African Applied Freshwater Ecology
(Fisheries/Aquatic/Environmental)

Bayesian Hierarchical Model for Evaluating Municipal Water Systems Yield Improvement in Tanzanian Urban Settings

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Published: 24 May 2000 | **Received:** 19 March 2000 | **Accepted:** 02 May 2000

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DOI: 10.5281/zenodo.18713180

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Abstract

In Tanzania, municipal water systems are crucial for urban sustainability but often face challenges in meeting demand. A Bayesian hierarchical model was developed to analyse yield data from multiple sites, accounting for spatial heterogeneity and variability. The analysis revealed that incorporating site-specific parameters significantly improved the predictive accuracy of yield models ($R^2 = 0.85$). Bayesian methods provided more nuanced insights into municipal water system performance compared to traditional approaches. Further research should focus on model validation and application in diverse urban settings. municipal water systems, yield improvement, Bayesian hierarchical models, Tanzania The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African Geography, Bayesian Statistics, Hierarchical Modelling, Water Yield Analysis, Quantile Regression, Spatial Statistics, Econometrics*

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