# Methodological Evaluation of Municipal Water Systems in Nigeria: A Multilevel Regression Analysis for Cost-Effectiveness Assessment

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## Abstract

Municipal water systems in Nigeria face significant challenges related to reliability, affordability, and accessibility. A multilevel regression model was employed to analyse data from multiple levels of the system (e.g., infrastructure, user behaviour) to determine factors influencing cost-effectiveness. The regression analysis revealed that water pressure and network connectivity significantly impacted users' satisfaction with municipal water systems. This study provides a robust framework for understanding the complexities of municipal water systems in Nigeria and suggests potential areas for improvement. Investment in infrastructure upgrades, particularly to enhance water pressure and network efficiency, is recommended to improve cost-effectiveness and user satisfaction. The empirical specification follows $Y = \beta_{0+\beta}^{\vec{}} \, p \, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

**Keywords:** *African geography, multilevel modelling, cost-effectiveness, regression analysis, water resources management, urban development, public health economics*

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