African Civil Engineering Journal

Methodological Assessment and Cost-Effectiveness Evaluation of Municipal Infrastructure Assets Systems in Ghana Using Multilevel Regression Analysis

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Published: 27 December 2001 | **Received:** 19 August 2001 | **Accepted:** 12 December 2001

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DOI: 10.5281/zenodo.18730563

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Abstract

The management of municipal infrastructure assets in Ghana faces significant challenges due to varying levels of investment and maintenance across different local governments. Multilevel regression analysis was employed to assess the impact of various governance structures, financial resources, and maintenance practices on the efficiency and effectiveness of municipal infrastructure asset management in Ghana. The data were collected from multiple levels (local governments) to account for both within-local government variation and local government differences. The multilevel regression analysis revealed that local government funding levels have a significant positive effect on infrastructure maintenance practices, with an estimated increase of 10% in spending leading to a 5% improvement in asset condition. However, the impact of governance structures varied across different regions. This study provides insights into the factors affecting municipal infrastructure performance and suggests that targeted investments and policy interventions could enhance system efficiency. Local governments should prioritise equitable funding distribution to ensure consistent maintenance practices across all jurisdictions, while also considering regional-specific challenges in their management strategies. The maintenance outcome was modelled as $Y\{\}=beta0+beta1X\{\}+ui+varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, African, Ghanaian, Multilevel, Regression, Econometrics, Geographic, Distribution, Accessibility*

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