



Methodological Evaluation of Water Treatment Facilities Systems in Uganda Using Multilevel Regression Analysis

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Abstract

Water treatment facilities in Uganda face challenges related to cost-effectiveness and system performance, necessitating a methodological evaluation. A multilevel regression model was employed to analyse data from multiple water treatment facilities across Uganda. The model accounts for both facility-level and regional variability in system performance, incorporating robust standard errors to address potential heteroscedasticity. The analysis revealed a significant positive relationship between the presence of community engagement mechanisms and improved water quality outcomes, suggesting an important role for stakeholder involvement in enhancing treatment efficacy. This study highlights the importance of considering both facility-specific and contextual factors when assessing water treatment systems' cost-effectiveness in Uganda. Investment strategies should prioritise facilities with robust community engagement programmes to maximise long-term system performance and sustainability. The maintenance outcome was modelled as $Y_i = \beta_0 + \beta_1 X_i + u_i + \epsilon_i$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: Sub-Saharan, Africa, geospatial, data-mining, multilevel, modelling, regression, evaluation, water, sanitation

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