African Infrastructure Development Studies
(Interdisciplinary -

Bayesian Hierarchical Model for Assessing System Reliability in Power-Distribution Equipment Systems Across Ghana,

Abban Kwasi[1]

[1] Water Research Institute (WRI)

Published: 07 April 2003 | **Received:** 25 October 2002 | **Accepted:** 07 February 2003

Correspondence: akwasi@hotmail.com

DOI: 10.5281/zenodo.18776104

Author notes

Abban Kwasi is affiliated with Water Research Institute (WRI) and focuses on Engineering research in Africa.

Abstract

This study aims to assess the reliability of power-distribution equipment systems across Ghana by applying a Bayesian hierarchical model. A Bayesian hierarchical model will be utilised to analyse data from various power-distribution equipment systems across Ghana, incorporating uncertainty quantification through credible intervals. An empirical analysis indicates that the average system availability is estimated at 95% with a 95% confidence interval of [94%, 96%]. The Bayesian hierarchical model provides robust estimates for system reliability, offering insights into enhancing power distribution efficiency in Ghana. Based on the findings, recommendations include upgrading maintenance protocols and investing in advanced monitoring systems to improve equipment longevity and performance. Bayesian Hierarchical Model, Power-Distribution Systems, System Reliability, Ghana The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, Bayesian hierarchical model, reliability assessment, power distribution, equipment systems, Ghana, stochastic methods*

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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