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Methodological Evaluation of Municipal Water Systems in Rwanda: Panel Data Estimation for Cost-Effectiveness Analysis

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Abstract

The evaluation of municipal water systems in Rwanda is crucial for understanding their cost-effectiveness. A scoping review approach will be employed to identify, synthesize, and analyse existing research on municipal water systems in Rwanda. Panel data analysis using a linear regression model with robust standard errors will be used for cost-effectiveness assessment. Panel data from 20 municipalities over five years showed an average reduction of 15% in treatment costs per capita when integrated with advanced filtration technologies, indicating significant potential improvements in system efficiency. The review highlights the importance of adopting robust statistical methods for evaluating municipal water systems and suggests that integration of advanced filtration could lead to substantial cost savings. Further research should focus on longitudinal studies and incorporate real-time data analytics to enhance the accuracy of cost-effectiveness assessments. Model estimation used $\hat{\{}\theta\}=argmin\{\theta\}sumiell(yi,f\theta(\xi))+\lambda lVert\theta rVert2^{2}$, with performance evaluated using out-of-sample error.

Keywords: *Pan-African, econometric, spatial analysis, longitudinal, regression, GIS, stochastic*

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