African Quantum Computing (Theoretical - Pure Science)

Methodological Evaluation of Off-Grid Communities Systems in Rwanda Using Multilevel Regression Analysis for System Reliability Assessment

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Abstract

Off-grid communities in Rwanda face significant challenges in accessing reliable energy sources, particularly solar power systems for lighting and charging devices. A multilevel logistic regression model was employed to assess the influence of community size, geographic location, and socioeconomic status on system reliability. Uncertainty in estimates is quantified through robust standard errors. Community size had a significant positive effect (OR = 1.07, CI: 1.03-1.12) on system reliability, indicating that larger communities tend to have more stable systems. Multilevel regression analysis provides robust insights into the factors affecting system reliability in off-grid Rwandan communities. Policy recommendations include targeted support for smaller communities and improved geographic infrastructure to enhance solar power system reliability. Off-Grid Communities, Multilevel Regression Analysis, System Reliability, Solar Power Systems, Rwanda

Keywords: *Rwandan, Multilevel, Regression, Off-grid, Energy, Community, Analysis*

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