



Panel Data Estimation for Yield Improvement in Municipal Water Systems across Nigeria: A Methodological Evaluation

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Abstract

Municipal water systems in Nigeria face challenges related to yield improvement due to various factors such as infrastructure degradation and operational inefficiencies. Panel data analysis was employed using a generalized linear mixed model (GLMM) with robust standard errors to account for potential heterogeneity and autocorrelation in yield measurements. The GLMM revealed an average increase of 15% in water yield across monitored systems, though variability existed among different regions. This study provides evidence that panel data methods can be effectively utilised to assess and improve municipal water system performance in Nigeria. Further research should explore the implementation of these methods at a larger scale and consider additional variables affecting yield improvement. The empirical specification follows $Y = \beta_{0+\beta} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: Nigerian, Panel, Econometrics, Water, Governance, Efficiency, Sustainability

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