Multilevel Regression Analysis to Evaluate Adoption Rates in Municipal Water Systems across Tanzania

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Abstract

Municipal water systems in Tanzania face challenges related to adoption rates, necessitating a comprehensive evaluation approach. A multilevel regression model was employed to analyse data from multiple levels (e.g., national, regional, local) representing municipal water systems. The model accounts for both fixed effects (system characteristics) and random effects (geographical variation). The analysis revealed a significant difference in adoption rates across different geographical regions, with urban areas showing higher adoption compared to rural settings. Multilevel regression analysis provided nuanced insights into the factors influencing municipal water system adoption rates, highlighting the importance of regional context in policy design and implementation. Policy makers should prioritise interventions in underserved rural regions to enhance overall adoption rates and improve water security across Tanzania. The empirical specification follows $Y = \vec{\beta}_{0+\beta} \, p \, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Tanzania, Multilevel Regression, Spatial Analysis, Adoption Rates, Quantitative Methods, Water Systems, Geographic Information Systems (GIS)*

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