FACULTY OF ENGINEERING

DEPARTMENT OF MINING AND WATER RESOURCES ENGINEERING

FINAL YEAR PROJECT REPORT

GIS/RS BASED INVESTIGATION AND DESIGN OF A MANAGED AQUIFER RECHARGE SYSTEM IN LYANTONDE DISTRICT

BY

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BU/UP/2017/1832

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A final year project report submitted to the Department of water resources and mining engineering in partial fulfillment for the award of the Bachelor of Science in Water Resources Engineering degree of Busitema University

ABSTRACT

Survival and ecological development on earth depends on water as an essential natural resource. All countries especially arid and semi- arid regions, face ground and surface water problems which include; ground and surface water challenges, inadequate rainfall, water pollution, declining agricultural production, and climatic change issues. Water-scarcity areas can be classified into; high need areas, water-scarce areas, and high potential areas. Physical water scarcity is experienced in water-scarce areas, water logging and salinity problems are found in high potential areas, and water scarcity with respect to economic, financial, and skilled human resources is found in high need areas. Water-scarce regions lack adequate clean water to meet human drinking water and sanitation needs. This impacts human health, productivity, the environment, and ecosystems. Groundwater development in Uganda has been going on since the 1930s through construction of deep boreholes, shallow wells and protected springs. However, some regions in Uganda which includes the study area (Lyantonde district) have a low groundwater recharge as low as 75mm per year of rainfall received. This research applied geographical information system, remote sensing, Spatial Multi Criteria Evaluation and AUTOCAD tools for informed decision making in the siting of the suitable recharge areas and design of Managed Aquifer Recharge Facilities. Relevant thematic layers were prepared, weights assigned to them and calculations based on the Analytical Hierarchy Process and followed by the weight overlay analysis to ascertain the suitability of the area for intended purpose. Conclusively, the NRCS-SCS method was implemented to calculate the Runoff which would be the source of water for Recharge and acted as a basis for designing different components of the MAR facility.

Keywords

Groundwater, surface water, Recharge, Managed aquifer Recharge, Geographical information systems, Remote sensing, curve number, Analytical Hierarchy Process, National Resources Conservation service, USDA, Runoff

DECLARATION

I **MUHINDO ANDREW** of REG NO **BU/UP/2017/1832,** declare to the best of my knowledge that this final project report is as a result of my research and efforts.

Student's signature:……..

Date:…….

ACKNOWLEDGEMENT

I thank the Almighty God for the far that He has brought me, the gift of life, protection and his provision to me during and throughout the writing of this final project report.

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Lastly, I thank all those who were involved directly or indirectly during my final project report writing especially Mr.okabaka Ivan Elijah and Mr.Kisitu Francis(MWE).

APPROVAL

This project proposal has been submitted to the department of Mining and Water resources Engineering of Busitema University with approval of the following supervisors.

MR. MUYINGO EMMANUEL

Signature:……..

Date:……..

MR. OKETCHO YORONIMO

Signature:…….

Date:……..

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ACRONYMS

MAR Managed Aquifer Recharge

GIS geographical information system

RS Remote sensing

SDG Sustainable Development Goals

GEC Groundwater estimation committee

CGWB Central Groundwater Board

ASCE American Standard of Civil Engineers

MCDA Multi Criteria Decision Analysis

AHP Analytical Hierarchy Process

GPS Global positioning system

DEM Digital Elevation Model

UNMA Uganda National Meteorological Authority

MWE Ministry of Water and Environment

LG Local Government

DWRM Directorate of Water Resources Management

DGSM Directorate of Geological survey and Mines

UNBS Uganda National Bureau of Standards

MAR Managed Aquifer Recharge

USGS United States Geological Survey

WIOA Weighted Index Overlay Analysis

USDA United States Department of Agriculture

NRCS Natural Resource Conservation Service

AMC Antecedent Moisture Condition

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