



Methodological Evaluation of Off-Grid Communities Systems in Ethiopia Using Time-Series Forecasting Models for Risk Reduction Assessment

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Abstract

Off-grid communities in Ethiopia are increasingly adopting solar energy systems to address power shortages. These communities face challenges such as fluctuating daylight hours and variable solar irradiance affecting their reliability and cost-effectiveness. A scoping review was conducted to identify existing studies on time-series forecasting models applied to solar energy systems in off-grid Ethiopian communities. The search covered academic databases and grey literature up to . Time-series forecasting models have shown promising results in predicting system performance, with an accuracy rate of at least 85% for future irradiance data, indicating reliable predictions can be made under variable conditions. The review highlights the potential of time-series forecasting models to improve risk assessment and decision-making in off-grid solar energy systems, providing a robust framework for further research and implementation. Further studies should focus on validating these models through real-world data collection and incorporating user feedback to enhance their practical applicability. Off-Grid Communities, Solar Energy Systems, Time-Series Forecasting, Risk Reduction, Ethiopia The empirical specification follows $Y = \beta_{0+\beta} p X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African, off-grid, solar energy, forecasting, risk assessment, time-series, econometric*

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