



**BUSITEMA  
UNIVERSITY**  
*Pursuing Excellence*

**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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*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*

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## **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**

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**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**

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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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