



Off-grid Communities Systems in Senegal: A Multilevel Regression Analysis for Cost-Effectiveness Evaluation

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Abstract

Off-grid communities in Senegal face challenges in accessing electricity, necessitating innovative solutions. A multilevel regression analysis was conducted to assess the impact of various socioeconomic variables on system efficiency across different geographical regions in Senegal. The analysis revealed a significant positive correlation ($p < 0.05$) between per capita income and the level of electrification, indicating that higher-income communities achieved better performance with their off-grid systems. Multilevel regression analysis provided robust insights into cost-effectiveness metrics for off-grid community systems in Senegal. Further research should focus on implementing energy-efficient technologies and improving access to finance for low-income households. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: Sub-Saharan, African, Socioeconomic, factor analysis, multilevel, modelling, regression, evaluation

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