



A Multilevel Regression Framework for Evaluating Cost-Effectiveness in Senegalese Municipal Water Systems

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Abstract

This study focuses on evaluating the cost-effectiveness of municipal water systems in Senegal, a country facing significant challenges related to water scarcity and infrastructure development. A multilevel regression model will be employed, incorporating fixed effects for municipal boundaries and random intercepts for individual water supply units. This approach allows for the disaggregation of system-level costs and benefits across various scales. This study provides a robust methodological foundation for assessing the economic viability of municipal water projects in Senegal and beyond. Public policymakers should consider adopting these multilevel regression techniques to inform future infrastructure investments and resource allocation decisions. The empirical specification follows $Y = \beta_{0+\beta} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Sub-Saharan, Senegalese, multilevel, regression, econometrics, sustainability, infrastructure, accessibility*

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