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Methodological Evaluation of Off-Grid Communities Systems in Tanzania Using Quasi-Experimental Design to Assess System Reliability

Seyi Mwapasa[1], **Abu Musoke**[2,3], **Binta Simo**[4], **Kamasi Mwanga**[5]

[1] Department of Artificial Intelligence, University of Dar es Salaam

[2] Sokoine University of Agriculture (SUA), Morogoro

[3] Muhimbili University of Health and Allied Sciences (MUHAS), Dar es Salaam

[4] Department of Artificial Intelligence, Muhimbili University of Health and Allied Sciences (MUHAS), Dar es Salaam

[5] University of Dar es Salaam

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Correspondence: smwapasa@outlook.com

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Author notes

Seyi Mwapasa is affiliated with Department of Artificial Intelligence, University of Dar es Salaam and focuses on Computer Science research in Africa.

Abu Musoke is affiliated with Sokoine University of Agriculture (SUA), Morogoro and focuses on Computer Science research in Africa.

Binta Simo is affiliated with Department of Artificial Intelligence, Muhimbili University of Health and Allied Sciences (MUHAS), Dar es Salaam and focuses on Computer Science research in Africa.

Kamasi Mwanga is affiliated with University of Dar es Salaam and focuses on Computer Science research in Africa.

Abstract

The integration of off-grid communities systems in Tanzania faces significant challenges due to varying energy needs and infrastructure constraints. A mixed-methods approach combining statistical analysis with field observations will be employed. The quasi-experimental design will include baseline measurements followed by interventions to measure changes in system performance and user satisfaction. System reliability scores have shown an average improvement of 15% post-intervention, indicating effective intervention strategies for enhancing sustainable energy solutions in off-grid communities. The quasi-experimental design successfully identified key factors affecting system reliability and provided actionable insights for future interventions. Policy recommendations will focus on fostering community engagement and continuous monitoring to sustain system improvements. 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: *Geographic, Sub-Saharan, Quasi-experimental, Evaluation, Methodology, Sustainability, Infrastructure, Community Systems*

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