

Analysis of Case Study of Engineering Challenges in a Specific African Country in São Tomé and Príncipe: An African Perspective

J, o, e, l, S, t, e, w, a, r, t, ,, L, a, w, r, e, n, c, e, T, h, o, m, a, s, ,, C, l, a, r, e,
B, r, o, w, n, ,, A, l, i, s, o, n, C, l, a, r, k

DOI: <https://doi.org/10.5281/zenodo.18559483>

| Abstract

Engineering projects in small island developing states face distinct geological and infrastructural challenges. These are often under-represented in structural geology and engineering literature, which predominantly addresses continental settings. A systematic method for analysing these challenges from an African perspective is needed to improve project planning and risk mitigation. This methodology article presents a structured, replicable framework for analysing engineering challenges related to structural geology in São Tomé and Príncipe. Its primary objective is to detail a process for identifying, categorising, and evaluating geotechnical and geological constraints on infrastructure development within the specific context of an African island nation. The proposed methodology employs a qualitative case study approach. It comprises: 1) a desk-based review of geological maps and project reports; 2) systematic field reconnaissance to document geohazards and construction issues; 3) stakeholder interviews with local engineers and planners; and 4) synthesis of data using thematic analysis to identify recurring challenge patterns. The framework emphasises contextual factors, including material availability and localised weathering profiles. As a methodology article, this paper presents a framework rather than empirical results from a full application. However, a pilot application illustrated potential output, identifying a dominant theme: the frequent

underestimation of tropical weathering effects on volcanic bedrock slopes, which was a recurring factor in road construction failures. The developed methodology provides a structured, context-sensitive tool for investigating engineering-geological interactions in São Tomé and Príncipe. It underscores the necessity of tailored approaches that account for the specific structural geology and socio-economic conditions of African island settings. Researchers and practising engineers should adopt this framework for pre-project feasibility studies in similar geographies. Future work must involve applying the methodology to generate a comprehensive database of case-specific challenges and mitigation strategies. structural geology, engineering geology, methodology, case study, São Tomé and Príncipe, island geology, geotechnical challenges, tropical weathering This work provides a dedicated methodological framework for analysing structural geology-related engineering challenges in the under-studied context of African island developing states, aiming to standardise and improve site characterisation practices.
