African Climate Change Science (Earth Science focus)

Bayesian Hierarchical Model for Evaluating Adoption Rates in Municipal Water Systems in Kenya

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Abstract

The adoption rates of municipal water systems in Kenya are critical for ensuring sustainable access to clean drinking water and reducing water-related diseases. The proposed methodology employs a Bayesian hierarchical model with latent random effects to account for unobserved heterogeneities among municipalities. The model's parameters are estimated using Markov Chain Monte Carlo (MCMC) methods. Uncertainty is quantified through posterior credible intervals. The Bayesian hierarchical model provides a robust framework for evaluating and understanding municipal water system adoption patterns in Kenya, offering insights into effective interventions to enhance coverage. Policy makers should consider the spatial heterogeneity of adoption rates when planning future investments in municipal water systems. Tailored strategies can be developed based on these insights to maximise impact. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Kenya, Bayesian hierarchical model, adoption rates, municipal water systems, stochastic processes, spatial analysis, econometrics*

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