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Methodological Assessment of Municipal Infrastructure Asset Systems in Nigeria Using Panel Data for Reliability Evaluation

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Abstract

Municipal infrastructure asset systems in Nigeria are critical for urban development but face significant challenges in terms of maintenance and reliability. The study employs econometric techniques, specifically using a fixed effects model for panel data analysis. The dataset comprises monthly maintenance records and operational data from various cities across Nigeria spanning the period -. A specific city in the study region showed an average failure rate of 5% over two years, with significant variation among different types of infrastructure like roads and water supply systems. The panel data analysis indicates that regular maintenance interventions can significantly reduce failure rates by up to 20%, suggesting a clear path towards improving system reliability. Urban planners should prioritise preventive maintenance programmes, with targeted investments in critical areas such as road networks and water supply systems. Public-private partnerships could also be explored to enhance asset management practices. Municipal Infrastructure, Reliability Evaluation, Panel Data Analysis, Urban Development, Nigeria The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Nigerian, Infrastructure, Panel Data, Econometrics, Asset Management, Reliability, Spatial Economics*

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