African Laser Physics (Pure Science)

Methodological Evaluation of Municipal Water Systems in Senegal: Multilevel Regression Analysis for Efficiency Enhancement

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Abstract

The municipal water systems in Senegal face challenges in delivering efficient services to a growing population. A multilevel regression model was employed to analyse data collected from various levels of Senegalese municipalities. The model includes an intercept term, three predictor variables representing infrastructure, management practices, and socio-economic conditions, all estimated with robust standard errors to account for potential heteroscedasticity. The multilevel regression analysis revealed a significant positive relationship between investment in water infrastructure ($p < 0.05$) and system efficiency, indicating that increased funding leads to better service delivery. This study underscores the importance of targeted investments in municipal water systems for improving overall efficiency and sustainability. Policy makers should prioritise investments in water infrastructure and implement robust management practices to enhance the performance of Senegalese municipal water systems. Senegal, Municipal Water Systems, Multilevel Regression Analysis, Efficiency Enhancement The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

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

ABSTRACT-ONLY PUBLICATION

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