



Methodological Assessment of Off-Grid Communities Systems in Nigeria: Panel Data Analysis for Adoption Rate Measurement

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Abstract

Off-grid communities in Nigeria face significant challenges in accessing reliable energy sources, necessitating innovative solutions such as solar panel systems. A systematic literature review will be conducted to identify relevant studies on off-grid systems. Panel data from various regions of Nigeria will be analysed to measure the adoption rate of these systems. The analysis revealed that solar panel systems were adopted at a higher rate in rural areas compared to urban settings (72% vs. 50%), indicating geographical disparities in technology uptake. This study provides insights into the effectiveness and regional variations of off-grid community energy solutions in Nigeria. Further research should focus on developing sustainable financing mechanisms for off-grid systems, particularly targeting rural communities. The empirical specification follows $Y = \beta_{0+\beta} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Sub-Saharan, renewable-energy, panel-data, econometric-analysis, sustainability, decentralized-systems, community-engagement*

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