



Bayesian Hierarchical Model for Evaluating Cost-Effectiveness in Transport Maintenance Depots Systems in Kenya: An Analytical Study

Wamunyane Ochieng^{1,2}, Olumbe Mutemi³, Kibet Kigen⁴, Gikonyo Gitonga^{5,6}

¹ Maseno University

² Department of Civil Engineering, International Centre of Insect Physiology and Ecology (ICIPE), Nairobi

³ Department of Electrical Engineering, Maseno University

⁴ Kenyatta University

⁵ Department of Civil Engineering, Maseno University

⁶ International Centre of Insect Physiology and Ecology (ICIPE), Nairobi

Published: 25 March 2008 | **Received:** 27 December 2007 | **Accepted:** 29 January 2008

Correspondence: wochieng@outlook.com

DOI: [10.5281/zenodo.18871063](https://doi.org/10.5281/zenodo.18871063)

Author notes

Wamunyane Ochieng is affiliated with Maseno University and focuses on Engineering research in Africa.

Olumbe Mutemi is affiliated with Department of Electrical Engineering, Maseno University and focuses on Engineering research in Africa.

Kibet Kigen is affiliated with Kenyatta University and focuses on Engineering research in Africa.

Gikonyo Gitonga is affiliated with Department of Civil Engineering, Maseno University and focuses on Engineering research in Africa.

Abstract

Transport maintenance depots (TMDs) play a critical role in ensuring vehicles are operational for public and commercial transport systems in Kenya. A Bayesian hierarchical model was developed to analyse data from multiple depots, accounting for variations in operational costs and vehicle types. Uncertainty quantification was performed through credible intervals. The analysis revealed that the proportion of vehicles requiring repair within a depot can vary significantly by type, with some categories showing up to 40% higher maintenance needs compared to others. Bayesian hierarchical modelling provided insights into cost-effectiveness across different depots and vehicle types in Kenya's transport system. The findings suggest that targeted interventions focusing on high-maintenance vehicle categories could enhance overall efficiency of TMDs. The maintenance outcome was modelled as $Y \{ \} = \beta_0 + \beta_1 X \{ \} + u_i + \text{varepsilon} \{ \}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Bayesian statistics, hierarchical modelling, cost-effectiveness analysis, transport systems, maintenance depots, geographic information systems, predictive analytics*

ABSTRACT-ONLY PUBLICATION

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

✉ **REQUEST FULL PAPER**

Email: info@parj.africa

Request your copy of the full paper today!

SUBMIT YOUR RESEARCH

Are you a researcher in Africa? We welcome your submissions!

Join our community of African scholars and share your groundbreaking work.

Submit at: app.parj.africa



Scan to visit app.parj.africa

Open Access Scholarship from PARJ

Empowering African Research | Advancing Global Knowledge