



# Bayesian Hierarchical Model for Evaluating Cost-Effectiveness in Municipal Water Systems across Nigeria,

Olufunke Obilewa<sup>1,2</sup>, Funmilayo Adebisi<sup>3</sup>

<sup>1</sup> University of Calabar

<sup>2</sup> Covenant University, Ota

<sup>3</sup> Department of Interdisciplinary Studies, University of Calabar

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**Correspondence:** [oobilewa@gmail.com](mailto:oobilewa@gmail.com)

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## Author notes

*Olufunke Obilewa is affiliated with University of Calabar and focuses on Environmental Science research in Africa.*

*Funmilayo Adebisi is affiliated with Department of Interdisciplinary Studies, University of Calabar and focuses on Environmental Science research in Africa.*

## Abstract

This study focuses on evaluating municipal water systems in Nigeria by comparing their cost-effectiveness across different regions. A Bayesian hierarchical model will be employed to analyse data from multiple municipal water systems in Nigeria. This approach allows for the integration of site-specific conditions into a unified analysis framework. The analysis revealed significant variations in cost-effectiveness across regions, with some areas showing substantial savings through targeted interventions. The Bayesian hierarchical model provided valuable insights into the cost-effectiveness of municipal water systems in Nigeria, facilitating informed decision-making for future improvements. Based on the findings, specific recommendations will be made to enhance efficiency and reduce costs across all regions. The empirical specification follows  $Y = \beta_{0+\beta}^{-1} p X + varepsilon$ , and inference is reported with uncertainty-aware statistical criteria.

**Keywords:** Nigerian, hierarchical, Bayesian, econometrics, stochastic, optimization, GIS

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