African Geological Engineering

Assessment of Structural Integrity in Aging Infrastructure in Uganda: A Replication Study

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Abstract

Structural integrity assessment of aging infrastructure is crucial for ensuring public safety in urban areas such as Uganda. The study utilised a combination of traditional visual inspections and advanced non-destructive testing (NDT) methods to assess the condition of selected infrastructure components. Data were analysed using statistical software to evaluate the reliability and robustness of the assessment process. Concrete strength measurements showed an average strength of 30 MPa with a confidence interval indicating variability within ±5%. The replication study confirmed the validity of the initial findings, providing reassurance for ongoing maintenance and future structural assessments in Uganda's infrastructure. Based on the replicated results, it is recommended that regular NDT inspections be integrated into routine maintenance schedules to ensure long-term safety and durability of critical structures. The maintenance outcome was modelled as $Y\{\} = beta0 + beta1X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *African urbanization, structural reliability analysis, fatigue crack propagation, life cycle assessment, condition monitoring, finite element modelling, geospatial analytics*

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