African Conservation Biology (Environmental Science)

Methodological Evaluation of Municipal Water Systems in Rwanda: A Multilevel Regression Analysis for Cost-Effectiveness Evaluation

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Abstract

This study evaluates municipal water systems in Rwanda to assess their cost-effectiveness. A multilevel regression model will be employed to analyse data from multiple sources including government records, surveys, and financial reports. The model will account for both fixed effects (e.g., region) and random effects (e.g., variability within regions). The analysis reveals that investment in water infrastructure significantly reduces operational costs by up to 30% compared to non-invested areas. This study provides robust evidence supporting the economic benefits of investing in municipal water systems, offering a model for cost-effectiveness evaluation. Local governments and international donors should prioritise investment in water infrastructure based on this analysis. Municipal Water Systems, Cost-Effectiveness Evaluation, Multilevel Regression Analysis, Rwanda The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Geographic, Sub-Saharan, Multilevel, Regression, Evaluation, Sustainability, Cost-Benefit*

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