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# Off-grid Communities Systems in Ghana: Methodological Evaluation and Quasi-Experimental Assessment of Cost-Effectiveness

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## Abstract

Off-grid communities in Ghana are facing challenges in accessing reliable electricity sources, necessitating innovative solutions for sustainable energy provision. A mixed-method approach was employed, integrating quantitative data collection (cost-benefit analysis) and qualitative interviews (perceptions and experiences). The cost-effectiveness of the off-grid systems varied by community type, with solar-powered solutions being the most cost-effective in rural areas. This study provides a robust framework for assessing similar projects in other regions, highlighting the need for tailored energy solutions based on local contexts. Further research should include longitudinal studies and explore multi-faceted impacts of these systems on community development. Off-grid communities, Ghana, cost-effectiveness, quasi-experimental design, sustainability The empirical specification follows $Y = \vec{\beta}_{0+\beta}\, p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

**Keywords:** *Sub-Saharan, African, SpatialAnalysis, Econometrics, RandomizedControlTrial, BalancedDesign, QualitativeResearch*

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