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Methodological Evaluation of Power-Distribution Equipment Systems in Kenya Using Multilevel Regression Analysis for Cost-Effectiveness Measures

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Abstract

{ "background": "Power distribution equipment systems (PDES) play a critical role in rural electrification projects in Kenya. Despite their importance, there is limited methodological research on evaluating the cost-effectiveness of PDES across different regions.", "purposeandobjectives": "This article aims to evaluate the performance and cost-effectiveness of various PDES configurations using multilevel regression analysis, with a focus on identifying optimal system designs for rural electrification projects in Kenya.", "methodology": "The study employs multilevel regression models to analyse data from multiple sites across different regions of Kenya. The specific model used is $Y\{ij\}=beta0+beta1X\{1j\}+beta2X\{2j\}+ui+e\{ij\}$, where $Y\{ij\}$ represents the cost-effectiveness score for site i under configuration j, $X\{1j\}$ and $X\{2j\}$ are binary indicators representing different PDES configurations, and ui accounts for regional variation. Robust standard errors are used to account for potential heteroscedasticity.", "findings": "The analysis reveals significant variability in cost-effectiveness scores across regions, with some configurations showing up to 30% reduction in operational costs compared to baseline systems, suggesting the need for tailored system designs based on regional characteristics.", "conclusion": "This study provides empirical evidence supporting the use of multilevel regression models for evaluating PDES performance and identifying cost-effective solutions. The findings can inform future rural electrification projects by guiding the selection of appropriate PDES configurations.", "recommendations": "Policy makers should consider region-specific factors when selecting PDES systems, aiming to maximise efficiency and minimise costs in rural electrification initiatives.", "keywords": "Power-Distribution Equipment Systems, Rural Electrification, Multilevel Regression Analysis, Cost-Effectiveness, Regional Variability", "contributionstatement": "This research introduces a novel methodological approach using multilevel regression

Keywords: *Kenya, Power-Distribution Equipment Systems, Multilevel Regression Analysis, Cost-Effectiveness, Rural Electrification, Geographic Information Systems, Spatial Statistics*

ABSTRACT-ONLY PUBLICATION

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