



Methodological Evaluation of Transport Maintenance Depot Systems in Tanzania Using Multilevel Regression Analysis for Efficiency Gains

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Abstract

Transport maintenance depots (TMDs) in Tanzania play a critical role in ensuring vehicles are operational and efficient across various sectors such as agriculture and mining. A multilevel regression model was employed, accounting for both fixed effects (e.g., depot size) and random effects (e.g., regional variations). The analysis revealed significant differences in maintenance times across different regions with a relative efficiency gain of up to 20% when considering inter-regional variability. Multilevel regression analysis provides robust insights into the operational efficiency of TMDs, facilitating targeted interventions for improvement. Regional authorities should prioritise investments in infrastructure and training to enhance depot performance. The maintenance outcome was modelled as $Y_{ij} = \beta_0 + \beta_1 X_{ij} + u_i + v_j + \epsilon_{ij}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: Tanzania, Multilevel Regression, Depot Management, Efficiency Metrics, Spatial Analysis, Hierarchical Models, Quality Control

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