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Assessing Public Awareness and Perception of Renewable Energy Technologies in the Northeastern Nigerian Construction Industry

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Abstract

The transition to renewable energy is critical for addressing environmental sustainability and energy security concerns. This study examines public awareness and perception of renewable energy technologies (RETs) in North Eastern Nigeria, with an emphasis on their potential for supporting sustainable housing solutions. The target population comprised 100 households from four states: Adamawa, Taraba, Bauchi, and Gombe. These states were chosen due to the relative peace they're experiencing compared to other states in the region. A questionnaire was used to collect data for the research. Hence, quantitative research design was employed, utilizing an online survey to gather responses from 80 households across four states. Multiple regression analysis revealed that willingness to adopt RETs, individual environmental perceptions, and perceived risk reduction significantly influence public acceptance. Willingness to Innovate (WTI) ($\beta = 0.303$, SE = 0.109), Personal Environmental Perception (PEP) ($\beta = 0.227$, SE = 0.104), and Perceived Risk Reduction Effect (PRRE) ($\beta = 0.195$, SE = 0.077) show strong positive associations with perceptions of RETs' capability to meet household energy needs. However, barriers such as high installation costs, insufficient knowledge, and weak policy implementation continue to hinder adoption. The study underscores the need for increased public awareness, government incentives, and supportive infrastructure to facilitate RET adoption. The findings provide valuable insights for policymakers and stakeholders in formulating strategies to promote sustainable energy solutions in Nigeria.

Keywords: Assessment, Construction Industry, Perception, Public Awareness, Renewable Energy, Technologies.

Introduction

The socioeconomic growth of any nation is strongly tied to the stability and efficiency of its energy sector (Olatunji et al., 2018). With rapid urbanization and population growth, the demand for urban housing and energy has risen significantly (Olotuah et al., 2019). Globally, buildings account for approximately 40% of total energy consumption, which is required for essential activities such as cooking, refrigeration, and ventilation (Bhagat et al., 2022; IRENA, 2023). However, in many countries, including Nigeria, this energy demand is met primarily through fossil fuels, contributing to significant environmental and public health challenges (Ritchie et al., 2020; Chanchangi et al., 2022).

Since the Industrial Revolution, fossil fuels have dominated the global energy mix, accounting for roughly three-quarters of greenhouse gas emissions (Zhang et al., 2019; Ritchie et al., 2020). Consequently, there is growing global consensus on the need to transition to renewable energy sources (RES) to foster long-term sustainability (Omoregie, 2020). Renewable energy technologies (RETs) offer a promising pathway for mitigating the harmful effects of fossil-based energy systems while delivering economic and environmental benefits (Tabrizian, 2019). The ongoing shift toward decentralized and smart energy systems powered by renewables is poised to transform socioeconomic dynamics worldwide (Amega et al., 2022).

Nigeria, despite being Africa's largest crude oil and gas producer, faces considerable challenges in its transition to a renewable energy economy. Factors such as crude oil theft, gas flaring, price volatility, corruption, and mismanagement continue to undermine national energy self-sufficiency (NSCP, 2021). Currently, approximately 45% of Nigeria's population lacks access to the national grid, leading to widespread reliance on petrol and diesel generators (Elinwa et al., 2020). In addition, persistent issues with transmission infrastructure, inadequate distribution networks, aging power systems, and vandalism contribute to unreliable electricity supply (Dodo et al., 2020), with adverse consequences for national development.

Renewable energy offers significant potential to reduce dependence on fossil fuels and advance sustainability goals, including SDG 7: Affordable and Clean Energy (Chanchangi et al., 2022). In a context marked by frequent power outages and limited grid coverage, community-based renewable energy initiatives could play a transformative role in enhancing energy access (Ugulu and Aigbovboa, 2019). However, these projects typically require careful planning, substantial investment, and supportive public policies. Public perceptions of and attitudes toward renewable energy are critical to the success of such initiatives (Ribeiro et al., 2018).

Against this backdrop, this study investigates public awareness and perceptions of renewable energy technologies in North Eastern Nigeria. The objective is to assess public awareness and perception of renewable energy technologies and provide actionable recommendations to foster greater adoption of renewable energy in the region's construction sector and contribute to the development of sustainable housing solutions.

Methodology

This study adopted a quantitative research design to assess relationships between key variables related to renewable energy adoption. This approach was selected for its ability to support broad population coverage and ensure statistical objectivity. It enables the identification of underlying patterns through systematic data collection and analysis, using deductive reasoning to confirm or refute relevant theoretical assumptions (Ali, 2021).

The study was conducted in North Eastern Nigeria—a region with high levels of solar radiation, making it an attractive site for potential solar energy investments. The target population comprised 100 households from four states: Adamawa, Taraba, Bauchi, and Gombe. These states were chosen due to the relative peace they're experiencing compared to other states in the region. Based on Krejcie and Morgan's (1970) sample size determination table, a sample size of 80 households was established.

The research employed a convenience sampling technique to facilitate data collection via online channels. This method enabled the distribution of an online survey using platforms such as WhatsApp and Facebook (Tanner, 2018). While convenience sampling may introduce limitations regarding representativeness, it offers practical advantages for exploratory studies in resource-constrained environments.

Primary data were collected through a structured online questionnaire administered using Google Forms. In addition, secondary data were obtained from relevant journal articles, reports, and institutional publications to provide contextual background and support analysis. Prior to analysis, the collected data were cleaned and pre-processed in Microsoft Excel to ensure accuracy and completeness. Statistical analysis was conducted using SPSS version 23 (Alem, 2020; Kapur, 2018).

Ethical considerations were prioritized throughout the research process. Informed consent was obtained from all participants, and strict measures were implemented to ensure the confidentiality and anonymity of respondents' data.

Results and Discussion

Demographic Profile of Respondents

The demographic analysis reveals that male respondents constitute the majority of the sample (84.4%), with females accounting for 15.6%, indicating a gender imbalance. The marital status distribution shows that most respondents are single (55.8%), followed by married individuals (42.9%), and a small proportion (1.9%) are divorced. This suggests that the sample comprises a relatively young and career-focused population.

Regarding educational attainment, the majority (67.5%) hold either a bachelor's degree (BSc, B.Tech, BA) or a Higher National Diploma (HND), while 16.9% possess secondary school qualifications. Respondents with a master's degree (MSc) account for 9.1%, and 6.5% hold an NCE or OND. In terms of employment status, 41.6% are in full-time employment, 26% are students, 13% are self-employed, 10.4% are unemployed, while part-time workers and homemakers account for 7.8% and 1.3%, respectively.

Regression Model Results

The multiple regression model (Table 1) explores factors influencing household perceptions of renewable energy technologies (RETs) in meeting domestic energy needs. The model demonstrates a good fit with an R^2 of 0.345, indicating that approximately 34.5% of the variance in household perception is explained by the predictor variables. The F-statistic (3.931) further confirms the model's overall statistical significance.

Among the independent variables, Willingness to Innovate (WTI) ($\beta = 0.303$, SE = 0.109), Personal Environmental Perception (PEP) ($\beta = 0.227$, SE = 0.104), and Perceived Risk Reduction Effect (PRRE) ($\beta = 0.195$, SE = 0.077) show strong positive associations with perceptions of RETs' capability to meet household energy needs.

Conversely, Gender ($\beta = -0.151$, SE = 0.181) and Environmental Knowledge (EQ) ($\beta = -0.073$, SE = 0.090) exhibit negative but relatively weak relationships with the dependent variable. Other variables, such as Age, Marital Status, Employment Information, and Public Awareness/Information, display minimal effects.

These results suggest that psychological and perceptual factors—such as openness to innovation, environmental consciousness, and risk perceptions—play a more substantial role in shaping attitudes toward RETs than demographic factors alone.

Table 2: Multiple Regression Model of Household Perception of Renewable Energy's Capability to Provide the needed Energy at Home.

Variables	Coefficient	Standard Error
Age	0.090	0.124
Gender	-0.151	0.181
MS	0.017	0.057
EQ	-0.073	0.090
EI	0.024	0.040
PAI	0.026	0.133
WTI	0.303	0.109
PEP	0.227	0.104
PRRE	0.195	0.077
R= 0.587		
R^2= 0.345		
F-statistics= 3.931		

Source: Author's computation (2023). MS= Marital status EQ= Educational qualification, EI= Employment information, PAI= Public awareness/information, WTI= Willingness to pay, PEP= Perception of renewable energy towards environmental protection PRRE= Perception of renewable energy's reliability, R= Pearson correlation coefficient and R^2= R squared.

Awareness of Renewable Energy Technologies

As illustrated in Figure 1, Hydropower emerges as the most widely recognized RET, with 50% of respondents reporting strong awareness. Solar photovoltaic and wind turbines are moderately known, with 30% and 25% of respondents indicating strong awareness, respectively. Awareness of biomass and energy storage technologies is somewhat lower (20–25%). In contrast, hydrogen fuel and smart grids remain relatively unfamiliar to the public, with 25–30% of respondents unaware of these technologies.

Similarly, IRENA (2023), reported greater public familiarity with traditional RETs compared to emerging technologies. This highlights a need for increased public education efforts on advanced RET solutions.

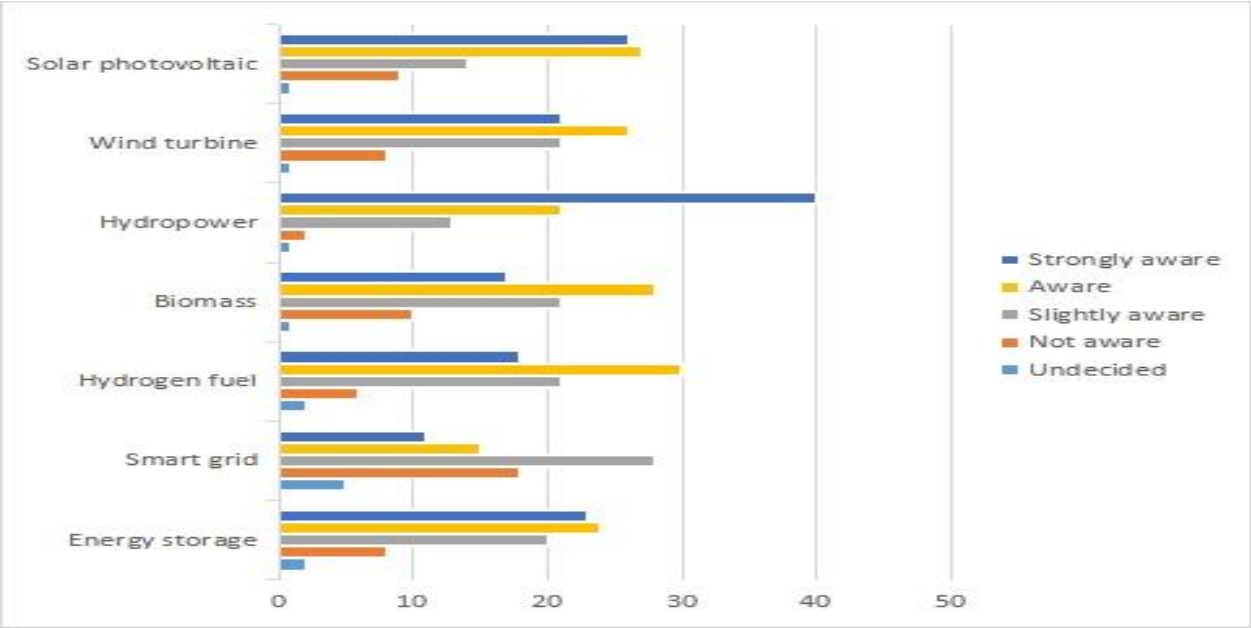

Figure 1: Level of awareness of renewable energy technologies.

Drivers of Renewable Energy Adoption

As shown in Figure 2, key drivers of RET adoption include the presence of effective policies and sector reforms (45–50%) and the local production of RET components (40–45%). Additionally, energy security and clean energy imperatives are acknowledged by 35–40% of respondents as important drivers.

While financial incentives and subsidies receive moderate support (30–35%), participation in policy-making processes and availability of after-sales services are perceived as weaker drivers, with 20–25% disagreement. These results align with Ugulu and Aigbovboa (2019), who identified policy reforms and incentives as essential enablers of RET adoption.

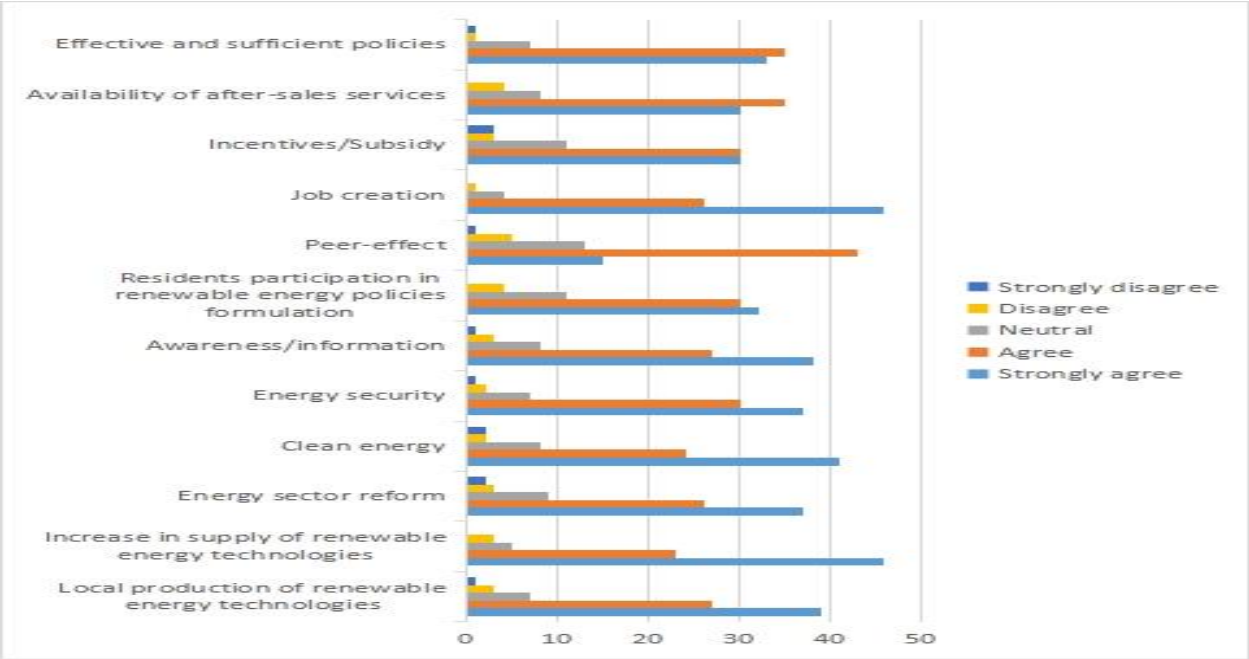

Figure 2: Drivers to the adoption of renewable energy.

Challenges to Renewable Energy Adoption

Respondents identified several significant barriers to RET adoption (Figure 3). The high initial cost of installation is the most frequently cited challenge (45%). Inadequate knowledge and awareness (30%) and limited access to funding (35%) are also critical impediments.

Other notable barriers include poor policy implementation and high import duties on RET components (30%), as well as limited technical expertise, lack of local manufacturing capacity, and weak standardization practices (25–35%). Furthermore, socio-economic factors such as poverty and behavioral resistance to change were cited by 20–30% of respondents.

These findings are consistent with prior studies (Zhang et al., 2019; Omoregie, 2020), which highlight cost, knowledge, and policy gaps as persistent obstacles to RET adoption in developing countries.

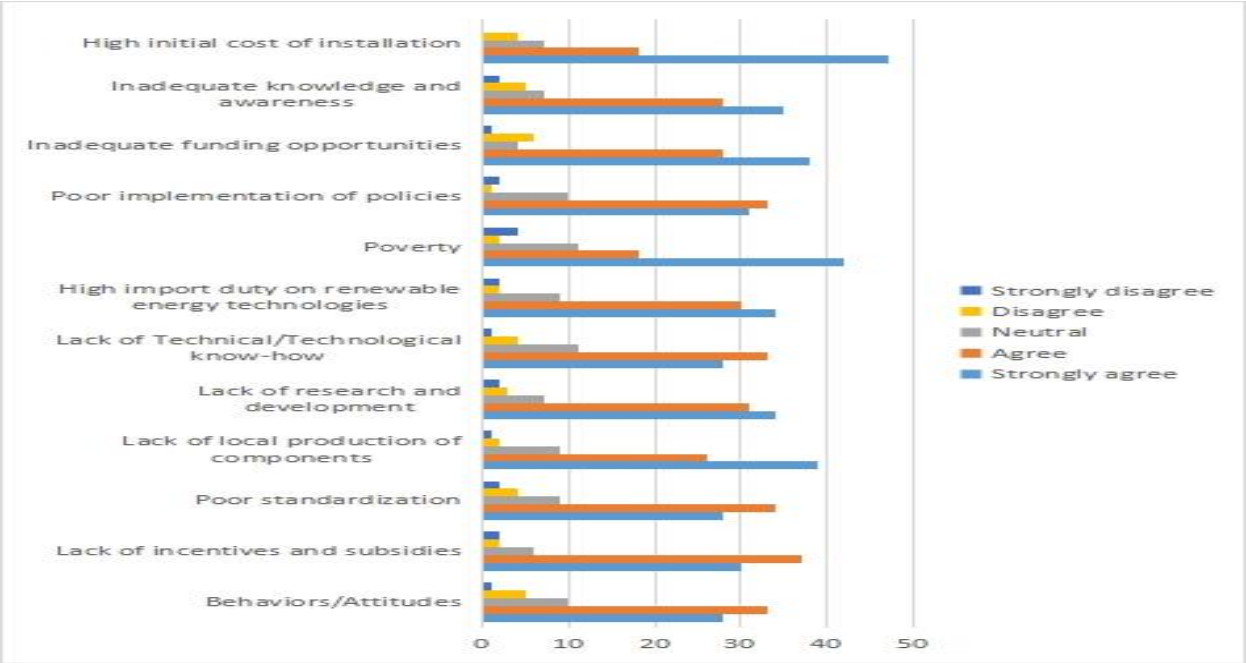

Figure 3: Challenges to the adoption of renewable energy.

Summary of Findings

Overall, the study demonstrates that public willingness to adopt RETs is significantly influenced by personal environmental perceptions and perceived risk reduction benefits. However, practical and financial barriers—especially installation costs and policy deficiencies—remain substantial hurdles. These findings underscore the need for integrated policy measures and public education initiatives to foster a supportive ecosystem for RET adoption in Nigeria.

Conclusion

Based on the findings in this study, it is concluded that:

i. There is substantial public interest in RETs, actual adoption is constrained by high costs, limited awareness, and weak policy frameworks.

ii. Key factors driving adoption include personal environmental consciousness, perceived risk reduction, and willingness to innovate. To overcome the identified challenges, targeted policy interventions are required. These should include financial incentives, tax reliefs, subsidies for RET installations, and investments in technical infrastructure.

iii. Additionally, awareness campaigns should focus on educating the public about both traditional and emerging RETs, such as hydrogen fuel and smart grids.

iv. Enhancing local manufacturing capacity and fostering public-private partnerships can also help reduce reliance on imported RET components.

v. Ultimately, if these barriers are effectively addressed, Nigeria can accelerate progress toward achieving SDG 7 (Affordable and Clean Energy) while advancing environmental sustainability and economic development.

vi. Training and good welfare amenities are among management policies that can be engaged by organizations to improve labour productivity.

References

Aleem, D. D. (2020). An Overview of Data Analysis and Interpretation in Research. *International Journal of Academic Research in Education*, *8*(1): 1–27. https://doi.org/10.14662/IJARER2020.015

Ali, A. (2021). Quantitative Research Tools. https://doi.org/10.13140/RG.2.2.30033.25442

Amega, K., Laré, Y., Bhandari, R., Moumouni, Y., Egbendewe, A. Y. G., Sawadogo, W. and Madougou, S. (2022). Solar Energy Powered Decentralized Smart-Grid for Sustainable Energy Supply in Low-Income Countries: Analysis Considering Climate Change Influences in Togo. *Energies*, *15*(24): 9532. https://doi.org/10.3390/en15249532

Bhagat, K., Dai, C., Ye, S., Bhayo, M. Z., Kalwar, B. A. and Mari, M. A. (2023). Stochastic Energy Management Strategy of Smart Building Micro-grid with Electric Vehicles and Wind-Solar Complementary Power Generation System. *Journal of Electrical Engineering and Technology*, *18*(1): 147–166. https://doi.org/10.1007/s42835-022-01193-1

Chanchangi, Y. N., Adu, F., Ghosh, A., Sundaram, S. and Mallick, Tapas. K. (2022). Nigeria's Energy Review: Focusing on Solar Energy Potential and Penetration. *Environment, Development and Sustainability*. https://doi.org/10.1007/s10668-022-02308-4

Dodo, U. A., Ashigwuike, E. C. and Eronu, M. M. (2020). Renewable Energy Readiness in Nigeria: A Review Focusing on Power Generation. *UniAbuja Journal of Engineering and Technology*. 1(1): 115-144.

Elinwa, U. K., Ogbeba, J. E. and Agboola, O. P. (2021). Cleaner Energy in Nigeria Residential Housing. *Results in Engineering*, *9*, 100103.

IRENA, (2023). *Renewable Energy Roadmap: Nigeria*. 2023. https://www.irena.org/Publications/2023/Jan/Renewable-Energy-Roadmap-Nigeria.

Kapur, R. (2018). *Research Methodology: Methods and Strategies*. Delhi India

Krejcie, R. V., and Morgan, D. W.: (1970). Determining Sample Size for Research Activities. Educational and Psychological Measurement, 30(3): 607-610.

NSCP. (2021). Retrieved October 14, 2024, from http://www.nigeriasolarcapitalpartners.com/projects/

Olatunji, O., Akinlabi, S., Oluseyi, A., Abioye, A., Ishola, F., Peter, M. and Madushele, N. (2018). Electric Power Crisis in Nigeria: A Strategic Call for Change of Focus to Renewable Sources. *IOP Conference Series: Materials Science and Engineering*, *413*, 012053. https://doi.org/10.1088/1757-899X/413/1/012053

Olotuah, A. A., Tukur B, R., Dimuna, O. K., Olotuah, O. A., Adesiji, S. O. and Olotuah, M. A. (2019). Energy Efficiency in Housing and Socio-Economic Development in Nigeria. *WEENTECH Proceedings in Energy*, 238–243. https://doi.org/10.32438/WPE.5019

Omoregie, O. (2020). Fostering Sustainability through Renewable Energy Resource Development: The Law and Policy in Nigeria. *The IAFOR International Conference on Sustainable, Energy and Amp; the Environment – Hawaii 2020 Official Conference Proceedings*. https://doi.org/10.22492/issn.2432-8642.2020.7

Ribeiro, F., Ferreira, P., Araújo, M. and Braga, A. C. (2018). Modelling Perception and Attitudes towards Renewable Energy Technologies. *Renewable Energy*, *122*, 688–697. https:/doi.org/10.1016/j.renene.2018.01.104

Ritchie, H., Roser, M. and Rosado, P. (2020). Co_2 and Greenhouse Gas Emissions. *Our World in Data*. https://ourworldindata.org/co2-and-greenhouse-gas-emissions

Tabrizian, S. (2019). Technological Innovation to Achieve Sustainable Development—Renewable Energy Technologies Diffusion in Developing Countries. *Sustainable Development*, *27*(3): 537–544. https://doi.org/10.1002/sd.1918

Ugulu, A. I. and Aigbavboa, C. (2019). Assessing Urban Households' Willingness to Pay for Standalone Solar Photovoltaic Systems: A Case Study of Lagos, Nigeria. *Journal of Sustainable Development of Energy, Water and Environment Systems*. https://doi.org/10.13044/j.sdewes.d7.0274

Zhang, Y., Wang, H., Gao, W., Wang, F., Zhou, N., Kammen, D. M. and Ying, X. (2019). A Survey of the Status and Challenges of Green Building Development in Various Countries. *Sustainability*, *11*(19): 5385. https://doi.org/10.3390/su11195385