African Technology and Development (Interdisciplinary -

Bayesian Hierarchical Model for Risk Reduction in Power-Distribution Equipment Systems in Kenya

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Abstract

The reliability of power distribution equipment systems is critical for Kenya's economic development, particularly in rural areas where access to electricity is limited. A Bayesian hierarchical model was applied to analyse data from Kenyan power distribution networks. The model incorporates spatial and temporal variations in equipment performance, aiming to quantify risk reduction effectiveness. The analysis revealed significant reductions in maintenance costs by up to 30% when applying the proposed Bayesian hierarchical model compared to traditional methods. The study validated the efficacy of the Bayesian hierarchical model for enhancing risk management in power distribution equipment systems, offering a robust tool for future interventions. Policy makers are encouraged to integrate this model into national infrastructure planning and maintenance strategies. Bayesian Hierarchical Model, Power Distribution Equipment, Risk Reduction, Kenya The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Kenya, Hierarchical Modelling, Bayesian Statistics, Reliability Engineering, Asset Management, Monte Carlo Simulation, Markov Chain Monte Carlo*

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

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