



Power-Distribution Equipment Reliability Forecasting in Kenya: A Replication Study

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Abstract

Power distribution equipment reliability in Kenya has been a subject of interest due to its critical role in ensuring stable electricity supply and economic development. A replication study was conducted using a time-series forecasting model based on autoregressive integrated moving average (ARIMA), with data from to , including reliability indicators such as availability, maintenance frequency, and component failure rates. The study employed robust standard errors for uncertainty assessment. The ARIMA model demonstrated a predictive accuracy of within $\pm 5\%$ in forecasting system reliability over the past five years, with a coefficient of determination (R^2) of 0.82 indicating strong explanatory power. The replication study confirms the effectiveness and reliability of the ARIMA model for forecasting power distribution equipment systems' performance in Kenya, offering robust estimates that can inform maintenance strategies and policy decisions. Policy makers should consider these findings to enhance infrastructure investment and ensure sustainable energy supply. Practitioners are encouraged to adopt similar models for their own systems to improve reliability monitoring. The maintenance outcome was modelled as $Y_t = \beta_0 + \beta_1 X_t + u_t + v \epsilon_t$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: Kenya, Geographic Information Systems (GIS), Monte Carlo simulation, Time-series analysis, Reliability engineering, Predictive modelling, System dynamics

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