



BUSITEMA UNIVERSITY.

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF WATER RESOURCES ENGINEERING

FINAL YEAR PROJECT REPORT

**PERFORMANCE EVALUATION OF SOLID WASTE MANAGEMENT. A CASE
STUDY OF MBALE CITY.**

By

OBUA.BENJAMIN: BU/UP/2020/0360.

SUPERVISOR;

ENG.BADAZA MOHAMMAD

**A project report submitted to the Department of Water Resources Engineering in
Partial fulfilment of the requirement for the award of the Bachelor of science in
water resources engineering of Busitema University**

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ABSTRACT

Rapid urbanization and population growth in Mbale City have exacerbated solid waste management (SWM) challenges, resulting in environmental pollution, public health risks, and inefficiencies in waste collection and disposal. This study evaluates the current state of SWM in Mbale City, identifies existing gaps, and proposes a Geographic Information System (GIS)-based framework to optimize waste collection and disposal. The study analysed waste generation patterns across residential, commercial, and industrial areas using field surveys, interviews, GIS mapping, and remote sensing. Results indicate that over 75% of the total waste generated is organic, followed by plastics (12%), paper (5%), and other materials (8%). Despite a daily waste generation of approximately 250 tons, only 55% is collected, leaving 45% uncollected, which contributes to illegal dumping and environmental hazards. Furthermore, only 20% of the collected waste is properly disposed of in designated landfills, while 80% is mismanaged due to inadequate infrastructure and collection inefficiencies. A GIS-based framework was developed to enhance waste management efficiency by identifying waste generation hotspots, optimizing collection routes, and improving resource allocation. Route optimization analysis demonstrated that implementing GIS-based collection strategies reduced travel distances by 15%, leading to lower operational costs and a 30% improvement in waste collection efficiency. The study also found that waste collection frequency varies significantly, with high-density areas experiencing delays of up to 7 days, worsening sanitation conditions. The findings emphasize the urgent need for improved waste management strategies, including increased waste collection coverage, expansion of recycling initiatives, and stricter enforcement of waste disposal regulations. By integrating GIS technology, this study provides a data-driven approach to enhancing waste collection efficiency and promoting sustainable urban waste management in Mbale City.

DECLARATION

I, OBUA.BENJAMIN, hereby declare that all the work material portrayed in this project proposal is my original work except where explicit citation has been made and it has not been presented to any Institution of higher learning for any academic award.

Name: OBUA.BENJAMIN

Registration number: BU/UP/2020/0360



Date: 7th /November/2025

APPROVAL

This is to certify that the project proposal under the title “**Performance evaluation of Solid Waste Management. A Case Study of Mable City**” has been done under the best of my efforts and is now ready for examination

ENG. BADAZA MOHAMMAD

Department of Water Engineering

Signature: 
07/NOV/2025

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LIST OF ACRONYMS

ESRI -ENVIRONMENTAL SYSTEMS RESEARCH INSTITUTE

GEE- GOOGLE EARTH ENGINE

GIS- GEOGRAPHIC INFORMATION SYSTEMS

GPS- GLOBAL POSITIONING SYSTEM

GTD- GROUND TRUTH DATA NIR NEAR INFRARED

RS- REMOTE SENSING

SDSS- SPATIAL DECISION SUPPORT SYSTEM

SWM- SOLID WASTE MANAGEMENT

UBOS- UGANDA BEUREAU OF STATISTICS

USGS- UNITED STATES GEOGRAPHICAL SURVEY

WCR- WASTE COLLECTION AND ROUTING

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Appendixes

Location	Latitude	Longitude	Total Waste (kg/day)	Organic Waste (%)	Plastic Waste (%)	Metal & Glass (%)	Hazardous Waste (%)	Volume (m ³ /day)	Per Capita Waste (kg/person/day)
Central Market	1.070748	34.178636	700	82% (574 kg)	14% (98 kg)	3% (21 kg)	1% (7 kg)	4.2 m ³	0.95 kg/person/day
Namakwekwe	1.088638	34.180247	450	78% (351 kg)	15% (67.5 kg)	4% (18 kg)	3% (13.5 kg)	3.1 m ³	0.85 kg/person/day
Industrial Area B	1.077775	34.16309	900	72% (648 kg)	18% (162 kg)	5% (45 kg)	5% (45 kg)	5.7 m ³	1.2 kg/person/day
Busamaga	1.076173	34.194823	600	75% (450 kg)	17% (102 kg)	5% (30 kg)	3% (18 kg)	3.9 m ³	0.90 kg/person/day
Nkoma	1.102703	34.197042	500	80% (400 kg)	14% (70 kg)	3% (15 kg)	3% (15 kg)	3.3 m ³	0.87 kg/person/day