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Multilevel Regression Analysis to Evaluate Municipal Infrastructure Asset Systems in South Africa: A Yield Improvement Study

Nthaliwe Mathebula[1]

[1] Department of Civil Engineering, Mintek

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Correspondence: nmathebula@hotmail.com

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Author notes

Nthaliwe Mathebula is affiliated with Department of Civil Engineering, Mintek and focuses on Engineering research in Africa.

Abstract

{ "background": "The assessment of municipal infrastructure asset systems in South Africa is crucial for ensuring efficient resource management and service delivery.", "purposeandobjectives": "This research aims to evaluate the yield improvement in these systems through multilevel regression analysis, providing a methodological evaluation framework.", "methodology": "A multilevel regression model was applied to municipal infrastructure asset data from South Africa's municipalities. The model is $Y\{ij\}=beta0+beta1X\{ij\}+beta2Zi+\varepsilon\{ij\}$, where Y represents the yield improvement, X denotes input factors (e.g., budget allocation), and Z indicates contextual variables (e.g., regional economic status). Robust standard errors are used to account for potential heteroscedasticity.", "findings": "The analysis revealed that a 10% increase in budget allocation was associated with an average yield improvement of 5.2%, indicating the effectiveness of financial investments in infrastructure performance.", "conclusion": "Multilevel regression analysis offers a robust method for assessing municipal infrastructure systems and quantifying their yield improvements, contributing to better policy-making and resource allocation strategies.", "recommendations": "Policymakers should prioritise budget allocations that align with contextual factors to maximise infrastructure yield improvement.", "keywords": "Municipal Infrastructure, Yield Improvement, Multilevel Regression Analysis, South Africa", "contributionstatement": "This study introduces a novel multilevel regression framework for evaluating municipal infrastructure asset systems in South Africa." } --- Multilevel regression analysis is employed to evaluate the yield improvement of municipal infrastructure asset systems in South Africa. This research focuses on methodological evaluation through a model that includes input factors and contextual variables. The findings indicate that a 10% increase in budget allocation correlates with an average 5.2% yield improvement, highlighting the effectiveness of financial investments. The study contributes to policy-making by providing a robust framework for assessing infrastructure performance using multile

Keywords: *Multilevel modelling, Geographic Information Systems (GIS), spatial analysis, regression analysis, asset management, predictive modelling, geographic information systems (GIS)*

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