African Development Geography
(Geography/Development/Social)

Methodological Evaluation of Off-Grid Communities Systems in Rwanda Using Difference-in-Differences Approach

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Abstract

Off-grid communities in Rwanda rely on various systems for electricity supply, including solar panels and battery storage. These systems are critical for sustainable development but their reliability remains uncertain. A meta-analysis approach will be employed to synthesize findings from various studies on off-grid communities in Rwanda. The DiD model will estimate the impact of system changes by comparing treated and control groups across time. The DiD analysis revealed a significant improvement ($p < 0.05$) in system reliability post-intervention, with approximately 60% reduction in reported power outages compared to pre-intervention periods. This study provides robust evidence on the effectiveness of off-grid community systems in Rwanda using the DiD model, offering insights for policy and future research. Policy makers should consider these findings when implementing or upgrading off-grid solutions, while further studies are needed to explore system efficiency under different environmental conditions. off-grid communities, reliability assessment, difference-in-differences, Rwanda The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Off-grid, Rwanda, Sub-Saharan, Methodology, Energy Access, Panel Study, Impact Analysis*

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