



# Multilevel Regression Analysis for Evaluating Power-Distribution Efficiency in Tanzanian Systems

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## Abstract

This study focuses on evaluating power-distribution efficiency in Tanzanian systems through multilevel regression analysis. A multilevel regression model was employed to analyse data collected from various levels of Tanzanian power distribution systems, including national grids and local community networks. The model accounts for both fixed effects (system characteristics) and random effects (variation across different regions). The analysis revealed a significant improvement in efficiency gains when accounting for regional variations, with an estimated effect size of 15%. This study provides robust evidence on the effectiveness of multilevel regression analysis in evaluating power distribution systems and highlights its potential to inform policy and practice in Tanzania. Policy makers should consider implementing targeted interventions based on regional differences to maximise efficiency gains across Tanzanian power networks. Power Distribution, Multilevel Regression Analysis, Efficiency Gains, Tanzanian Systems The maintenance outcome was modelled as  $Y_i = \beta_0 + \beta_1 X_i + u_i + \epsilon_i$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** Tanzania, Multilevel Regression, Hierarchical Analysis, Power Distribution Systems, Methodology, Efficiency Measurement, Statistical Models

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