Time-Series Forecasting Model Evaluation in Off-Grid Communities of Uganda: A Meta-Analysis

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Abstract

Time-series forecasting models are essential tools for understanding trends in off-grid communities' adoption of renewable energy technologies. A comprehensive review of existing studies was conducted, with a focus on methodologies for time-series analysis applied to renewable energy data from Uganda. The models considered include ARIMA (Autoregressive Integrated Moving Average) and SARIMA (Seasonal Autoregressive Integrated Moving Average). One specific model, the SARIMA(1,0,1)(0,1,1)[12], showed a 95% confidence interval for its forecast errors within ±3 percentage points over a five-year period. The study concludes that while ARIMA models are widely used, SARIMA variants provide more accurate forecasts with seasonal adjustments. Further research should explore the applicability of these findings in other Ugandan off-grid communities and consider incorporating additional variables such as socioeconomic factors. Off-Grid Communities, Renewable Energy Adoption, Time-Series Forecasting, ARIMA, SARIMA The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

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