



Evaluating Community-Sourced Solar Power Stations in Rural Zimbabwe: Energy Access and Economic Viability Study

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Abstract

Solar power stations have been implemented in rural areas of Zimbabwe to address energy access issues. A mixed-methods approach combining quantitative data from surveys and interviews with qualitative insights from focus group discussions to assess the effectiveness of these projects in rural settings. Community participation rates were notably high (85% for solar station management committees), indicating strong community engagement but also suggesting potential challenges in sustaining long-term project success. While initial energy access improvements are evident, economic benefits require further analysis to determine sustained viability and impact on rural livelihoods. Further research is needed to explore the long-term economic impacts of these projects and identify strategies for enhancing community involvement and financial sustainability. Model estimation used $\hat{\theta} = \underset{\theta}{\operatorname{argmin}} \{ \sum_{i=1}^n (y_i - f(\theta; \xi))^2 + \lambda \|\theta\|_2^2 \}$, with performance evaluated using out-of-sample error.

Keywords: *Solar Energy, Rural Development, Community Participation, Geographic Information Systems, Participatory Evaluation, Renewable Resources, Sustainability Studies*

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