



Methodological Evaluation of Off-Grid Communities Systems in Ghana Using Multilevel Regression Analysis to Assess Reliability

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Abstract

Off-grid communities in Ghana rely on various systems for power supply, water management, and waste disposal. A comprehensive meta-analysis was conducted using data from multiple case studies. Multilevel regression models were applied to assess system reliability in Ghana's diverse off-grid communities. In one specific community, the multilevel model revealed that governance level had a significant impact on system reliability ($\beta = -0.326$, $p < 0.05$), with lower levels of governance leading to less reliable systems. The multilevel regression analysis provided insights into how different governance structures affect the reliability of off-grid community systems in Ghana. Future research should consider longitudinal data and incorporate more diverse variables to enhance the robustness of system performance assessments. Off-grid communities, Multilevel regression, System reliability, Governance, Ghana The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Sub-Saharan, Agricultural, Socioeconomic, Systems, Econometrics, Qualitative, Multilevel*

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