



# Geotechnical Engineering Application in Expansive Soils Foundation Design in Sudan Context, Benin Setting

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## Abstract

Geotechnical engineering plays a crucial role in foundation design for infrastructure projects, particularly in regions with expansive soils that experience significant swelling and shrinking cycles. A combination of field investigations, laboratory testing, and numerical modelling were employed to assess soil behaviour under various conditions. The findings from these methodologies informed the design recommendations for foundation construction. Field observations indicated that expansive soil layers varied in thickness between 2 meters (average) and up to 5 meters at some sites, affecting settlement predictions significantly. The study provided detailed recommendations for foundation design based on specific soil conditions observed in both Sudan and Benin settings. Foundation designs should consider the variability of expansive soils by incorporating buffer zones and reinforced materials where necessary to ensure stability and longevity of structures. Geotechnical Engineering, Foundation Design, Expansive Soils, Sudan, Benin The maintenance outcome was modelled as  $Y = \beta_0 + \beta_1 X + u_i + v + \epsilon$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** *Sub-Saharan, expansive-soils, geotechnical-analysis, foundation-design, cyclic-stress, soil-mechanics, wetting-drying*

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