African Legislative Studies (Political Science focus)

Methodological Evaluation of Off-Grid Communities Systems in Rwanda: A Randomized Field Trial for Measuring Risk Reduction

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Abstract

The rapid expansion of off-grid communities systems in Rwanda has led to a need for rigorous evaluation methods to assess their impact on reducing risks associated with unreliable energy supply. A randomized field trial was implemented across three villages in Rwanda. Participants received either an off-grid system or a control group. Data collection included surveys for user satisfaction and financial metrics over six months. The findings indicate that the off-grid systems led to a significant increase ($p < 0.05$) in user satisfaction by 20% compared to the baseline, suggesting improved reliability as a key risk reduction factor. This randomized field trial provides robust evidence on the benefits of off-grid communities systems in reducing risk factors such as energy unreliability and cost. The results offer insights for policy makers aiming to enhance resilience in rural electrification strategies. Based on these findings, policymakers should prioritise investment in reliable off-grid systems that incorporate user feedback mechanisms to ensure continuous improvement and sustainability. Model estimation used $\hat{\{\theta\}} = argmin\{\theta\} sumiell(yi, f\theta(\xi)) + \lambda lVert\theta rVert 2^2$, with performance evaluated using out-of-sample error.

Keywords: *Rwanda, Off-grid, Geographic Information Systems, Sampling Theory, Risk Analysis, Randomized Controlled Trials, Sustainable Energy Solutions*

ABSTRACT-ONLY PUBLICATION

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