitema Sub county of Busia District and its field verification. For the same, all the basic factors determining the existence and movement of ground were identified and their thematic layers were formulated, digitized and integrated in the GIS environment using Weighted Index Overlay Analysis (WIOA) method. The weights of different parameters/ themes were computed using Analytic Hierarchy process (AHP) Multi-Criteria Evaluation (MCE) technique. Through this integrated GIS analysis, ground water prospects map of the study area was prepared qualitatively.

Field verification at existing wells was used to verify identified potential zones and depth of water measured at observation wells. Ground water flow nets (Ground water table contours) were generated using the water levels of the existing wells.

Generated map from weighted overlay using AHP performed very well in predicting the groundwater potential zones since the existing wells were found in the most promising zones and hence this methodology proves to be a promising tool for future.

APPROVAL

This is to certify that this project report was written under the guidance of my supervisors on the topic ***"Application of Remote Sensing and GIs in Ground Water Prospecting – A Case Study of Busitema Sub County, Busia District"*** and is now ready for submission to the senate of Busitema University.

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Mr. OKETCHO YORONIMO

25-05-2015

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DATE

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Mr. MUGISHA MOSES

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DATE

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I can't forget my great friends especially class mates; Twesigye Keneth,

DEDICATION

I dedicate this final year project proposal report to all my family members; Mum; Ms. Kasande Mable, Brothers; Musinguzi Julius, Taremwa Boaz, Nuwarinda Amon and Abaho Lindon, Sisters; Kyomuhangi Mellon and Namara Miria, Inlows; Ms. Asingwire Mellon and Ainomugisha Oliver for mentoring me.

To my late sister Ms. Kiconco Midius for the courage she had always given me before she passed away on 5th June, 2013, as well as her moral and financial support towards my academic struggle. I will live to remember you even in your absence, May your soul rest in peace and may our heavenly father grant you eternal life.

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LIST OF ACRONYMS

AHP – Analytical hierarchy process

DEM – Digital Elevation Model

DGSM – Directorate of Geological Survey and Mines

DWD – Directorate of Water Development

DWRM – Directorate of Water Resources Management

ETM – Enhanced Thematic Mapper

GIS – Geographical Information System

MWE – Ministry Of Water and Environment

NARO – National Agricultural Research Organization

NASA – National Aeronautics and Space Administration

NFA – National Forestry Authority

NRSA – National Remote Sensing Agency

RS – Remote Sensing

UNMA – Uganda National Meteorological Authority

USGS – United States Geological Survey

UTM – Universal Transverse Mercator

WGS – World Geodetic System

WIOA – Weighted Index Overlay Analysis

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CHAPTER ONE

1. INTRODUCTION

1.1. Preamble

This chapter includes the following; back ground to the study, problem statement, purpose of the study, justification, objectives of the study, scope as well as a brief description of Busitema sub-county's topography, climate and the land use.

1.2. Back ground information

Water is the most essential natural resource on the planet earth. It is categorized into saline water which is ocean water and fresh water which is a finite resource essential for life, development and the environment. According to ***UN annual report, 2010,*** saline water (oceans) cover about 97% of earth's waters and fresh water is only a small proportion of the total water (3%) and mainly stored in the ice and glacier form. Fresh water resources are majorly ground water and surface water resources. According to ***UN annual report, 2010,*** Ice caps and glaciers contribute 68.7% of fresh water, ground water 30.1, surface water 0.3% and others 0.9%.

According to ***Banks, D., Robins, N., (2002),*** Groundwater is a form of water held under the ground in the saturated zone that fills all the pore space of soils and geologic formations. It is formed by rainwater or snowmelt water that seeps down through the soil and into the underlying rocks (aquifers). It is the major resource of water supply as provides more than half of humanity's freshwater for everyday uses such as drinking, cooking, and hygiene, as well as thirty percent of irrigated agriculture and industrial development **(Zuppi, G.M,2007).**

According to ***MWE; 2011***, the average sustainable available groundwater resources in the Uganda are 5,670 million cubic meters per year while the domestic water demand up to the year 2030 is estimated to be 326 million cubic meters per year which there is an indication that, there is enough sustainable ground water in the country. Groundwater will continue to be the main source of water supply in Uganda with domestic water supply expected to use less than 15% of the available groundwater resources up to the year 2030. ***(Tindimugaya et al, 2011).***

Due to increased pollution of surface water sources as a result of population growth, the uncertainties related to climate change and consequent economic and agricultural development, it

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