

RESEARCH

(a) *Completed*

1. Stability of slip surfaces or sloped Soils
2. Impact of Inorganic salts on soil geotechnical properties
3. Influence of termites on soil geotechnical properties
4. Use of cow bone, wood, and rice husk ashes as soil stabilisers
5. Soil improvement using locally available materials

(b) *Research in Progress*

1. **Soil Stabilisation or Improvement**

This involves the development of a cold solution of expanded polystyrene, pet bottle, nylon, and used serviette materials as soil stabilizers. These waste materials would be processed and used to stabilize both good and poorly-graded soils found in South Western Nigeria. The geotechnical properties of the mixture (soil plus stabilizers) will be determined. Emphasis will be placed on how to convert the waste materials to better usage such as in the construction of road bases of flexible pavements. The use of microorganisms like bacteria in soil stabilization will also be investigated. This will be collaborative research between two departments – Civil Engineering and Micro Biology. Production of non-hydraulic cement activated with hydraulic and other inorganic chemicals for soil improvement for roads, dam embankment construction.

2. **Knowledge-based in Geotechnical Engineering**

This involves the generation of geotechnical charts for quick estimation of geotechnical properties of soil within the same geological zone. The research will involve dividing the chosen area into geological zone based on its parent rocks. Soil samples will be collected from each zone and their geotechnical properties measured in the laboratory. For each zone, charts of fine to coarse aggregate ratio against soil geotechnical property would be plotted. The charts would be used for the approximate determination of soil geotechnical properties. The study will be out carried in major cities in South Western Nigeria.

Soil index properties such as grain size analysis and Atterberg limits would be correlated with their geotechnical properties such as California bearing ratio, shear strength parameters, and coefficient of permeability. The research would be carried out in Southwestern Nigeria. The models to be generated would serve as a tool for the quick determination of soil geotechnical properties from their index properties.

3. **Reinforced Earth**

This is another method of stabilizing troublesome or weak earth (soil) with fibers. Local fibers would be obtained from bamboo, rattan cane, worn-out tires, etc. The fibres would be subjected to durability tests and mixed with soils in different proportions. The soil fibre mixtures' geotechnical properties such as index, permeability, confined compression, shear strength, California bearing ratio, and settlement rate would be monitored.

4. **Structure Failures**

This involves studying mechanics leading to failure and devising means to ameliorate them.

5. Soil Remediation

Soil contamination in Nigeria is becoming rampant and there is a need to come up with appropriate methods to de-contaminate such soil. Methods like the use of electrical current and suitable electrodes to precipitate ions present in the soil are becoming popular in the advanced world. Research of this nature is collaborative research between departments of Civil Engineering and Electrical and Electronic Engineering. The research will focus on how to come up with suitable electrodes to be used in decontaminated soil containing metals. The presence of crude oil in soil affects bonds among soil particles and invariably affects soil geotechnical properties. Various means of improving bonds among crude oil contaminated soil will be investigated with a focus on Niger Delta areas.

6. Soil Dynamics

This entails study of earth tremors and device means of preventing side effects on existing building with focus on South Western Nigeria.