African Maintenance Engineering

Multilevel Regression Analysis for Risk Reduction in Power-Distribution Equipment Systems in Ethiopia,

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Abstract

Power-distribution equipment systems in Ethiopia have faced challenges related to reliability and maintenance efficiency over time. Multilevel regression analysis was employed to identify factors influencing system reliability and propose strategies for improvement. The analysis revealed that investment in preventive maintenance at a community level significantly reduced equipment failure rates by 18% compared to uninvested areas, with robust standard errors indicating reliable estimates. Multilevel regression analysis provides a structured approach for risk assessment and management of power-distribution systems in Ethiopia. Implementing preventive maintenance programmes at the community level is recommended as an effective strategy for reducing equipment failures. The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *African geography, regression analysis, multilevel modelling, reliability engineering, maintenance efficiency, power distribution systems, structural equation modelling*

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