



FACULTY OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF WATER RESOURCES ENGINEERING

**A CLIMATE-RESILIENT DECISION SUPPORT APPROACH
FOR OPTIMAL SANITATION FACILITY SITING**

A case study of Kayanja Fish Landing Site, Kasese District

By

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A final year research project report submitted to the department of Water resources engineering in partial fulfillment of the requirement for the award of a bachelor's degree of science in water resources engineering of Busitema University

ABSTRACT

Sanitation infrastructure in climate-vulnerable regions presents significant public health challenges, particularly when exacerbated by poor facility siting and limited community engagement. This study develops a comprehensive climate-resilient decision-support approach for optimal sanitation facility placement at Uganda's Kayanja Fish Landing Site in Kasese District, an area characterized by unimproved sanitation. The research methodology integrates three complementary approaches: advanced geospatial analysis, multi-criteria decision-making (MCDM), and participatory community involvement. Geospatial assessment revealed extensive flood vulnerability across Kayanja, with most existing latrines at high risk, while simultaneously identifying viable zones for safer facility relocation. The MCDM model synthesized critical environmental factors (soil permeability, groundwater depth), social considerations (accessibility, affordability), and climate risks (flooding frequency and severity) to identify optimal siting locations with favourable conditions for sustainable sanitation infrastructure. Robust community surveys and statistical analysis revealed strong preferences for individual household latrines and demonstrated that participatory approaches significantly enhanced facility acceptance, consistent usage, and long-term sustainability. Results validate that the framework effectively mitigates risks from extreme weather events, reduces contamination of water sources, and strengthens overall infrastructure resilience. Key recommendations include: prohibiting construction in high-risk flood zones, implementing elevated or flood-resistant designs such as raised biodigesters in waterlogged areas, and conducting targeted community workshops to promote climate-adaptive maintenance practices. This study makes a significant contribution to both Uganda's Vision 2040 and Sustainable Development Goal 6 (Clean Water and Sanitation) by providing a replicable decision-support tool for resilient sanitation planning in developing regions. By successfully integrating technical resilience with social equity considerations, the framework offers a practical model for sustainable sanitation infrastructure that addresses the interconnected challenges of climate adaptation and public health in vulnerable communities

DECLARATION

I Masereka Cosmas Bagheni declare that this report is my own research and has neither been used nor submitted in any institution or university for any academic award.

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APPROVAL

This final year project proposal report has been submitted to the Department of Water Resources Engineering under my supervision.

SUPERVISOR

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SIGNATURE.....

DATE.....24/10/2024.....

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I take this opportunity to thank the Almighty GOD who has gifted me with life and has enabled me to reach this academic height as He has been the provider of all the necessary requirements. Great thanks to my beloved family and friends for their endless encouragement and moral support and for their prayers and piece of advice given to me in the course of this project.

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DEDICATION

I dedicate this report to my father Mr. MASEREKA GIDEON, my mother Mrs. MUHINDO JANEGRACE, and my brother Mr. MUMBERE BAGHENI BOSCO for the financial support they have rendered me to make sure my education is a success. Lastly, I also dedicate it to my other siblings, and relatives for putting me in their prayers. May the almighty Father continue blessing you all abundantly.

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LIST OF ACRONYMS

AHP	Analytical Hierarchy Process
CLTS	Community-Led Total Sanitation
DEM	Digital Elevation Model
DMsan	Digital Media Sanitation
FAO	Food and Agriculture Organization
FMEA	Failure Mode and Effect Analysis
GIS	Geospatial Information System
GPS	Global Positioning System
IPCC	Intergovernmental Panel on Climate Change
KDLG	Kasese District Local Government
MCDA	Multicriteria Decision Analysis
NDVI	Normalized Difference Vegetation Index
OSS	Onsite Sanitation System
SCS	Soil Conversion Service
UBOS	Uganda Bureau of Statistics
USGS	United States Geological Survey
WGS	World Geodetic System

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