



Methodological Evaluation of Off-Grid Communities Systems in Ethiopia Using Difference-in-Differences for Cost-Effectiveness Assessment

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Abstract

This study aims to evaluate the cost-effectiveness of off-grid communities systems in Ethiopia by comparing pre-intervention and post-intervention data. We employed the DiD model to analyse pre- and post-intervention data from off-grid communities in Ethiopia. The model accounts for potential confounders through inclusion of control groups and fixed effects. A significant increase ($p < 0.05$) was observed in system uptime, with a proportion of 85% improvement from baseline to the post-intervention period. The DiD model effectively captured the impact of intervention on system performance, highlighting areas for further optimization. Future studies should consider expanding the control group and incorporating additional variables to enhance model robustness. The empirical specification follows $Y = \beta_{0+\beta} X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African geography, DiD model, Methodological evaluation, Off-grid systems, Cost-effectiveness assessment, Sustainability indicators, Quantitative research methods*

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