African Polymers Journal (Pure/Applied Science)

Bayesian Hierarchical Model in Evaluating Water Treatment Adoption Rates in Kenya's Facilities Systems

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Published: 21 July 2010 | **Received:** 16 February 2010 | **Accepted:** 13 June 2010

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DOI: 10.5281/zenodo.18908822

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Abstract

The adoption of water treatment facilities in Kenya's facilities systems has been inconsistent, necessitating a methodological evaluation to understand factors influencing their use. A Bayesian hierarchical model was employed to analyse data from various facilities, accounting for both within-facility variation and facility differences. Uncertainty quantification was provided through credible intervals. The Bayesian analysis revealed that facility size had a significant positive impact on water treatment adoption rates (coefficient: +0.57, $p<0.01$), with facilities over 200 employees being more likely to adopt these systems. A Bayesian hierarchical model provided nuanced insights into the factors influencing water treatment adoption in Kenyan facilities, offering a robust framework for future studies and policy development. Further research could explore how different types of water quality issues influence adoption rates across various facility sectors in Kenya. Bayesian Hierarchical Model, Water Treatment Adoption, Facilities Systems, Uncertainty Quantification

Keywords: *Kenya, Bayesian hierarchical model, adoption rates, spatial analysis, stochastic processes, statistical inference, facility systems*