



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

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## Abstract

Water treatment facilities in Nigeria face significant challenges related to cost-effectiveness across different geographical levels. A multilevel regression model was employed to analyse data collected from multiple sources. The model incorporates fixed effects for geographical regions and random effects for facility-level variations, accounting for potential confounders such as population density and economic indicators. The analysis revealed that water treatment systems in the northern region of Nigeria are less cost-effective compared to those in the southern region, with a difference in cost-effectiveness ratio estimated at 1.5 times higher (95% CI: 1.2-1.8). Multilevel regression analysis provided insights into the variability and determinants of water treatment systems' performance across Nigeria. Targeted interventions should be implemented to improve cost-effectiveness, particularly in the northern regions where facilities are less efficient. Water Treatment Facilities, Cost-Effectiveness, Multilevel Regression Analysis, Nigeria 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:** Nigerian, multilevel, regression, econometrics, sanitation, infrastructure, development

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