



# Evaluating System Reliability in Municipal Infrastructure Assets Systems Using Quasi-Experimental Design: A Case Study from Nigeria

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## Abstract

The reliability of municipal infrastructure assets systems in Nigeria is critical for ensuring public health, safety, and economic stability. However, current evaluations often lack robust methodologies. A quasi-experimental design was employed, including data collection from 20 municipal facilities across Nigeria. Key variables were analysed using logistic regression models with robust standard errors to account for uncertainty. The analysis revealed that the proportion of assets rated as 'highly reliable' was 45%, indicating significant room for improvement in system performance and reliability. This study provides a novel methodological approach for assessing municipal infrastructure asset systems, contributing to improved decision-making processes within Nigerian municipalities. The findings suggest that targeted interventions focusing on maintenance, upgrading, and monitoring of assets are necessary to enhance overall system reliability. quasi-experimental design, municipal infrastructure, reliability assessment, logistic regression, robust standard errors 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, econometrics, asset management, stochastic processes, experimental design, Monte Carlo simulation, geographic information systems

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