



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

Mujawanda Umuhoza^{1,2}, Kizito Nyamwanga^{3,4}, Gatera Kambukiza⁴, Nyamagana Rugamba¹

¹ University of Rwanda

² African Leadership University (ALU), Kigali

³ Department of Interdisciplinary Studies, African Leadership University (ALU), Kigali

⁴ Department of Research, Rwanda Environment Management Authority (REMA)

Published: 15 February 2007 | **Received:** 25 November 2006 | **Accepted:** 02 January 2007

Correspondence: mumuhoza@outlook.com

DOI: [10.5281/zenodo.18854797](https://doi.org/10.5281/zenodo.18854797)

Author notes

Mujawanda Umuhoza is affiliated with University of Rwanda and focuses on Environmental Science research in Africa.

Kizito Nyamwanga is affiliated with Department of Interdisciplinary Studies, African Leadership University (ALU), Kigali and focuses on Environmental Science research in Africa.

Gatera Kambukiza is affiliated with Department of Research, Rwanda Environment Management Authority (REMA) and focuses on Environmental Science research in Africa.

Nyamagana Rugamba is affiliated with University of Rwanda and focuses on Environmental Science research in Africa.

Abstract

Off-grid communities in Rwanda face challenges accessing reliable electricity sources, leading to high costs and limited access to essential services. A meta-analysis approach was employed to synthesize existing data from various studies in Rwanda. Multilevel regression models were used to analyse system costs and benefits across different geographical regions and socio-economic groups. The analysis revealed that solar home systems (SHS) are the most cost-effective option, with an average cost-effectiveness ratio of 200 per household year for rural areas compared to grid-connected solutions, which were found to be more expensive at 350 per household year in urban settings. The multilevel regression models provided robust estimates of system costs and benefits, enabling policymakers to make informed decisions about off-grid energy investments in Rwanda. Policymakers should prioritise the adoption of solar home systems for rural areas due to their cost-effectiveness. Urban settings may benefit from a mix of grid-connected solutions and SHS depending on specific needs and infrastructure availability. off-grid communities, multilevel regression analysis, cost-effectiveness, Rwanda, renewable energy

Keywords: Sub-Saharan, Rwanda, Multilevel, Regression, Cost-Benefit, Evaluation, Sustainability

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

✉ **REQUEST FULL PAPER**

Email: info@parj.africa

Request your copy of the full paper today!

SUBMIT YOUR RESEARCH

Are you a researcher in Africa? We welcome your submissions!

Join our community of African scholars and share your groundbreaking work.

Submit at: app.parj.africa



Scan to visit app.parj.africa

Open Access Scholarship from PARJ

Empowering African Research | Advancing Global Knowledge