



Methodological Evaluation of Municipal Infrastructure Assets Systems in Nigeria: Multilevel Regression Analysis for System Reliability Assessment

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Abstract

Municipal infrastructure assets in Nigeria are critical for economic development but suffer from degradation due to inadequate maintenance and management. A mixed-methods approach was employed, integrating quantitative data analysis through multilevel regression models with qualitative insights from stakeholder interviews to assess system reliability across different levels of governance and asset management. Multilevel regression analyses revealed significant differences in system reliability between local government areas (LGAs) in terms of infrastructure funding and maintenance practices, suggesting a need for targeted interventions at the LGA level. The study underscores the importance of multilevel regression analysis for assessing municipal infrastructure systems' reliability and highlights the critical role of governance levels in asset management outcomes. Policy recommendations include prioritising LGAs with lower system reliability scores, implementing targeted funding mechanisms to improve maintenance practices, and fostering stakeholder collaboration for effective asset management. Municipal Infrastructure, System Reliability, Multilevel Regression Analysis, Nigeria The maintenance outcome was modelled as $Y = \beta_0 + \beta_1 X + u_i + \text{varepsilon}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *African geography, multilevel modelling, asset management, degradation analysis, regression analysis, infrastructure sustainability, system reliability*

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