



Power-Distribution Equipment Reliability in Rwanda: A Multilevel Regression Analysis

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Abstract

Power-distribution equipment systems are critical for ensuring reliable power supply in Rwanda's industrial and residential sectors. A multilevel regression model with robust standard errors was applied to analyse data from various Rwandan regions. The analysis revealed a significant effect of regional infrastructure on power distribution equipment reliability ($p < 0.05$). Regional differences in infrastructure significantly impact the reliability of power-distribution systems. Investment in improving regional infrastructure is recommended to enhance system reliability. Power Distribution, Multilevel Regression, Infrastructure, Reliability, Rwanda The maintenance outcome was modelled as $Y = \beta_0 + \beta_1 X + u_i + \text{varepsilon}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: Rwanda, Geographic Information Systems (GIS), Power-Distribution Equipment (PDE), Multilevel Modelling, Structural Equation Modelling, Reliability Engineering, Statistical Analysis

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