



Methodological Evaluation of Off-Grid Communities Systems in Nigeria Using Difference-in-Differences for System Reliability Assessment

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Abstract

This study examines the reliability of off-grid communities systems in Nigeria, focusing on their methodological evaluation. A difference-in-differences (DiD) statistical model was employed to analyse the impact of interventions on off-grid communities' systems reliability. This approach compares changes in outcomes between treatment and control groups over time. The DiD analysis revealed a significant reduction in system failures by 20% within the intervention group compared to the control group, providing concrete evidence for the effectiveness of certain system improvements. The findings suggest that implementing specific upgrades can substantially improve system reliability among off-grid communities in Nigeria. Based on these results, recommendations include prioritising maintenance and upgrading systems in areas with higher failure rates to enhance overall reliability. The empirical specification follows $Y = \beta_{0+\beta}^{-} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: Nigerian, off-grid, communities, systems, reliability, methodology, econometrics, DiD

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