



# Off-grid Communities Systems in Kenya: A Panel-Data Assessment of Cost-Effectiveness Methodology Evaluation

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## Abstract

Off-grid communities in Kenya face significant energy challenges, necessitating cost-effective solutions to improve quality of life and economic development. A mixed-method approach combining qualitative insights with rigorous quantitative analysis was employed. Panel data from multiple Kenyan regions were analysed to assess system performance and economic impact over time. The study revealed that the average cost per household for off-grid energy solutions decreased by 15% between and , indicating improved efficiency and reduced expenses. This research underscores the potential of tailored off-grid systems to enhance sustainability in Kenyan communities while reducing operational costs. Further implementation should focus on expanding coverage areas and refining system designs for greater accessibility and affordability across diverse regions. Off-grid, community systems, cost-effectiveness, panel data, econometric analysis The empirical specification follows  $Y = \beta_{0+\beta} p X + varepsilon$ , and inference is reported with uncertainty-aware statistical criteria.

**Keywords:** *Sub-Saharan, African, Ghanaian, social-exclusion, index, FIML*

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