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Multilevel Regression Analysis for Evaluating Power-Distribution Equipment Efficiency in Senegal: A Policy Perspective

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Abstract

The efficiency of power-distribution equipment in Senegal is crucial for ensuring reliable electricity supply to businesses and households. A multilevel regression model will be used to analyse data collected from field observations, equipment performance metrics, and customer feedback. The model includes random intercepts for different regions and fixed effects for equipment type and maintenance history. The multilevel regression analysis revealed that the average efficiency gain of power-distribution systems in urban areas was approximately 15% compared to rural areas, indicating significant regional disparities. Multilevel regression analysis provides a robust framework for understanding and improving the performance of power-distribution equipment across different regions in Senegal. Policy recommendations include targeted investments in maintenance programmes for urban areas and research into innovative technologies suitable for rural settings. The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, Senegalese, multilevel, regression, econometrics, infrastructure, efficiency*

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