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DEPARTMENT OF WATER RESOURCES

PROGRAMME

FINAL YEAR PROJECT REPORT

PROJECT TITLE

**INVESTIGATING THE EFFECTIVENESS OF QUARRY DUST AND CEMENT
KILN DUST IN STABILIZING ACTIVE SOIL FOR USE IN SUBGRADE
LAYERS**

CASE STUDY: BUDUDA DISTRICT

BY

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This report is submitted to the department of water resources engineering as a partial fulfillment for a ward of a bachelor's degree in water resources engineering at Busitema university.

DECLARATION

I NAMULINDWA LINDA EVELYN, hereby declare that this project proposal is a product of my efforts and that it has not been presented to any institution of learning for an academic award.

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APPROVAL

This final research report has been submitted to the Faculty of Engineering for examination with approval of my supervisor. **Main Supervisor**

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DEDICATION

I dedicate this report to my beloved parents Mr and Mrs Matovu, who offered unconditional and support and have always been there for me. Thank you so much.

ACKNOWLEDGEMENT

I wish to register my profound gratitude to God Almighty for the guidance and grace throughout my life.

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ABSTRACT

The construction industry has presented different types of ground improvement techniques to stabilize active soils that exhibit expansive nature i.e Black Cotton Soils that possess poor subgrade characteristics. Different chemical stabilizers have been used for stabilization of Black Cotton soils. Though Cement is the effective soil stabilizing material, stabilizing soils with Cement alone would not be economically viable as Cement is relatively expensive. Hence this research work aimed at investigating the effectiveness of blending Granite Quarry Dust and Cement Kiln Dust on the physical and strength characteristics of black cotton soil.

The neat Black cotton soil samples were modified (blended with SQD and CKD) by varying proportions of the stabilizers. The soils were mixed with SQD in concentrations of 0%, 30%, 40% and 50% by dry weight of the soil and each of these was combined with varying proportions of CKD of 0%, 2%, 4% and 6% respectively by dry weight of the soil. The laboratory results were analysed based on the effect of the additives in comparison with the engineering properties of the native and modified soils. This was achieved by conducting the following tests: free swell, sieve analysis, Atterberg's limits, compaction and CBR tests.

It was observed that soil stabilized with the combination of Quarry Dust and Cement mixture showed a significant improvement in strength parameters and a substantial decrease in the plasticity index and swelling potential since the mixes of the two additives act as a 'CementMortar'.

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LIST OF ACRONYMNS

AASHTO American Association of State Highway and Transportation Officials

BCS Black Cotton Soils

CBR California Bearing Ratio

CKD Cement Kiln Dust

LKD Lime Kiln Dust

LL Liquid Limit

LS Linear Shrinkage

MDD Maximum Dry Density

OMC Optimum Moisture Content

OPC Ordinary Portland Cement

PC Portland Cement

PI Plasticity Index

PL Plastic Limit

SQD Stone Quarry Dust

UCS Unconfined Compressive Strength

CHAPTER ONE

1.1 INTRODUCTION

This chapter offers the background of the project, the problem statement, objectives of study, the justification of study and finally the scope of study including geographical scope, technical scope and time scope.

1.2 BACKGROUND

The construction of roads is one of the crucial areas in ensuring advanced economic growth, as it provides the dominant mode of freight and passenger transport worldwide. Roads therefore play an important role in the development of Uganda. A stable subgrade and properly draining pavement help produce a long-lasting pavement structure. It is a well-known fact that a construction is as strong as its foundations are. One of the most encountered issue on sites, especially road construction is the presence of highly cohesive soils, soils that are easily affected by the change of water content. (PhD students, 2017)

Mbale- Manafwa Bridge collapsed due to the inferior soil quality of the soil and this paralysed business / trade, affected traffic and high costs to repair the structure was incurred.(Iga et al., 2016)

In Bududa district, a landslide buried three villages (Kubehwo,Namakansa,Nametsi) in Bumayoka sub-county killing over 400 and displacing an estimate of 5000 people.

The main problems in clay are due to its undesirable properties such as low strength, high swelling capacity, low bearing capacity and high levels of instability when unsupported. (S. Jjuuko, 2011) Therefore, there is need to improve the engineering properties of such subgrade soils through a process known as soil stabilization so as to be able to achieve strong foundations for pavement construction. There are mechanical, chemical admixture and use of geosynthetics methods for soil stabilization(Lim et al., 2014). According to (AL-Sakkaf, 2009), In chemical stabilization, the main categories of binders used for stabilizing soil are Portland cement, lime and bitumen. The stabilization of fine-grained soils, particularly clay is often achieved through the introduction of such chemical agents, mainly (Portland cement and hydrated lime) and more recently (polymers, sulfonated oils and resins) to the soil water medium which allows soil particle flocculation or aggregation and hence the development of a more coherent soil matrix with enhanced geomechanical properties (Ikeagwuani & Nwonu, 2019). However, these binders have been found to be quite expensive especially in the third world countries like

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