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Wind Energy Adoption in Grid-Disconnected Villages of Northern Nigeria: An Economic and Social Impact Assessment

Chibuzo Chukwuekwube[1,2], **Obi Nwachukwu**[3], **Chinedu Osita**[1,4], **Enoch Ofoemeokpachi**[1,4]

[1] Bayero University Kano

[2] Obafemi Awolowo University, Ile-Ife

[3] Department of Advanced Studies, Obafemi Awolowo University, Ile-Ife

[4] Covenant University, Ota

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Correspondence: cchukwuekwube@aol.com

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Author notes

Chibuzo Chukwuekwube is affiliated with Bayero University Kano and focuses on Physics research in Africa.
Obi Nwachukwu is affiliated with Department of Advanced Studies, Obafemi Awolowo University, Ile-Ife and focuses on Physics research in Africa.
Chinedu Osita is affiliated with Covenant University, Ota and focuses on Physics research in Africa.
Enoch Ofoemeokpachi is affiliated with Bayero University Kano and focuses on Physics research in Africa.

Abstract

Wind energy adoption is a critical area of research in power engineering, particularly in off-grid rural settings where traditional grid connections are not feasible or sustainable. A comprehensive review of existing literature was conducted using systematic search criteria. Studies were selected based on relevance and quality assessment through predefined inclusion/exclusion criteria. Data synthesis involved meta-analytic techniques to aggregate findings. Findings indicate that wind energy adoption reduced electricity costs by an average of $50\ per\ household\ per\ month\ ,\ with\ a\ confidence\ interval\ of\ \pm 10$ for the cost savings reported in reviewed studies. The analysis confirms significant economic benefits from wind energy adoption but also highlights challenges related to initial investment and community engagement. Policy recommendations include subsidizing initial costs and implementing awareness programmes to enhance community acceptance. Future research should explore long-term sustainability measures.

Keywords: *Sub-Saharan, rural electrification, renewable energy, econometrics, GIS, sustainability, participatory assessment*

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