



Methodological Assessment of Municipal Water Systems Efficiency in Nigeria: A Panel Data Analysis

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Abstract

The inefficiency of municipal water systems in Nigeria has led to significant health and environmental challenges. This review employs systematic literature search methods to identify relevant studies. A mixed-method approach is adopted, combining quantitative and qualitative insights for comprehensive evaluation. Panel-data estimation reveals a moderate improvement in system efficiency over the last decade (proportion of systems improving by about 20%). The review underscores the need for improved policy frameworks and investment in technological upgrades to enhance water system performance. Policy-makers should prioritise stakeholder engagement, robust data collection, and continuous monitoring of municipal water systems efficiency. The empirical specification follows $Y = \beta_{0+\beta} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Nigerian, water scarcity, efficiency measurement, stochastic frontier analysis, econometrics, GIS, spatial analysis*

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