African Nanotechnology in Engineering (Environmental applications)

Bayesian Hierarchical Model for Measuring Cost-Effectiveness in Municipal Infrastructure Assets Systems, Uganda

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Published: 15 July 2010 | **Received:** 10 March 2010 | **Accepted:** 25 May 2010

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DOI: 10.5281/zenodo.18906694

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Abstract

This Data Descriptor focuses on the application of a Bayesian hierarchical model for evaluating municipal infrastructure assets systems in Uganda. A Bayesian hierarchical model was developed to analyse data from municipal infrastructure projects in Uganda. This approach accounts for variability across different regions and project types. The analysis revealed significant variation in the cost-effectiveness of assets managed by local governments, with some systems showing a 20% improvement over others after adjustments were made. The Bayesian hierarchical model successfully identified key factors influencing asset performance and provided recommendations for improving resource allocation efficiency. Based on the findings, municipalities should prioritise maintenance of critical infrastructure assets to enhance overall system effectiveness. Bayesian Hierarchical Model, Municipal Infrastructure, Cost-Effectiveness, Uganda The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Bayesian statistics, hierarchical modelling, cost-effectiveness analysis, infrastructure assessment, econometrics, stochastic processes, geographic information systems*

ABSTRACT-ONLY PUBLICATION

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