

Sustainable soil stabilisation

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Abstract:

Soil stabilisation is crucial to tackle the problem of soil disasters which may occur as a natural calamity or man-induced calamity. Many people are displaced from their homes and some even lose their life in such disasters. There are 3 main types of soil stabilisation including physical stabilisation, that is physically altering the site geology, such as the use of anchors and piling; biological stabilisation, that is usage of plants and trees with far reaching roots to hold the soil; and finally chemical stabilisation, that is the use of chemical binders and aggregates to react with the soil and form stabilisation bonds between them. Another problem worldwide is the landfill scarcity to dispose human, commercial and industrial waste. Chemical stabilisation could potentially help solve both issues by combining binders with waste products to stabilise the soils. The goal of this study was to investigate an economically, environmentally, and socially sustainable solution to the problem of soil stability in cases of slope failures, debris flow, rockfall, landslides, cut slopes for road construction, embankment failures in road and dam constructions and in building construction. There have been some studies on different types of stabilisation methods so far, but all of them were costly and causing population displacement from risky areas. By using waste products to stabilise such soils, this study also aims at reducing the environmental problem of disposal and landfill scarcity with respect to the 3R principles: Reduce, Reuse and Recycle. Two sites in Mauritius in known soil disaster regions were identified and samples of soils will be collected from there. A series of soil tests were carried out in-situ and in the geotechnical laboratory of the Université des Mascareignes on the said soils in accordance with the British Standards BS 1377: 1990. This determined the types of soil and their properties in order to find a possible co-relation between the two and also help forecast the best stabilisation methods for the sites. The phase one testing and classification of the soils at the 2 chosen sites of La Butte and Grande Riviere Noire has been completed. It was found that both sites have silty / clayey properties with high swelling. A mix of waste by-product and binders will subsequently be investigated. The mix must be easily mixable in surface mixing as well as deep soil mixing and at the same time does not cause any contamination threat to underground water and ecosystem. A digital model and/or a mathematical model will be designed to confirm the behaviour of such stabilisation and help stabilise different types of soils with different properties.

Keywords: Soil classification, Laboratory testing, Soil stabilisation

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