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Methodological Evaluation of Off-Grid Communities Systems in Kenya Using Time-Series Forecasting Models

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Abstract

In Kenya, off-grid communities face challenges in accessing reliable energy sources, leading to inefficiencies in their systems. Current methodologies for evaluating these systems are varied and lack a standardised approach. A comprehensive systematic review was conducted using electronic databases such as PubMed, Scopus, and Web of Science. Studies were selected based on specific eligibility criteria related to methodologies used for evaluating off-grid energy systems. The findings indicated that time-series forecasting models can effectively measure efficiency gains in these systems, with some studies showing a 15% improvement in forecast accuracy when using ARIMA models compared to simpler methods. Time-series forecasting models provide valuable insights into the performance of off-grid energy systems and offer a standardised approach for evaluating their efficiency. Future research should focus on integrating these models with real-world data to validate their predictive capabilities in diverse settings. Policymakers could also benefit from using this method to inform energy policy decisions. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Kenya, Off-Grid Communities, Methodology, Energy Efficiency, Time-Series Analysis, Forecasting Models, Geographic Information Systems*

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