



FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF WATER RESOURCES ENGINEERING

FINAL YEAR PROJECT REPORT

**INVESTIGATING THE FEASIBILITY OF USING LATERITE SOIL, RECYCLED
POLYETHYLENE TEREPHTHALATE (PET), AND CEMENT FOR THE
PRODUCTION OF INTERLOCKING BRICK**

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BU/UP/2021/2365

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Final year report is submitted to the Department of Mining and Water Resources Engineering
in partial fulfillment of the requirement for the award of a Bachelor of Science degree in
water resources engineering at Busitema University.

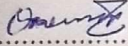
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ABSTRACT

The global plastic waste crisis, generating 430 million tons annually, coupled with Uganda's daily production of 600 tons, of which 42% remains uncollected in Kampala, exacerbates environmental pollution and flooding. Concurrently, the abundant laterite soil in Uganda, characterized by its iron- and aluminum-rich composition, remains underutilized in sustainable construction. This study investigates the feasibility of producing interlocking bricks using laterite soil, recycled polyethylene terephthalate (PET), and cement to address plastic waste management and affordable housing demands. Laterite soil was characterized for physical and mechanical properties, including moisture content (7.2%), particle size distribution (SW-SC classification), maximum dry density (2.235 g/cm³), and plasticity index, ensuring suitability for construction. Mix proportions were optimized using Response Surface Methodology (RSM) in Minitab, identifying an optimal mix of 2400 g laterite, 200 g PET, and 400 g cement, which achieved a compressive strength of 3.7 MPa and flexural strength of 1.3157 MPa after 28 days of curing. These strengths meet Uganda's National Building Review Board standards for non-load-bearing elements (2-5 N/mm²) but fall short for load-bearing applications (5-10 N/mm²). Compared to conventional bricks, the optimized bricks align with stabilized soil bricks but are less robust than clay or concrete bricks. This eco-friendly approach reduces plastic pollution, leverages local resources, and supports affordable housing, contributing to Sustainable Development Goals 11 (Sustainable Cities) and 12 (Responsible Consumption). Recommendations include water absorption tests and exploration of additional stabilizers to enhance strength for broader applications.

DECLARATION

I, KOMAKECH FELIX ONEN II, a student of Busitema University with a registration number of BU/UP/2021/2365, hereby declare that this report is an actual work of my hands and has never been presented by any person or institution for an academic award.

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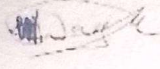
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APPROVAL

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

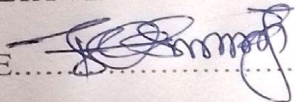
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ACKNOWLEDGEMENT

I am truly grateful to the Almighty God for His guidance, protection, and wisdom throughout this journey. I also want to thank my parents for their unwavering support, both spiritually and financially. It has meant the world to me. A special thanks to my supervisors, Mr. Wangi Mario and Mr. Muwulya Vincent, for their guidance and encouragement. I also appreciate the management of TakaTaka Plastics, my fellow students and the Water Resources Department for their support and the valuable knowledge they have shared, which has been instrumental in completing this report.

DEDICATION

This final year project report is joyfully dedicated to my beloved parents, Komakech John Bosco and Lakop Mary, for their love, care, guidance, counsel, prayers, encouragement and for having supported me financially and materially in my studies. May Almighty God reward them abundantly and protect them in their daily activities.

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ABBREVIATIONS

PE Polyethylene

PET Polyethylene Terephthalate

MSW Municipal Solid Waste

GHGs Greenhouse Gases

CO₂ Carbon Dioxide

NO Nitrogen Oxide

LDPE Low-Density Polyethylene

PP Polypropylene

HDPE High-Density Polyethylene

HDXLPE High-density cross-linked polyethylene

MDPE Medium-density polyethylene

XLPE Cross-linked polyethylene

LDPE Low-density polyethylene

USCS Unified soil classification system

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