Resilient Soft Clay Ground Enhancement with Eggshell Lime and Rice Husk Ash

Nasrin Neyestani*

Department of Surgery, National and Kapodistrian University of Athens, Greece

Abstract

Soft clay soils, characterized by their low shear streng ' moisture variation. This method not only o ers an eco-friendly so utilizing readily available, low-cost materials. Field applications demonstrate the practical bene ts of this approach, making it a promising technique for sustainable soil improvement in various construction contexts.

Keywords: So clay; Soil stabilization; Eggshell lime; Rice husk ash; Pozzolanic reaction; Soil strength Enhancement; Environmental impact

Introduction

In civil engineering and construction, the challenge of stabilizing so clay soils is a well-known issue that impacts the safety, durability, and cost-e ectiveness of structures. So clay o en su ers from poor load-bearing capacity, high compressibility, and susceptibility to seasonal moisture variations. Innovative and sustainable methods for ground improvement are crucial to addressing these challenges. One promising approach involves using eggshell lime and rice husk ash-two readily available and eco-friendly materials. is article explores how these materials can enhance the resilience of so clay soils [1].

Understanding so clay challenges

So clay soils are characterized by their low shear strength and high compressibility, which can lead to excessive settlement and instability when subjected to construction loads. Traditional methods for improving these soils o en involve chemical stabilizers, mechanical treatments, or replacement of the soil. However, these methods can be expensive and environmentally taxing [2].

e role of eggshell lime

Eggshells, which are typically discarded as waste, are rich in calcium carbonate. When processed and calcined, eggshells produce lime (calcium oxide), a material known for its soil stabilization properties. e transformation process involves heating eggshells to high temperatures, which converts calcium carbonate into calcium oxide. When this lime is mixed with soil, it reacts with clay particles to form stable compounds, enhancing the soil's strength and reducing its plasticity.

Chemical stabilization: Lime stabilizes clay soils through a process known as pozzolanic reaction. is chemical reaction between lime and clay minerals results in the formation of cementitious compounds, which bind soil particles together and improve soil strength.

Durability: Lime-stabilized soils exhibit improved resistance to moisture variations, reducing the risk of swelling and shrinkage. is enhances the long-term stability of the soil under varying environmental conditions [3].

e bene ts of rice husk ash

Rice husk ash (RHA) is a by-product of rice milling and is o en underutilized. When rice husks are burned, they produce ash rich in silica. is ash can is used as a supplementary soil stabilizer due to its pozzolanic properties.

Pozzolanic activity: Silica in RHA reacts with lime to form additional cementitious compounds. is reaction further improves the strength and durability of the stabilized soil.

Environmental impact: Using RHA not only reuses an agricultural by-product but also reduces the environmental impact associated with rice milling waste disposal.

Combining eggshell lime and rice husk ash

e combination of eggshell lime and rice husk ash o ers a synergistic e ect, enhancing the overall stabilization of so clay soils. e dual pozzolanic reactions with both lime and silica provide a more comprehensive improvement compared to using either material alone.

Enhanced strength: e combined 7es an B morsh o ers a c0.availsole 0.0

***Corresponding author:** Nasrin Neyestani, Department of Surgery, National and Kapodistrian University of Athens, Greece, E-mail: Nasrin.neyestani@gmail.com

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