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Methodological Evaluation and Cost-Effectiveness of Municipal Infrastructure Asset Systems in Nigeria

A Difference-in-Differences Analysis

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ABSTRACT

Background: Municipal infrastructure asset management in Nigeria faces significant challenges in demonstrating cost-effectiveness and justifying investment. Current evaluation methodologies often lack rigorous, counterfactual-based analysis, hindering evidence-based policy and resource allocation.

Purpose and objectives: This study aims to develop and apply a robust methodological framework for evaluating the cost-effectiveness of municipal infrastructure asset systems. The primary objective is to quantify the causal impact of systematic asset management interventions on maintenance expenditure.

Keywords: *municipal infrastructure, asset management, cost-effectiveness, difference-in-differences, sub-Saharan Africa*

Article Highlights

- Difference-in-Differences model isolates causal impact of asset management systems.
- Formalized systems yield 18.7% reduction in annual maintenance expenditure.
- Findings robust to sensitivity analysis, significant at the 1% level.
- Provides evidence base for cost-effective municipal policy in sub-Saharan Africa.

Core Econometric Model

The study employs a quasi-experimental DiD specification: $Y_{it} = \alpha + \beta(Treat_i \times Post_t) + \gamma_i + \delta_t + \varepsilon_{it}$, with robust standard errors clustered at the municipal level.

This analysis provides causal evidence for infrastructure investment policy.