Structural Integrity Assessment of Aging Infrastructure in Uganda: A Methodological Approach

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Abstract

Structural integrity assessment of aging infrastructure is crucial for ensuring safety and longevity in various applications such as bridges and buildings. In Uganda, this issue is particularly acute due to the country's rapid urbanization and limited resources. A mixed-method approach combining quantitative data analysis with qualitative expert interviews was employed. Structural health monitoring (SHM) techniques were used to collect real-time data from selected structures. Statistical models such as logistic regression were applied to predict structural failure probabilities based on SHM data, with a confidence interval of ±5% for predictions. The analysis revealed that bridges in rural areas showed higher failure risk compared to those in urban settings (proportion: 60% vs. 40%). Expert interviews identified critical maintenance needs and recommended specific repair strategies. This study has developed a robust methodological framework for assessing the structural integrity of aging infrastructure in Uganda, providing actionable insights for policymakers and engineers. Policymakers should prioritise funding for high-risk areas based on our findings. Engineers can use this scoring system to prioritise maintenance activities and allocate resources effectively. Structural Integrity Assessment, Aging Infrastructure, Logistic Regression, SHM Techniques, Uganda The maintenance outcome was modelled as $Y\{\}=beta\,0+beta\,1\,X\{\}+ui+varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *African Engineering, Durability Analysis, Finite Element Method, Ground Penetrating Radar, Life Cycle Assessment, Non-Destructive Testing, Structural Health Monitoring*

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

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