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**APPRAISING RENEWABLE ENERGY POLICY IMPACTS ON GRASSROOTS
DEVELOPMENT IN NIGERIA, 2015-2025: TRENDS, ISSUES AND
CHALLENGES.**

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Abstract

Access to reliable and affordable energy is fundamental to grassroots development because electricity supports household welfare, education, healthcare, agricultural production, small-scale enterprises, communication and other productive activities. In Nigeria, persistent electricity deficits, particularly in rural and underserved communities, have encouraged the Federal Government to adopt policies and programmes intended to promote renewable energy and decentralized electricity generation. This paper appraises the impact of Nigeria's renewable energy policy on grassroots development, with particular reference to the National Renewable Energy and Energy Efficiency Policy (NREEEP) and associated renewable-energy interventions. The study is derived from a broader quantitative investigation of selected national policies and grassroots development in Nigeria. It adopts a descriptive research design and uses structured questionnaire data obtained from 827 respondents drawn from selected communities across the six geopolitical zones of Nigeria and within a time scope of 10 years. Descriptive statistics, including frequencies, percentages, mean scores and standard deviations, were employed to examine respondents' assessments of the contribution of renewable-energy policy to grassroots development. The analysis indicates that renewable-energy interventions have generated important opportunities for improving electricity access, supporting micro and small businesses, enhancing household welfare and encouraging decentralized energy solutions. However, the aggregate renewable-energy impact score of 2.98 falls marginally below the criterion mean of 3.00, indicating that respondents did not perceive the policy as having achieved a sufficiently significant grassroots impact overall. This suggests that policy potential has not yet translated into commensurate grassroots outcomes. Current trends nevertheless indicate expanding adoption of solar home systems, solar hybrid mini-grids and private-sector-led decentralized electricity solutions. Major challenges include inadequate financing,

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infrastructure deficits, weak implementation capacity, affordability constraints, regulatory and institutional difficulties, technical capacity gaps and uneven geographical distribution of interventions. The paper recommends stronger rural-energy financing mechanisms, improved institutional coordination, community participation, local technical capacity development, transparent monitoring and evaluation, and greater integration of renewable energy with productive grassroots activities.

Keywords: *renewable energy policy, grassroots development, rural electrification, renewable energy, mini-grids, energy access, Nigeria.*

Introduction

Energy is an essential input into virtually every dimension of socioeconomic development. At the grassroots level, electricity is not simply a household utility; it is an enabling resource for agricultural production, small and medium-scale enterprises, education, healthcare, communication, water supply, food processing and other activities that determine the economic and social wellbeing of local communities. Consequently, the availability, affordability, reliability and sustainability of energy have direct implications for the capacity of rural and underserved communities to participate meaningfully in national development.

Nigeria possesses considerable renewable-energy resources, particularly solar, hydropower, biomass and wind. Nevertheless, the country has historically struggled to translate these resources into widespread and reliable electricity access. The problem is especially pronounced in rural communities where conventional grid extension is often technically difficult and economically expensive. Various substantial differences between urban and rural electricity access have been identified and has emphasized the role of decentralized renewable-energy systems in addressing underserved communities. The Nigerian government formulated and approved the National Renewable Energy and Energy Efficiency Policy (NREEEP), in 2015, which provides a policy framework for increasing the contribution of renewable energy and improving energy efficiency in Nigeria. The policy is intended to support diversification of the energy mix, improve electricity access and encourage the development and utilization of renewable energy resources. (National Renewable Energy and Energy Efficiency Policy, 2015). The policy recognizes renewable energy and energy efficiency as important instruments for improving energy security, expanding electricity access and reducing dependence on conventional energy sources.

This policy framework is significant from a grassroots development perspective because renewable energy can be deployed in communities that are difficult or uneconomical to connect to the national grid. Solar systems, mini-hydropower, biomass technologies and other decentralized solutions can potentially bring electricity closer to rural households and productive users. The policy environment has subsequently been complemented by additional institutional and regulatory developments. Nigeria's electricity-sector reforms and the expansion of decentralized energy markets have created opportunities for private-sector participation in mini-grid development. Research on Nigeria's mini-grid sector indicates that the regulatory framework has helped catalyse investment and market growth, although equitable access at the last mile remains an unresolved concern.

The significance of renewable energy policy to grassroots development has increased as Nigeria has moved beyond an exclusive reliance on conventional grid expansion toward decentralized energy solutions. Programmes such as the Nigeria Electrification Programme (NEP)

have supported solar hybrid mini-grids and standalone solar systems in unserved and underserved communities. The programme is explicitly designed to provide electricity to households, micro, small and medium-sized enterprises, educational institutions and healthcare facilities (National Renewable Energy and Energy Efficiency Policy, 2015).

Recent evidence demonstrates that the renewable-energy sector is experiencing substantial growth. By 2024, World Bank-supported interventions associated with Nigeria's electrification efforts had supported 125 mini-grids and more than one million solar home systems, extending electricity access to more than 5.5 million Nigerians and generating more than 5,000 local green jobs. These developments suggest that renewable energy is increasingly becoming an important component of Nigeria's strategy for addressing electricity deficits and stimulating economic activities in underserved areas (Rural Electrification Agency, 2025).

However, the existence of policy instruments and projects does not necessarily imply that policy objectives have been fully achieved. The central concern of this paper is therefore not merely whether renewable energy initiatives exist, but whether they have produced meaningful grassroots development outcomes. This distinction is important because a policy may demonstrate considerable implementation activity while its actual developmental impact remains limited by affordability, reliability, institutional weaknesses, inadequate maintenance, financing constraints and unequal geographical coverage (Dye, 1973).

Against this background, the paper appraises the impact of renewable energy policy on grassroots development in Nigeria, examines major trends, identifies implementation issues and challenges, and proposes measures for strengthening the contribution of renewable energy to inclusive grassroots transformation.

Renewable Energy and Grassroots Development

Concept of Grassroots Development

The term grassroots generally refer to the foundational or local level of a society. It is commonly associated with communities, households, local organizations, small producers, informal enterprises, farmers, artisans, and other groups operating close to the base of society. Grassroots should not, however, be treated as an exact synonym for rural. Rurality has geographical, demographic, economic, administrative, and sociocultural dimensions. The distinction between rural and urban areas varies across countries and may also change over time (Madu, 2010; Dijkstra et al., 2020).

Different countries therefore use different population thresholds, administrative criteria, population-density measures, infrastructure indicators, and economic characteristics to distinguish rural from urban communities. Rios (1988) observes that definitions of rurality are context-specific, meaning that a settlement regarded as rural in one country may not necessarily meet the same classification in another.

The OECD (2011), for example, uses population density as one of its criteria for identifying predominantly rural regions. The United States Census Bureau (2010) uses population thresholds and the distinction between urban and non-urban areas, while the United Kingdom has historically employed population size and settlement characteristics. Within Nigeria, population size has also been used as an administrative criterion, although poverty, infrastructure deficits, economic activities, and remoteness are important practical indicators of grassroots or rural conditions.

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Grassroots communities frequently possess some common characteristics. These may include:

- relatively low population density;
- strong dependence on agriculture, natural resources, informal activities, or local enterprises;
- limited access to higher educational opportunities;
- restricted formal employment opportunities;
- inadequate infrastructure and public services; and
- weaker access to markets, technology, finance, and institutional support (Myrdal & Kristiansen, 2015).

However, grassroots development should not be understood exclusively in geographical terms. It also refers to a development approach that places local people at the centre of the development process.

Yahaya (2019) conceptualizes rural development as multidimensional, encompassing agriculture, education, health, infrastructure, social relations, political participation, commerce, industry, and integration with the wider economy. The Inter-American Foundation (2020) describes grassroots development as a process through which disadvantaged populations organize themselves to improve the social, cultural, and economic wellbeing of their families and communities. The concept is consequently closely related to ideas such as community-led development, bottom-up development, people-centered development, and development from below.

Eversole (2020) emphasizes that communities possess knowledge about their own circumstances and are therefore capable of identifying priorities that may not always be visible to external policymakers. Local populations understand the particular resources, constraints, opportunities, cultural practices, and institutional arrangements that characterize their communities.

Grassroots development therefore gives importance to local knowledge and local agency. It differs from approaches in which development interventions are designed entirely by external authorities and subsequently transferred to communities with limited local participation. Gaventa and Lewis (1989) view grassroots development as an alternative to conventional trickle-down approaches. Instead of assuming that benefits generated at the national or urban level will automatically reach poorer communities, grassroots development emphasizes direct local participation and community organization. Osisioma (2004) similarly argues that persistent neglect of the grassroots can undermine national development because communities at the local level possess resources, labour, knowledge, and productive capacities that can contribute to wider economic transformation.

For this study, grassroots development is conceptualized as the process through which local communities experience and participate in improvements in economic productivity, employment, income, infrastructure, social welfare, access to services, local enterprise, participation, and sustainable livelihoods.

The National Renewable Energy and Energy Efficiency Policy (NREEEP) was developed in 2015 within the context of Nigeria's persistent electricity-access challenges. The policy sought to diversify the country's energy resources, increase renewable energy deployment, improve energy efficiency, and expand access to reliable and environmentally sustainable energy. The importance of this policy is particularly pronounced in rural Nigeria, where grid electricity has

historically been less accessible than in urban areas. The International Energy Agency (2019) and World Bank (2017) identify Nigeria as having a substantial population without reliable electricity access. Rural households have also historically relied heavily on biomass and fuelwood. The NREEEP recognized the environmental and health consequences associated with excessive dependence on traditional biomass energy. The policy therefore seeks to encourage both grid-connected and off-grid renewable energy solutions. Its objectives include:

1. diversifying Nigeria's energy resources;
2. strengthening national energy security;
3. ensuring affordable and reliable renewable energy;
4. increasing indigenous technological and managerial capacity;
5. attracting private-sector investment;
6. expanding electricity access to underserved populations; and
7. developing appropriate financing mechanisms for renewable-energy investment (**National**

Renewable Energy and Energy Efficiency Policy, 2015).

Renewable energy has particular relevance for grassroots development because energy availability affects the productivity of local economic activities. Reliable electricity can support small enterprises, agricultural processing, refrigeration, irrigation, education, healthcare, communications, and local manufacturing. Renewable energy can also contribute to poverty reduction by lowering dependence on expensive and environmentally damaging energy sources. Solar-powered water systems, mini-grids, solar home systems, and other decentralized technologies can provide services to communities that are difficult or costly to connect to conventional electricity infrastructure. The policy is also linked to several SDGs. Renewable energy can contribute to poverty reduction, food security, health, education, gender equality, clean water, employment, industrial development, and climate action.

Practically, the relationship between renewable energy and grassroots development operates through several channels. For example, access to renewable electricity can support agricultural processing and food preservation, thereby reducing post-harvest losses. Solar-powered boreholes can improve access to clean water. Reliable electricity can support health facilities and schools. Energy access can also reduce the amount of time women and children spend collecting fuelwood, potentially creating greater opportunities for education and economic activity.

Renewable energy improves household welfare by providing lighting, phone charging, refrigeration and other basic services. For economic and business development, renewable energy supports economic activities. Small enterprises can extend operating hours, use electrically powered equipment and reduce dependence on expensive generators. Since agriculture is the main economic activity of rural areas, renewable energy can strengthen agricultural value chains through irrigation, cold storage, processing and preservation.

It needs to be stressed that, renewable energy contributes to education and human-capital development by providing lighting and electricity for schools and households; creating access to and supporting healthcare delivery by powering health facilities, refrigeration and essential medical equipment. Decentralized renewable energy systems can stimulate employment creation through installation, maintenance, distribution and other activities associated with the emerging green economy.

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Nigeria's renewable-energy policy environment includes complementary instruments such as the National Renewable Energy Action Plan, National Energy Efficiency Action Plan, Rural Electrification Strategy and Implementation Plan, Renewable Energy Master Plan, and other energy-sector initiatives. The Rural Electrification Agency has also implemented programmes involving mini-grids, solar installations, rural electrification funds, and energy access for economic clusters and public institutions.

Thus, the developmental significance of renewable energy extends beyond electricity generation. The ultimate issue is whether electricity access is converted into productive, social and economic benefits at the community level.

The tables below show the estimated generation capacity of renewable energy with their target dates and respective population coverages.

Table 1: Percentage distribution of access to energy by the Nigerian population.

Region	Nigeria
Population without Electricity	93 million
Overall Electrification Rate (%)	45
Urban Electrification Rate (%)	55
Rural Electrification Rate (%)	35

Source: Renewable Energy Roadmap (2023)

Table 2: Share of the population with access to electricity in Nigeria from 2015 to 2023

Year	Percentage (%)
2015	52.5
2016	59.3
2017	54.4
2018	56.5
2019	55.4
2020	55.4
2021	59.5
2022	60.5
2023	61.2
2024	61.5
2025	61.2

Source: Statista (2026)

Table 3: Renewable Energy Generation Targets MW (2010 -2030)

Resource	2010 (MW)	2015 (MW)	2030 (MW)
Large Hydro	1,930	5,930	48,000
Small Hydro	100	734	19,000
Solar PV	5	120	500
Solar Thermal	0	1	5
Biomass	0	100	800
Wind	1	20	40
Total RE	2.036	6,905	68,345

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Total Energy	16.00	30.00	192.00		
Resources	0	0	0		
Percentage of RE (%)	13	23	36		

Source: Renewable Energy Roadmap (2023)

Table 4: Targets for the share of grid-connected renewable energy in 2010, 2020 and 2030

Grid Connected Generation (GWh)	2010	2020	2030
Renewable energy electricity generation in GWh (excluding medium and large hydro)	0	6,864	25,402
Renewable energy share in the electricity mix in % (excluding medium and large hydro)	0	13	15
Total renewable energy generation in GWh (including medium and large hydro)	4,749	20,031	49,766
Renewable energy share in the electricity mix in % (including medium and large hydro)	17	38	31

Source: National Renewable Energy Action Plans, 2015-2030 (2016)

Table 5: National 2020 and 2030 targets and estimated trajectory for Rural Population served by Renewable Energy RE

	2015	2020	2022	2025	2030
Rural population served with electricity services (number of inhabitants)	4,600,000		35,144,352	43,253,284	53,043,063
Rural population served with electricity services (in % of total)	28		35	40	44
Share of rural population served by renewable energy and hybrid mini-grids (%)	NA	5	N/A	N/A	10
Share of rural population served by standalone renewable energy systems (%)	NA		4.7	NA	5

Source: National Renewable Energy Action Plans, 2015 -2030 (2016)

Table 6: Energy and Population Access Targets

Goal	Energy Type and Population Access Targets	Year
Solar Energy	5 Mn Solar home systems connections, mostly in sparsely populated areas	2030
Development of Solar Energy Mini-Grids	8.9 Mn Mini-grid connections (104.8k mini-grids) in densely populated areas further from existing grid infrastructure	2030

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Total Energy supplied to households	8400 GWh p.a. & 3.6 GW Total electricity supplied to unelectrified residential households	2030
New Population Access to Energy	106 Mn & 19.3 Mn Additional people and residential households reached respectively	2030
New Energy Grid Connections	5.4 Mn Grid connections in densely populated areas within close proximity of existing grid infrastructure	2030

Source: Nigeria Energy Transition and Investment Plan (2024)

Table 7: Renewable Energy and SDG Targets

SDG	Developmental Target	Role of Renewable Energy (RE)
SDG 1	No poverty	RE will help to meet the basic human needs of families especially in the rural areas such as food, clothing, and shelter. Enable the sustenance of livelihoods. Refrigeration and other methods to preserve and increase the shelf life of agricultural produces, thus reducing waste and ensuring more earning capacity. Reduce rural-urban migration. Clean energy for cooking and heating in households. Higher levels of income per capita.
SDG 2	End hunger, achieve food security and improved nutrition and promote sustainable agriculture	RE will be used in the production, processing, preservation and transportation of food. The mechanization processes, power used by food processing facilities, irrigation etc. can rapidly be achieved through the installation of RE in the food value chains. Moreover, RE can also be produced and traded.
SDG 3	Good health and well-being	RE ensures that particulates and smoke from the use of fuel wood and biomass is totally avoided. Mortality rates from respiratory diseases, tuberculosis, malaria etc. will be greatly reduced. Vulnerability to illnesses is reduced. Thermal comfort (heating and cooling) and refrigeration which are good health and nutrition is provided. Moreover, health care facilities have reliable power for medical devices and also needed to provide essential services. Refrigerators for storage of vaccines and drugs.

SDG 4 Quality education	Education especially in the rural areas is ensured. Efficient lighting for students to study and access to educational resources is facilitated. Information and communication technologies, on which modern education is based, also require energy input which is readily provided More enrollment of girls in schools will be achieved since they no longer need to be involved in searching for fuel wood, Schools can provide meals to children in energy efficient ways.
SDG 5 Gender equality	RE creates more opportunities for women empowerment, close the economic gap between men and women. Reduced burden on women in sourcing fuel wood and biomass in cooking and more time for them to rest or pursue other endeavours.
SDG 6 Clean water and sanitation	RE will ensure increased access to clean water through solar boreholes, thus providing safe and clean drinking water to ensure sanitation and personal hygiene.
SDG 8 Decent work and economic growth	Provision of safe working environments as hazardous substances are mitigated, adequate lighting in workplaces, the use of appropriate work equipment, development of new skills and employment opportunities in RE, training and education in RE. Establish business incubators, connect suppliers with external markets. Driving entrepreneurship
SDG 9 Industry, innovation, and infrastructure.	RE will support industrialization through local hiring, procurement, training and skills development, create innovations in providing zero greenhouse gas and clean energy, development of critical infrastructure for investments in energy and industrialization processes. The deployment of RE can create employment in the electricity value chain itself, in assembling, distributing, installing and maintaining equipment,
SDG 13 Climate action	RE will definitely lead to low carbon and GHG emissions. Ozone layer depletion and global warming will be checkmated.

Source: Compiled in accordance to the Sustainable Development Goals (2015)

Trends in Renewable Energy and Grassroots Development in Nigeria

- **Shift from Centralized to Decentralized Energy Systems**

One of the most important trends is the increasing movement from exclusive dependence on centralized grid electricity toward decentralized energy systems. Solar mini-grids and standalone solar systems are increasingly being deployed in communities where conventional grid extension is difficult. The Nigeria Electrification Programme was specifically established to provide electricity to households, MSMEs, educational institutions and healthcare facilities in unserved and underserved communities through mini-grids and standalone solar systems. This trend is particularly relevant to grassroots development because it permits energy interventions to be targeted directly at communities rather than waiting for the gradual extension of national transmission and distribution infrastructure.

- **Expansion of Solar Energy**

Solar energy has become one of the most visible components of Nigeria's renewable-energy transition. Its attractiveness derives from Nigeria's substantial solar resource, the modular nature of photovoltaic systems and the declining technological barriers to deployment. The growth of solar home systems and solar mini-grids has created opportunities for households and enterprises to obtain electricity independently of the conventional grid. The World Bank reports that Nigeria's electrification interventions had supported more than one million solar home systems and 125 mini-grids by 2024, providing electricity access to more than 5.5 million Nigerians.

- **Growth of Mini-Grids**

Mini-grids represent another important trend. They can provide electricity to clusters of households and businesses and may be more suitable than individual solar systems for communities requiring higher-capacity productive uses.

By April 2025, the Nigeria Electrification Project had enabled 19.20 MW of renewable-energy capacity for mini-grids and supported 180 mini-grids across 23 states, according to World Bank project documentation. The project also reported electricity access through mini-grids for more than 732,000 people and electricity connections for more than 15,000 MSMEs. (Rural Electrification Agency, 2025) These figures demonstrate the potential of decentralized renewable energy to contribute simultaneously to energy access and local economic activity.

- **Increasing Private-Sector Participation**

Another important trend is the growing role of private-sector developers in renewable-energy deployment. Rather than relying entirely on government ownership and financing, Nigeria's recent programmes have increasingly used grants, results-based financing and other mechanisms to attract private investment. This approach is significant because the scale of Nigeria's energy deficit requires financial resources and technical capabilities beyond what public-sector institutions alone can provide.

- **Increasing Recognition of Productive Uses of Energy**

A further trend is the movement from viewing electricity access primarily as a household welfare intervention toward recognizing electricity as an input into local economic production.

This involves powering businesses, agricultural processing, irrigation, refrigeration, ICT services and other income-generating activities. The World Bank's Nigeria Electrification Project, for

example, explicitly measured the number of MSMEs gaining electricity access through mini-grids. This development is particularly important because electricity access is more likely to generate sustained grassroots transformation when it is connected to productive economic activities.

- **Movement toward Larger-Scale Distributed Renewable Energy**

Nigeria is also moving toward larger-scale decentralized renewable-energy programmes. The Distributed Access through Renewable Energy Scale-Up (DARES) programme was designed to build on the achievements of the Nigeria Electrification Project and extend distributed renewable energy to millions of additional Nigerians. The World Bank reported that DARES is intended to provide new or improved electricity access to more than 17.5 million Nigerians and to replace more than 280,000 polluting petrol and diesel generator sets. This indicates a transition from isolated pilot projects toward a more systematic distributed

Aim and Objectives of the Study

The aim of this paper was to appraise the impact of renewable energy policy on grassroots development in Nigeria, with particular attention to emerging trends, implementation issues and challenges affecting the translation of policy objectives into tangible community-level development outcomes.

Specifically, the study sought to:

1. Examine the extent to which renewable energy policy has contributed to grassroots development in Nigeria;
2. Assess the perceived contribution of renewable energy interventions to electricity access in rural and underserved communities;
3. Examine the contribution of renewable energy to grassroots economic activities, particularly small-scale enterprises and productive activities;
4. Identify major trends in renewable-energy development and decentralized electricity provision in Nigeria;
5. Identify the major challenges limiting the effective implementation of renewable energy policy at the grassroots level; and
6. Propose measures for improving the contribution of renewable energy policy to sustainable grassroots development in Nigeria.

Methods

The study adopted a quantitative research approach using a descriptive research design. The empirical analysis was based on the data gotten from 827 respondents drawn from selected communities across Nigeria's six geopolitical zones. The communities represented North Central, North East, North West, South East, South South and South West geopolitical zones of Nigeria. Data were collected using a structured questionnaire. The questionnaire contained statements designed to measure respondents' assessment of the implementation and impact of renewable energy policy on grassroots development. Responses were measured using an ordinal response scale, with a criterion mean of 3.00 adopted for interpreting the results. Mean scores equal to or above the criterion mean indicate general agreement with the relevant statements, whereas scores below 3.00 indicate general disagreement. The quantitative data were analyzed using frequencies, percentages, mean scores and standard deviations. The aggregate assessment of renewable-energy policy produced a grand mean of 2.98.

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The interpretation was based on the following decision rule:

- Mean ≥ 3.00 : positive assessment/agreement;
- Mean < 3.00 : negative assessment/disagreement.

This approach provided a straightforward assessment of whether respondents considered renewable energy policy to have produced substantial grassroots-development effects.

Population of the Study

Geopolitical Zone	State	LGA	Community	Population
North Central	Nasarawa	Agwanga	Akwanga	37,473
North West	Kaduna	Igabi	Afaka	500,000
North East	Borno	Maid. Met. Council (MMC)	Bolori II	138,800
South South	Delta	Ukwuani	Umuaja	3,791
South East	Anambra	Awka South	Nibo	11,897
South West	Lagos	Oshodi-Isolo	Oshodi	931,000
			Total	1,622,961

Source: National Bureau of Statistics (2023); World Population Review (2026); City Population (2026) & Umuaja Development Association (2026)

Sample and Sampling Method of the Study

The study adopted a multistage sampling technique in selecting respondents from the six geopolitical zones of Nigeria. The use of a multistage sampling approach was considered appropriate because the study covered a wide geographical area and involved respondents from diverse socio-economic and demographic backgrounds.

The sample size of 1,000 respondents was determined by using the Cochran's Sample Size Formula in simple random sampling technique, Cochran's Sample Size Formula is used to compute an ideal sample size for a desired level of precision, it is recommended to be used for studies with infinite populations (Cochran, 1977).

$$n = \frac{z^2 p(1-p)}{e^2}$$

where;

e = the margin of error (0.031)

p = the fraction of the population that displays the attribute (0.5)

z = the z-value (1.98)

$$= 3.8416 \times 0.5 \times 0.5$$

$$= 0.000961$$

$$= 999.37$$

$$= 1,000 \text{ approx}$$

Data Analysis and Results**Distribution of Respondents by Geopolitical Zones and Communities**

The study was geographically distributed across Nigeria's six geopolitical zones to provide a broad representation of grassroots experiences with the implementation and outcomes of national policies. A total of 827 respondents participated in the study.

Table 8: Distribution of Respondents by Geopolitical Zones and Communities

Geopolitical Zone	State	LGA	Community	Number	Percentage (%)
North Central	Nasarawa	Akwanga	Akwanga	126	17.1
North East	Borno	Maiduguri Metropolitan Council	Bolori II	105	11.5
North West	Kaduna	Igabi	Afaka	115	17.6
South East	Anambra	Awka South	Nibo	112	12.3
South South	Delta	Ukwuani	Umuaja	204	22.3
South West	Lagos	Oshodi/Isolo	Oshodi	165	19.2
			Total	827	100

Source: Researcher's Fieldwork (2025)

The geographical distribution demonstrates that the study covered communities from all six geopolitical zones. The South South zone, represented by Umuaja in Ukwuani Local Government Area of Delta State, had the largest number of respondents with 204 respondents (22.3%), while the North East, represented by Bolori II in Maiduguri Metropolitan Council of Borno State, had 105 respondents (11.5%). The geographical spread strengthens the comparative basis of the study by incorporating respondents from different sociocultural, economic and environmental contexts.

Table 9: Mean and Standard Deviation Analysis of Responses on the Impact of the National Renewable Energy and Energy Efficiency Policy, 2015

S/N	Statement	Mean	Std. Dev.	Decision
1	Energy access has improved in rural communities	3.46	1.42	Accepted
2	Local businesses have grown due to energy access	2.96	1.47	Rejected
3	There are job creation and rapid economic empowerment	2.88	1.45	Rejected
4	Reduced conflicts among rural populations have occurred	2.29	1.33	Rejected
5	Cost of local business operations has reduced greatly	2.72	1.42	Rejected
6	Local energy infrastructure and technology have improved	3.13	1.48	Accepted
7	Energy costs are now cheaper and affordable	3.49	1.39	Accepted
8	Quality of life in rural communities has improved	2.93	1.44	Rejected
	Grand Mean	2.98		Rejected
	Grand Standard Deviation		1.37	

Source: Researcher's Fieldwork (2025).

Decision rule: A mean score of 3.00 and above is accepted, while a mean score below 3.00 is rejected.

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Table 9 presents respondents' assessment of the extent to which the National Renewable Energy and Energy Efficiency Policy, 2015, has contributed to grassroots development. The overall **grand mean of 2.98**, compared with the criterion mean of **3.00**, indicates that respondents generally did not perceive the policy as having achieved a sufficiently significant overall impact on grassroots development. The **grand standard deviation of 1.37** indicates a considerable degree of variation in respondents' assessments of the policy's outcomes.

However, the item-level results reveal a more differentiated pattern than the aggregate result suggests.

The first statement, **"Energy access has improved in rural communities,"** recorded a mean of **3.46** and a standard deviation of **1.42**. Since the mean exceeds the criterion value of 3.00, the statement was accepted. This represents one of the strongest positive assessments in the table and indicates that respondents recognized improvements in energy access within rural communities.

Similarly, the statement that **"Local energy infrastructure and technology have improved"** recorded a mean of **3.13** and a standard deviation of **1.48**, resulting in an accepted decision. This finding suggests that respondents observed improvements in the physical and technological infrastructure associated with energy provision. The result is important because infrastructure development constitutes an essential intermediate outcome through which renewable-energy policy can contribute to broader grassroots development. The highest mean score was recorded for the statement that **"Energy costs are now cheaper and affordable,"** with a mean of **3.49** and a standard deviation of **1.39**. The acceptance of this statement suggests that respondents perceived some improvement in the affordability of energy. This may have implications for household welfare and the operating environment of small businesses.

Despite these positive assessments, the remaining five statements recorded means below the 3.00 criterion. The statement that **"Local businesses have grown due to energy access"** recorded a mean of **2.96** and a standard deviation of **1.47**. Although the score is very close to the criterion mean, it falls marginally below the threshold and was therefore rejected. This suggests that improvements in energy access have not yet translated into sufficiently broad or visible business growth at the grassroots level.

The statement concerning **job creation and rapid economic empowerment** recorded a mean of **2.88** and a standard deviation of **1.45**. The rejection of this statement indicates that respondents did not perceive renewable-energy policy as having generated substantial employment and economic empowerment. This finding raises an important policy concern because one of the expected developmental benefits of improved energy access is increased economic activity and employment.

The statement **"Reduced conflicts among rural populations have occurred"** recorded the lowest mean score of **2.29**, with a standard deviation of **1.33**. The result indicates that respondents did not associate the renewable-energy policy strongly with conflict reduction. This is understandable because the relationship between energy access and conflict is indirect and mediated by other social, political and economic factors.

The statement that **"Cost of local business operations has reduced greatly"** recorded a mean of **2.72** and a standard deviation of **1.42**. This finding indicates that, despite perceived improvements in energy access and affordability, respondents did not believe that these improvements had substantially reduced the operating costs of local businesses.

Finally, **"Quality of life in rural communities has improved"** recorded a mean of **2.93** and a standard deviation of **1.44**. Although this result approaches the criterion mean, it remains below 3.00 and was therefore rejected. The result indicates that improvements in energy access and infrastructure have not yet produced sufficiently strong perceived improvements in the broader quality of life of rural residents.

Taken together, the findings reveal a distinction between **energy-sector outputs and wider grassroots-development outcomes**. Respondents recognized improvements in energy access, energy infrastructure and affordability, but these improvements were not matched by equally strong perceptions of business growth, employment creation, reduction in operating costs, conflict reduction or quality-of-life improvements.

The principal result from the renewable-energy component of the study is presented below.

Policy Area	Grand Mean	Criterion Mean	Decision
Renewable Energy Policy	2.98	3.00	Disagree

Source: Researcher's Fieldwork (2025).

The result shows that the grand mean of respondents' assessment of renewable energy policy was 2.98, which is marginally below the criterion mean of 3.00. Based on the decision rule adopted for the study, respondents therefore did not agree that renewable energy policy had produced a sufficiently significant overall impact on grassroots development. The result is important because the difference between the observed mean and the criterion mean is relatively small.

Consequently, the finding should not be interpreted as evidence that renewable-energy policy has had no impact whatsoever. Rather, it suggests that the aggregate grassroots impact has not yet reached the level expected by respondents. This distinction is consistent with evidence of substantial activity within Nigeria's renewable-energy sector. For example, World Bank-supported interventions have resulted in the installation of numerous mini-grids and deployment of solar home systems, while the Nigeria Electrification Programme reports expanding access through decentralized renewable-energy systems.

The empirical result therefore points to a possible implementation-impact gap: renewable-energy interventions are expanding, but the benefits perceived at the grassroots level may still be insufficient, unevenly distributed or constrained by broader socioeconomic and institutional conditions.

Findings of the Study

The major findings emerging from the empirical assessment and review of current developments are as follows.

1. Renewable Energy Policy Has Not Yet Produced a Strong Overall Grassroots Impact

The most important empirical finding is that the renewable-energy component recorded a grand mean of 2.98, which is slightly below the 3.00 criterion mean. The finding indicates that respondents generally did not perceive the policy as having achieved a sufficiently strong overall impact on grassroots development.

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2. There Is Evidence of Significant Implementation Activity

Although, the survey assessment was marginally negative, evidence from implementation programmes demonstrates substantial activity. Mini-grids, solar home systems and other decentralized renewable-energy systems have expanded in Nigeria. The Nigeria Electrification Programme currently reports hundreds of mini-grids and millions of Nigerians impacted through its interventions. This suggests that the central challenge may not be the absence of renewable-energy interventions but their scale, consistency, accessibility, affordability and conversion into broader development outcomes.

3. Renewable Energy Has Potential to Support Grassroots Enterprise

The expansion of renewable electricity has created opportunities for MSMEs to operate more efficiently. Evidence from the Nigeria Electrification Project shows that thousands of MSMEs have gained electricity access through mini-grid interventions.

However, electricity access alone does not automatically result in enterprise growth. Businesses also require finance, equipment, markets, skills, infrastructure and a stable regulatory environment.

4. The Benefits of Renewable Energy Remain Uneven

The benefits of decentralized renewable energy have not been distributed uniformly across communities. Research on Nigeria's mini-grid regulatory framework notes that although the regulatory system has helped stimulate market development, electricity distribution remains inequitable at the last mile.

Therefore, national aggregate figures can conceal substantial differences between communities that have received interventions and those that remain underserved.

5. Policy Implementation Is More Advanced than Perceived Developmental Transformation

The contrast between increasing renewable-energy deployment and the 2.98 survey mean suggests an important distinction between policy outputs and development outcomes.

The construction of a mini-grid or distribution of solar systems constitutes an implementation output. Grassroots development, however, requires these outputs to produce sustained improvements in income, employment, enterprise productivity, education, healthcare and quality of life. The empirical findings suggest that the transition from energy infrastructure to broader socioeconomic transformation remains incomplete.

In summary, the results can be classified into two broad categories: positive energy-sector outcomes and limited socioeconomic outcomes.

Positive Energy Sector Outcomes

Three indicators were accepted:

1. Improvement in energy access in rural communities (**M = 3.46**);
2. Improvement in local energy infrastructure and technology (**M = 3.13**); and
3. Increased affordability of energy (**M = 3.49**).

These findings indicate that the renewable-energy policy has produced some recognizable improvements in the direct provision and accessibility of energy.

Limited Grassroots Socioeconomic Outcomes

Five indicators were rejected:

1. Growth of local businesses (**M = 2.96**);

2. Job creation and rapid economic empowerment (**M = 2.88**);
3. Reduction in conflicts among rural populations (**M = 2.29**);
4. Substantial reduction in local business operating costs (**M = 2.72**); and
5. Improvement in quality of life (**M = 2.93**).

The pattern indicates that improvements in energy access have not automatically translated into comprehensive socioeconomic transformation.

Trends Emerging from the Findings

The empirical results reveal several important trends in the relationship between renewable-energy policy and grassroots development.

Improvement in Energy Access Does Not Automatically Produce Developmental Transformation

The strongest evidence from the study is the difference between the relatively high score for improved energy access ($M = 3.46$) and the lower scores for business growth ($M = 2.96$), employment and empowerment ($M = 2.88$) and quality of life ($M = 2.93$). This suggests that access to energy constitutes an important foundation for development but is not, by itself, sufficient to produce grassroots transformation. Energy must be connected with productive assets, finance, skills, markets, infrastructure and supportive institutions before substantial economic outcomes can emerge.

Renewable Energy Infrastructure Is Expanding Faster than Its Socioeconomic Benefits

The accepted mean of **3.13** for improvements in local energy infrastructure and technology indicates that respondents recognize infrastructural progress. However, the lower socioeconomic scores suggest that the developmental benefits of these investments may take longer to materialize or may be constrained by other structural problems. This represents an important policy lesson: infrastructure should be treated as an enabling mechanism rather than an end in itself.

Energy Affordability Is a Relative Strength

The highest mean in the renewable-energy table is 3.49, relating to cheaper and more affordable energy. This indicates that affordability is perceived more positively than several of the broader development outcomes. Affordable energy can potentially reduce household expenditure and improve the viability of small enterprises. However, the relatively low score for reduced business operating costs (2.72) suggests that energy affordability at the household or community level has not necessarily translated into substantial cost reductions for enterprises.

Employment Effects Remain Limited

The mean of 2.88 for job creation and economic empowerment suggests that the employment-generating potential of renewable energy has not yet been fully realized. This may reflect limited local manufacturing, inadequate technical-skills development, insufficient scale of projects and weak integration between renewable-energy investments and local enterprise development.

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Broader Quality-of-Life Effects Remain Moderate

The mean of 2.93 for quality-of-life improvement is only marginally below the criterion mean. This indicates that the perceived welfare effects are neither entirely absent nor sufficiently strong to produce an affirmative decision under the study's criterion. This finding points toward a transitional stage in which energy-sector improvements are beginning to emerge but have not yet generated sufficiently broad improvements across other dimensions of rural welfare.

Table 9: Notable Implementation of Renewable Energy Policy in the Areas of Study

Area	Implementation
Afaka Community, Kaduna State	Federal solar power initiatives in Afaka, Kaduna State, are anchored by the Rural Electrification Agency (REA) under the Ministry of Power. These projects provide clean, sustainable, and reliable energy infrastructure to federal institutions and surrounding rural communities to drive economic development and national security The NDA 2.5MW Solar Hybrid Project is the most prominent federal solar installation in Afaka and is located at the Nigerian Defence Academy (NDA) Campus It is a 2.5 MWp solar photovoltaic (PV) array with 2 MWh battery energy storage system (BESS). Delivers uninterrupted, 24/7 power supply to academic buildings, administrative blocks, staff quarters, and cadet barracks. The project directly benefits over 12,368 people on campus, reducing reliance on diesel generators and improving security infrastructure. Large-scale installations of thousands of solar-powered streetlights have been executed across the community to enhance public safety and promote renewable energy Integration of massive solar infrastructure to power agricultural processing and manufacturing within newly established Special Economic Zones in the region.
Akwanga Community, Nasarawa State	418 No solar light was constructed and installed in Akwanga, Karu and Nasarawa LGAs benefitting 12,000 residences. Reducing Farmer–Herder Conflicts with Solar Powered borehole in Akwanga, Nasarawa State Installation of 17 solar-powered boreholes to provide clean water drastically reduced cholera, typhoid, hospital visits, and long treks that kept children out of school. To mitigate against farmer–herder conflicts, as water access reduced tensions and improved cooperation. The Federal Ministry of Agriculture and Food Security has facilitated solar LED streetlight developments and provided solar-powered irrigation pumps to boost horticultural and landscaping activities in the region Installation of a 20-kilowatt solar power grid specifically to ensure uninterrupted electricity for medical operations and maternity equipment I Gudi Primary Health Care facility. Solar street light installations to key community hubs and religious

	centers like the Akwanga Central Mosque and St. Patrick's Catholic Church to enhance public safety and social activities. Installation of a 5kW small hydropower turbine that provides year-round energy for seven households close to the river Mada, even during the dry season.
Bolori II Community, Borno State.	Installation of solar-powered streetlights to mitigate security risks and boost socio-economic/commercial activities Installation of Solar Boreholes to tackle water scarcity, several jumbo solar-powered boreholes and to provide uninterrupted, clean drinking water Constituency Solar Projects: Lawmakers representing the Borno Central Senatorial District (which includes Bolori II) consistently nominate and deploy off-grid solar streetlights and hybrid mini-grid installations to boost local security, extend nighttime economic activity, and provide sustainable community lighting.
Oshodi, Lagos	Facilitation of appropriations for solar-powered streetlights and motorized boreholes across Oshodi/Isolo Federal Constituencies to provide off-grid clean energy and utility support The Lagos State Electrification Agency (LSEA) and the local government have intermittently rolled out solar streetlights along major transit corridors to improve night-time visibility and reduce crime. Specific installations cover routes along the Gbagada–Oshodi Expressway Installation of solar-powered surveillance CCTV cameras at identified crime hotspots and black spots to boost the security architecture of the area.
Nibo Community, Anambra State	Construction of All-In-One Solar Street in Ifite Lights Nibo to improve road safety, security, and visibility across the area. Construction of solar-powered borehole systems to provide clean, consistent, and off-grid water access to villages like Egbeana Ezeawulu Local engineering firms service the immediate area by designing and installing residential inverters, lithium batteries, and solar panel arrays to combat power outages.
Umuaja Community, Delta State	Solar-powered streetlights have been commissioned in Umuaja and surrounding communities to boost commercial activities and local security While there are currently no operational commercial hydroelectric plants in Umuaja, the community is recognized as a prime location for future Small Hydropower (SHP) developments, specifically utilizing the River Ethiope Umuaja sits at the headwaters of the River Ethiope, making it the focal point of several regional renewable energy assessments and policy proposals

Source: Researcher's Fieldwork, 2025

Issues Affecting Renewable Energy Policy Implementation

I. Financing

Renewable-energy infrastructure requires significant upfront investment. Although solar technology has become increasingly accessible, many rural households and small enterprises

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lack the purchasing power required to acquire systems or pay connection and service charges. Financing therefore remains a critical issue for both consumers and renewable-energy developers.

II. Affordability

Energy access is meaningful only when households and enterprises can afford the electricity provided. A system may be technically available but economically inaccessible to poor households. This creates a major policy dilemma: renewable-energy projects must remain financially viable while ensuring that low-income communities are not excluded because of tariffs and connection costs.

III. Infrastructure Deficits

Poor roads, weak telecommunications networks, inadequate distribution infrastructure and limited local technical support can increase the cost of renewable-energy deployment and maintenance. These problems are particularly important in remote communities where logistics and technical servicing are difficult.

IV. Institutional Coordination

Renewable-energy development involves several institutions, including federal ministries, regulatory agencies, the Rural Electrification Agency, state governments, electricity distribution companies, private developers, financial institutions and communities. Weak coordination among these actors can delay projects, create regulatory uncertainty and reduce policy effectiveness.

V. Regulatory Complexity

The development of decentralized electricity markets requires clear rules concerning licensing, tariffs, grid interconnection, technical standards and consumer protection. Although Nigeria has developed a more robust mini-grid regulatory framework, research indicates that regulatory arrangements still need to place greater emphasis on equitable rural access alongside market efficiency.

VI. Technical Capacity

The sustainability of renewable-energy systems depends on the availability of technicians capable of installation, troubleshooting, maintenance and repair. Where communities depend entirely on external technicians, system downtime can increase and maintenance costs can become burdensome.

VII. Sustainability of Community Projects

Some renewable-energy projects may perform effectively during the initial implementation period but experience difficulties after external project financing or technical support ends. Long-term sustainability requires appropriate ownership structures, maintenance arrangements, community participation and financially viable operating models.

VIII. Foreign Exchange and Equipment Costs

Nigeria's dependence on imported renewable-energy equipment exposes developers and consumers to foreign-exchange risks and fluctuations in equipment prices. Recent assessments of Nigeria's renewable-energy sector identify high capital costs, regulatory bottlenecks and technical-capacity limitations among important constraints.

IX. Unequal Geographical Coverage

Communities that are economically attractive to developers may receive interventions more rapidly than extremely remote or poorer communities. Without deliberate equity mechanisms, market-based deployment can therefore reproduce existing spatial inequalities.

X. Limited Integration with Local Economic Development

Electricity interventions sometimes focus primarily on providing household electricity without sufficiently integrating energy access with agricultural processing, enterprise development, irrigation, cold storage and other productive activities.

Recommendations

Based on the findings, the following recommendations are proposed.

1. Establish Stronger Rural Renewable-Energy Financing Mechanisms

Government should strengthen concessional financing, guarantees, results-based financing and targeted subsidies for renewable-energy projects serving poor and remote communities. Financing mechanisms should prioritize communities where conventional grid extension is technically or economically difficult.

2. Link Renewable Energy to Productive Economic Activities

Renewable-energy policy should move beyond electricity provision to deliberately connect energy access with local economic development. Mini-grid projects should, where appropriate, incorporate productive-use equipment for agriculture, food processing, refrigeration, irrigation, welding, ICT and other community enterprises.

3. Strengthen Community Participation

Grassroots communities should participate in project identification, planning, implementation and monitoring. Community participation can improve local ownership, enhance accountability and facilitate the identification of energy needs that may not be captured by top-down planning.

4. Develop Local Technical Capacity

Government and private-sector developers should establish renewable-energy training programmes that equip young people in local communities with installation, maintenance, repair and energy-management skills. This would simultaneously address technical-capacity challenges and create employment opportunities.

5. Improve Institutional Coordination

Relevant federal and state institutions should establish clearer mechanisms for coordinating renewable-energy programmes. Such coordination should reduce duplication, improve resource allocation and establish consistent monitoring standards.

6. Prioritize Underserved Communities

Policy implementation should deliberately prioritize communities with the largest energy deficits rather than concentrating interventions primarily where commercial returns are highest. This is essential if renewable energy is to serve as an instrument of inclusive grassroots development rather than simply an expanding energy market.

7. Integrate Renewable Energy into National Grassroots Development Planning

Renewable-energy policy should be integrated with agricultural development, MSME development, rural infrastructure, healthcare, education and poverty-reduction programmes. Such integration would allow energy investments to generate multiplier effects across several dimensions of grassroots development.

Conclusion

Renewable energy represents an important opportunity for addressing Nigeria's persistent electricity-access challenge and advancing grassroots development. The National Renewable Energy and Energy Efficiency Policy established an important policy foundation for expanding renewable energy and improving energy efficiency, while subsequent interventions have demonstrated that decentralized renewable-energy systems can provide electricity to communities that conventional grid systems have historically underserved.

The empirical evidence from this study, however, presents a more cautious assessment. The renewable-energy policy component recorded a grand mean of 2.98, slightly below the criterion mean of 3.00. This indicates that respondents generally did not perceive renewable-energy policy as having produced a sufficiently strong overall impact on grassroots development. The grand mean of 2.98 therefore provides the central empirical conclusion of the study: the National Renewable Energy and Energy Efficiency Policy has generated some positive energy-sector outcomes, but its overall impact on grassroots development has remained below the level considered significant by the respondents.

This finding should not be interpreted as evidence of policy failure. Rather, it points to a gap between the potential and implementation of renewable energy on the one hand and its perceived grassroots developmental outcomes on the other. There is substantial evidence of progress in mini-grid deployment, solar-home-system distribution, private-sector participation and electricity access. The Nigeria Electrification Project, for example, has demonstrated that decentralized renewable-energy interventions can reach millions of Nigerians and support thousands of businesses.

The central challenge is therefore to convert expanding energy infrastructure into sustainable socioeconomic transformation. Renewable electricity must be affordable, reliable, geographically inclusive and connected to productive activities. It must also be supported by adequate financing, institutional coordination, technical capacity, community ownership and effective monitoring.

The future effectiveness of renewable-energy policy in Nigeria will consequently depend not merely on how many renewable-energy systems are installed but on what those systems enable people and communities to accomplish. When renewable energy is deliberately integrated with agriculture, MSME development, education, healthcare, employment and local enterprise, it can become a powerful instrument of grassroots transformation. The transition from energy access to grassroots development should therefore constitute the central focus of Nigeria's next phase of renewable-energy policy implementation.

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