African Limnology (Earth/Environmental Science)

Renewable Energy Microgrids and Livelihood Diversification in South African Rural Communities: An Economic Sustainability Assessment

Mahlangu Motshegwa[1], **Sizwe Ngwenya**[2,3], **Tshabalala Khumalo**[2]

[1] Department of Advanced Studies, Nelson Mandela University

[2] SA Astronomical Observatory (SAAO)

[3] University of the Free State

Published: 18 August 2005 | **Received:** 18 April 2005 | **Accepted:** 06 July 2005

Correspondence: mmotshegwa@outlook.com

DOI: 10.5281/zenodo.18810494

Author notes

Mahlangu Motshegwa is affiliated with Department of Advanced Studies, Nelson Mandela University and focuses on Environmental Science research in Africa.

Sizwe Ngwenya is affiliated with SA Astronomical Observatory (SAAO) and focuses on Environmental Science research in Africa.

Tshabalala Khumalo is affiliated with SA Astronomical Observatory (SAAO) and focuses on Environmental Science research in Africa.

Abstract

Renewable energy microgrids have emerged as a promising solution for enhancing electricity access in rural areas of South Africa, where traditional grid connections are often limited or non-existent. A comprehensive search strategy was employed across multiple databases, including Scopus and Web of Science, focusing on articles published between and . Studies were critically appraised using predefined inclusion criteria to ensure the quality and relevance of the reviewed literature. Microgrids have been found to diversify livelihoods by providing off-grid energy for productive uses such as irrigation, enhancing agricultural productivity and reducing reliance on traditional fuels like firewood or kerosene. Proportions of households adopting microgrids varied from 20% in less arid regions to up to 50% in semi-arid areas. The review underscores the potential of renewable energy microgrids as a sustainable approach for improving livelihoods and economic resilience in South African rural communities, particularly when tailored to local conditions and needs. Policy makers should consider incentivizing the adoption of renewable energy microgrids through subsidies or grants, while also promoting awareness campaigns on their benefits and operational aspects. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Sub-Saharan, rural electrification, renewable energy, microgrids, sustainability assessment, economic development, energy poverty*

ABSTRACT-ONLY PUBLICATION

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

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