



An evaluation of rural electrification in Nigeria: A study of Ibogun community, Ogun state

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Abstract

Rural electrification (RE) has not been effectively pursued especially due to huge financial implications in the RE infrastructure provision. Because of the privatisation of the electricity distribution in Nigeria and the compartmentalization of distributors to regional areas, it is expected that rural communities, which are composite part of the region, should be incorporated in the overall framework for RE. But since the deregulation of the electricity sector, little or no attempt has been made to evaluate the current situation of RE of many Nigerian communities. This study evaluated RE in Nigeria, however, using Ibogun community as its case study. This study adopted a cross-sectional survey approach. Multistage sampling technique was adopted to distribute 122 copies of questionnaire across 10 villages. Findings revealed that Ibogun community is a literate society dominated by the low-income class. 26% of its residents relied on the electricity service provider (ESP) for electricity supply whereas 69.7% received electricity supply from both ESP and alternatives, particularly power-generating sets. Because of the inadequate electricity supply, about 46% of residents used power-generating set between 1 to 4 hours daily to augment shortage. Most residents received estimated electricity bills, which indicate electricity consumption in the community is not metered. 42.6% confirmed electricity infrastructure was in a poor state and 50% rated electricity supply as poor. About 70% of the residents were affected by poor electricity supply but the greatest negative impacts were imposed on residents' businesses and communication. The major problem of electricity supply was the climate impacts on electricity infrastructure. Although residents perceive government role in electricity supply as marginal, nonetheless the residents considered as priority intervention, the upgrade of existing electricity facilities by the government. And to cope with various challenges of electricity supply and its associated impacts, Ibogun community has adopted self-help approaches toward improving electricity supply through the acquisition of electricity transformers and poles and execution of repairs of electricity transformers and poles when necessary. The inferential statistic (Spearman's Rank Correlation) results indicated that there is no significant association between income and variables (source of electricity, alternative source of energy supply, and daily hourly usage of a power-generating set). The study makes recommendations towards solving the challenges of rural electrification.

Keywords: consumption, electricity, Ibogun, rural electrification, supply

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1. Introduction

Access to electricity is usually a subject of concern globally [1]. This may not be unconnected to the importance of electricity to the economic development of a nation. Again, rural electrification is an act of bringing electrical power to rural and remote areas for safety, agriculture and health care purposes for rural development to make rural life comfortable for the dwellers [2]. It is important to state that modern cities were once rural, and therefore, rural development for national development cannot be overem-

phasised. However, development is dependent on adequate and regular energy supply.

Quite many studies have focused on rural electrification [3 – 6]. Jimenez observed that there was an increase in impacts evaluation studies on the effects of electricity on socio-economic development. In his study, [4] attempted to clarify how and to what extent access to electricity and improvement in such infrastructure contribute to economic and social development. He focused on the factors of education, labour and income outcomes and discovered that electrification brought about an increase of about 7% in school enrolment, 25% in employment and 30% in income. [5] examined factors influencing implementation of rural electrification programme in Kieni East

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Sub County in Kenya. They found that funding, electricity cost, alternative sources of power and demand affect the implementation of the Rural Electrification Programme. While charcoal was discovered to be major source amongst the various sources available, authors reported sufficient awareness of the alternative sources of power to electricity and utilisation of these alternatives by households because they are accessible, cheaper and more reliable.

In Nigeria, access to modern energy service in the rural area is worse as only 40% of Nigeria's population have access to electricity [7]. The challenge of rural electrification in Nigeria has been connected to factors such as difficulty in the terrain and low consumption. As such, the rural regions are made to suffer, since their locations are not attractive to small and medium scale industries, and as a result, leading to urban migration [8]. Again "almost 50% of the states in Nigeria have more than 50% of people without access to electricity, which brings to fore the challenge of lack of electricity access in various parts of Nigeria" (Oseni 2011, 2012 cited in 9).

Rural electrification (RE) has not been effectively pursued especially because of the huge financial implications in the provision of RE infrastructure. As the electricity distribution in Nigeria is privatised and the compartmentalization of distributors to regional areas, it is expected that rural communities which are composition part of the region, should be incorporated in the overall framework for RE. But since the privatisation of the electricity, little or no attempt has been made to evaluate the current situation of RE of many Nigerian communities. Hence this study is an attempt to evaluate RE in Nigeria, however, using Ibogun as its case study.

2. Problem Description

Electrification, as a source of energy, is very significant to the survival of the good living. Be it rural or urban, availability of electricity is essential for social, economic and psychological needs of man. In the last three (3) decades, efforts have been made to ensure that everybody irrespective of where they live, work or reside should have access to electricity. To ensure that this is achieved, the Nigerian government deregulate and privatise its energy sector especially electricity. To eliminate conflict of interest among the beneficiaries of the deregulation process, the government further created a geographical coverage for each of the beneficiaries to ensure that problems in terms of provision, operations, management and administration in the process of providing electricity to Nigerians are removed.

As a result of the deregulation and fractionalisation of electricity providers into various geographical coverage, it is expected that the service providers should go all out to ensure that irrespective of the settle-

ment status electricity should be provided. In the last decades, it is obvious that efforts have been made by electricity service providers to ensure that rural electrification is incorporated into their overall regional electrification master plan. This is further necessary as it has been observed that non-availability of electricity supply in many rural areas of Nigeria seems to be responsible for the rural-urban migration syndrome.

Again, it becomes worrisome why electricity service providers have not taken rural electrification programmes seriously. Information available reveal that returns on the investment made by the service providers in the rural areas do not justify the capital intensive nature and maintenance requirements for rural electrification. It is, therefore, important to ask some fundamental questions whether rural electrification in Nigeria is essentially meant for residents in the villages and communities only without cognisance of other economic activities and practices supporting rural economy such as artisanship, processing and packaging, which are also dependent on the availability of electricity. When such activities are considered in the rural electrification programme, will it not serve as a strategy for containing rural-urban migration. Again, what makes electricity supply in the urban areas of greater priority in rural communities, because the major associated problems service providers are faced in the urban environment include overloading as well as non-payment of consumption charges, which is similar with the problems in rural areas because of lack of infrastructure especially transformers, thus leading to overloading as well as non-payment. It is believed that by extending their presence in the rural areas could serve as a pull for people from the urban environment to the rural environment. It will also serve as a major parameter for industrial and manufacturing development thereby raising revenue desirable through rural electrification. It is against this background that this study is attempting an evaluation of rural electrification in Nigeria by focusing on Ibogun community. Ibogun community is located in Ifo local government area (LGA) of Ogun State, Nigeria.

3. Aim and Objectives

The aims of this study were evaluating rural electrification in Nigeria, using Ibogun community of Ogun State as its case study, with a view of addressing the major factors affecting rural electrification dilemma in Nigeria, and how to improve rural electrification programmes in the country and by extension Ibogun community of Ogun State. The specific objectives, therefore;

- i. To highlight rural electrification situation in Ibogun community, with a view of ascertaining the level of rural electrification status.
- ii. To examine the socio-economic characteristics and attributes of residents in the study area with a view

of providing means of appraising in quality and quantity terms of rural electrification infrastructure in the study area.

iii. To reveal the determinants for rural electrification provision.

iv. Based on the findings from i – iii, proffer solutions capable of generating sustainable rural electrification in Nigeria.

4. Literature Review

It has been estimated that 1.3 billion people in the world do not have access to electricity which represent 18% of the global population of which the majority are resident in Africa and South Asia [5]. [1] observed that the most rural area dwellers in Nigeria relied on fuelwood for energy need. Although, fuelwood is put to use by over 70% of Nigerians. However, it is on record that Nigeria had the second highest number of people without electricity access in 2016, estimated at about 74 million or 39% of the solution [IEA 2017 cited in 10]. Based on this verdict, the country accommodates the highest number of people without electricity access in Africa [IEA, 2017, World Bank 2017 cited in 10]. The poor access as noted is greatly experienced by the rural areas, especially in the poor countries, thus rural dwellers are at a disadvantage [4, 11]. The poor access has also been linked to factors such as high cost of providing electricity service in low-density area, difficult terrain of remote areas and low consumption by rural communities, which makes the rural electricity schemes more expensive compared to urban schemes and problem of affordability due to low rural income, electricity losses due to long distances as well as more expensive customer support and equipment maintenance [11]. Besides, there is a challenge of air pollution due to utilization of solid fuels for cooking, lighting and heating by the rural communities. The effects of this inefficient way of burning them result in considerable emission of air pollutants, which have implication for human health. For instance, kerosene burning devices can damage lung function, increase cancer risks as well as incidences of infectious illness and asthma. Also, kerosene lamps have been estimated to be responsible for seven per cent of annual global carbon emission.

“Since the privatization of generation and distribution in Nigeria, electricity expansion plans have focused on areas already covered by the grid or close to the grid, based on the business plans of the distribution companies. This makes electricity access to rural areas slow and creates a mix-up as to how to proceed with rural electrification” [ESMAP, 2005 cited in 9], but the plan of the Nigerian Rural Electrification Agency (NREA) was created to bridge the gap [9]. [12] survey revealed that poor electricity supply made residents resort to alternatives such as power-generating set, solar/inverter, fossil fuel and coal, all of which

pose threats to public health and the environment except solar/inverter. [8] analysis showed that the rural areas consume high polluted means of lighting houses in Nigeria, which is as a result of the rural electrification scheme failure to meet the demand for electricity by the rural consumers in Nigeria. This challenge is acute and peculiar because the country has not been able to provide adequate supply to the connected populace let alone the rural areas, and also, it has not been able to extend its service of power transmission to very part of the connected area of the country [8].

[13] in their study of rural energy condition in Oyo State posited that generator and other fuel-powered engines (grinding and welding engines), battery supported flashlights and fire-wood form the core energy sources in rural areas. The rural dwellers depend on fossil fuel generator to charge their phones and lamps, many (such as traders, welders and pepper grinders) also make use of petrol or diesel-powered engines to operate their livelihood-based machines. Households generally make use of flashlights powered by batteries and rechargeable lamps as a form of light for easy navigation at night.

The increases in the demand for electricity have grown faster than the supply and the population; this has led to the rural household to still rely on unhealthy and unsustainable sources of energy to light-up their environment. However, for any meaningful planning work towards rural electrification, reliable data cannot be overemphasised but this is lacking. He then advocated for collection of information as a disaggregate ward/village levels in Nigeria [9].

5. Study Area

Ibogun is situated in Ifo LGA of Ogun State, southwestern Nigeria (Figure 1). Ibogun is one of the eleven political wards recognised by the Independent National Electoral Commission [14]. Ibogun is made up of 32 villages. The villages consist of Olaogun, Adina, Akiode, Sulola, Ekundayo, Akin-side, Olaoparun, Opo, Alasia, Odeyinlo, Alapako Oke, Alapako Isale, Odeyemi, Alapoti, Egbeda, Fasina, Osungboye, Ilugboro, Omitoro, Balogun, Sowunmi, Ig-bogun, Awe Nla, Awe Kekere, Awe Alapapo, Fayelu, Abudu, Giwa, Olorundada, Ojodu, Abudu Tuntun, and Epoto.

Ibogun community has a moderate population and is not an exemption among communities that urgently needs rural electrification. By its agrarian nature, the community is involved with the cultivation of crops, vegetables and animal farming amongst which are poultry, piggery, etc. The community produces a relatively high yield of cassava every year, which is sufficient for setting up a garri producing factory and could turn out to be a major source of revenue to some residents. This is same for fufu processing that is currently being taken to neighbouring states especially

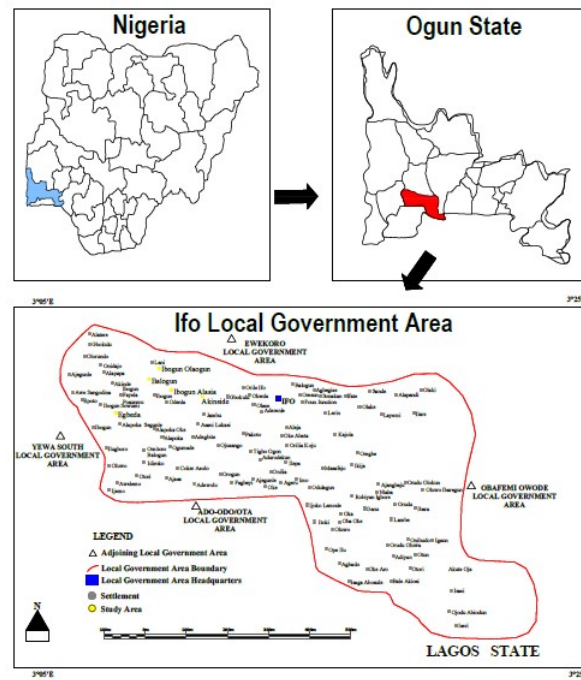


Figure 1: Map of study area.

Lagos State for sale. In terms of development, Ibogun community is predominantly residential and agricultural land uses along with scanty commercial activities. Also, there are institutional developments such as schools, health centres, police post, etc. The processing factories found at the community are small scale in nature and they include block making, sawmills, welding, etc. There are pieces of evidence of trading activities in the community with the domination of building/construction materials. Residential (housing) developments spring up from time to time due to its proximity to Lagos and some medium-sized urban areas in Ifo LGA and Ogun State. Ifo LGA, where Ibogun community is situated, is one of the Development Pressure Area as recognised by the Ogun State Regional Plan [15]. Ibogun is also host to the College of Engineering and Environmental Studies, Olabisi Onabanjo University, Ibogun Campus. The community has an advantage of locating next to border settlements to the western part through which some of the agricultural products from their farms if properly processed and packaged, can be exported for the benefits of the community, Ogun State and the country at large. These border settlements link up with Benin Republic, through which goods are imported into Nigeria.

6. Study Methodology

A cross-sectional approach was adopted for this study. The approach was based on the recommendation of the [16] in a study of rural electrification. The survey approach is believed to offer the merit of providing valid information that can be generalized

to a broader population. According to [17], cross-sectional research design is employed when a study is concerned about the prevalence of phenomenon or situation as well as involving only one contact with the study target population.

The study utilised data from both and secondary sources. The researchers utilised a questionnaire to obtain information from Ibogun community residents. The questionnaire used captures socio-economic profile of the residents, issues regarding sources of electricity supply, electricity consumption, and problems associated with electricity supply and consumption. The collected data were complemented by field observation. The secondary data sources included journal articles, government publications, and technical reports.

The study adopted a multistage sampling technique for sample selection. At the first stage, 10 villages were randomly selected out of the 32 villages making up Ibogun community. The villages selected are Olao-gun, Adina, Akinside, Opo, Alasia, Oderinlo, Egbeda, Fasina, Balogun, and Giwa. At the second stage, in each of the selected village, questionnaires were distributed using a purposive sampling technique. Data collected were analysed using a Statistical Package for Social Sciences (IBM Statistics 25). Also, results from analysis are presented through the use of tables and charts. Inferential statistics were also conducted to determine relationship or association with respondents' monthly income and variables (source of electricity, an alternative source of energy supply, and daily hourly usage of a power-generating set). To achieve the objective, three hypotheses were formulated. They are:

i. H_0 : There is no significant relationship or association between residents' income and source of electricity.

ii. H_0 : There is no significant relationship or association between residents' income and alternative source of energy supply.

iii. H_0 : There is no significant relationship or association between residents' income and daily hourly usage of a power-generating set.

7. Results and Discussions

7.1 Socioeconomic profile of respondents

From Table 1, the respondents' gender consists of 52% females and 48% males, a result which is an almost equal ratio. Results on the marital status of respondents show that a majority (74.6%) are married, singles accounted for 18.9%, and 4.1% are widowed. Also, the age distribution of the respondents indicates about 78% are within the working-age group with the potential to contribute to the economy of the rural community to which they belong. The majority (91.8%) of the respondents have acquired formal education, 0.8% had informal education and 6.6% had no education. The results of occupational status revealed that half (50%) are traders, 18.9% are artisans, farmers (12.3%), 9.8% are civil servants and 2.5% are private employees. The results indicate the rural communities are gradually transforming into township status with over 70% of the respondents working in a paid job and self-employed and less than 13% getting involved in farming. The monthly income of the respondents revealed half (50%) of the respondents earned below ₦18,000 (\$ 50), 31% earned between ₦18,001-₦60,000 (\$ 50 – \$ 166.70) and about 5% earned above ₦60,000 (> \$166.70), which thus implies Ibogun community is dominated by low-income class. The meagre income of the respondents may limit households' access to the required electricity. The study area represents an emerging settlement as results showed that 41.8% migrated to the community in the last three years. Another 20.5% had lived in the study area for 4-6 years, 17.2% lived for 7-10 years and 18.9% had been residents for over 10 years. The influx into the study area indicates an increase in electricity demand by the residents is inevitable.

7.2 Electricity supply

This study captured electricity sources for Ibogun Community as shown in Table 2. 26% of the respondents relied exclusively on the electricity service provider (Ibadan Electricity Distribution Company - IBEDC). A greater percentage (69.7%) received electricity supply from both IBEDC and alternatives whereas about 5% relied exclusively on alternatives. However, 4.1% did not connect to any electricity source. The alternative electricity sources used by the respondents are power-generating set (77%),

firewood (9.8%), solar inverter (0.8%) and coal (0.8%) (Table 2). A greater proportion utilizing power-generating set portend environmental pollution in Ibogun community. This finding is contrary to an earlier study by [12] that reported 48% of the respondents utilised power-generating set and 19% who utilised fossil fuel and coal, as an alternative energy source. The variations recorded may be due to the availability of energy sources and household income. More importantly, the results imply that electrification planning should be location-specific as household characteristics differ across geographical space. From Table 2, results revealed variations in the daily electricity supply by the IBEDC. 58.2% of the respondents confirmed daily electricity supply is between 1-5 hours while 19.7% received electricity supply for 6-10 hours. Another 12.3% received electricity supply for 11-16 hours and above 16 hours (6.6%). The results here demonstrated that in the study area, the majority received electricity supply for less than 5 hours daily. This must have informed the greater proportion that utilised power-generating set to augment the shortfall. The result confirmed [1] findings that the duration of electricity supply in the northern part of Nigeria is better than the southern part, where the study area is located.

7.3 Electricity consumption

The respondents' time of access to electricity varies as results in Table 3 showed that 13.9% of the respondents had access between 6pm and 12 midnight, 9% had their access time between 12 midnight - 6am, 5.7% confirmed 12noon-3pm, 3.3% said between 6-9am and equal proportion (1.6%) had day access time of 9am-12noon and 3-6pm respectively. Although, a greater proportion (62.3%) could not ascertain access time to electricity but there seems to be greater supply between 6pm and 6am. The results validated the stance of [1] who stated rural households have an average of 6 hours of electricity daily, which thus confirms that rural households tend to have shorter hours of electricity supply than urban households. Also, for electricity consumption, the respondents pay for the electricity bills via diverse modes. The largest proportion (73.8%) pay estimated sum as determined by the electricity service provider, 10.7% used prepaid meter, 7.4% through self-assessment and 4.1% used analogue meter serving as the basis for their electricity bills. The results indicated that less than 15% of the respondents have their electricity consumption metered, which is a challenge to ascertain energy demand in Nigeria. The results also implied the problems of overcharging and undercharging are inevitable. 87.7% of the respondents pay their electricity bills monthly, 2.5% pay once in two months and 0.8% pay once in 3 months. Of the proportion that utilised power-generating set, 31.1% used it between 3-4 hours daily, next is between 5-11 hours daily (20.5%), and 14.8%

Table 1. Socioeconomic profile of respondents.

Variable	Frequency	Percent	Variable	Frequency	Percent
Gender			Level of education		
Male	59	48.4	Informal	1	0.8
Female	63	51.6	Primary	21	17.2
<i>Total</i>	<i>122</i>	<i>100.0</i>	Secondary	66	54.1
Marital status			Tertiary	25	20.5
Single	23	18.9	No education	8	6.6
Married	91	74.6	No response	1	0.8
Widow/Widower	5	4.1	<i>Total</i>	<i>122</i>	<i>100.0</i>
No response	3	2.5	Occupational status		
<i>Total</i>	<i>122</i>	<i>100.0</i>	Farmer	15	12.3
Age			Artisan 23 18.9		
Below 20 years	9	7.4	Trader	62	50.8
21-30 years	32	26.2	Public Servant	12	9.8
31-40 years	44	36.1	Private	3	2.5
41-50 years	19	15.6	Retired	1	0.8
Above 50 years	16	13.1	Unemployed	1	0.8
No response	2	1.6	Student	5	4.1
<i>Total</i>	<i>122</i>	<i>100.0</i>	<i>Total</i>	<i>122</i>	<i>100.0</i>
Monthly income			Residency period		
Below ₦18,000	61	50.0	Less than 3 years	51	41.8
₦18,001 - ₦30,000	22	18.0	4-6 years	25	20.5
₦30,001 - ₦60,000	28	23.0	7-10 years	21	17.2
₦60,001 - ₦120,000	4	3.3	Above 10 years	23	18.9
Above ₦120,000	2	1.6	No response	2	1.6
No response	5	4.1	<i>Total</i>	<i>122</i>	<i>100.0</i>
<i>Total</i>	<i>122</i>	<i>100.0</i>			

Table 2. Electricity supply.

Variable	Frequency	Percent
Source of electricity		
IBEDC	26	21.3
Alternative	6	4.9
Both IBEDC & Alternative	85	69.7
Not connected to power	5	4.1
<i>Total</i>	<i>122</i>	<i>100.0</i>
Alternative sources		
Firewood	12	9.8
Solar/Inverter	1	0.8
Generating set	94	77.0
Coal	1	0.8
Others	2	1.6
No response	12	9.8
<i>Total</i>	<i>122</i>	<i>100.0</i>
Length of supply by ESP		
1-5 hours	69	56.6
6-10 hours	24	19.7
11-16 hours	15	12.3
Above 16 hours	8	6.6
No response	6	4.9
<i>Total</i>	<i>122</i>	<i>100.0</i>

that used for 1-2 hours. While 9.8% of the respondents power the set for 12-15 hours, marginal proportion (0.8%) used the set for above 16 hours (Table 3).

7.4 Perception on the state of infrastructure, electricity supply rating and impacts

From Table 4, results revealed respondents perceived state of infrastructure in the study area. 42.6% of the respondents stated that electricity infrastructure was poor, 36.9% claimed they were fair, and 9% said satisfactory. The proportions who stated good and very good were 7.4% and 3.3% respectively. The respondents' perceptions regarding electricity supply revealed half (50%) rated supply as poor, 36.1% thought it was fair, 7.4% stated satisfactory, 5.7% reported that supply was good and marginal proportion (0.8%) affirmed it was very good. About 70% of the respondents were negatively affected, and for those who reported severe impacts, results revealed the proportion of impacts range from businesses (24.1%), communications (24.1%), studies (18.5%), social (14.8%), security (14.8%), to recreation (0.8%).

7.5 Respondents' perception on the challenges of electricity supply

Results presented in Table 5 showed that 62.2% of the respondents strongly agreed or agreed to climate impacts on electricity infrastructure as a challenge whereas about 28% disagreed or strongly agreed. Similarly, over-half (51.7%) of the respondents strongly agreed or agreed to the fact of frequent breakdown of electricity transformer due to overloading as the problem of electricity supply while 36% disagreed or strongly disagreed. Respondents also made

Table 3. Electricity consumption.

Variable	Frequency	Percent
Access Time to Electricity		
12 midnight to 6am	11	9.0
6 - 9am	4	3.3
9am - 12 noon	2	1.6
12 - 3pm	7	5.7
3-6pm	2	1.6
6pm - 12 midnight	17	13.9
Unable to specify	76	62.3
No response	3	2.5
<i>Total</i>	<i>122</i>	<i>100.0</i>
Payment Mode for electricity consumption		
Prepaid Meter	13	10.7
Estimated	90	73.8
Self-Assessment	9	7.4
Analogue Meter	5	4.1
No response	5	4.1
<i>Total</i>	<i>122</i>	<i>100.0</i>
Electricity bills' payment frequency		
Monthly	107	87.7
Once in 2 months	3	2.5
Once in 3 months	1	0.8
No response	11	9.0
<i>Total</i>	<i>122</i>	<i>100.0</i>
Daily hourly usage of generating set		
1-2 hours	18	14.8
3-4 hours	38	31.1
5-11 hours	25	20.5
12 - 15 hours	12	9.8
Above 16 hours	1	0.8
No response	28	23.0
<i>Total</i>	<i>122</i>	<i>100.0</i>

their opinion known concerning non-payment of electricity bills by residents as a challenge to electricity supply, and results indicated that over half (52.4%) disagreed or strongly disagreed while 39.4% strongly agreed or agreed. Regarding the challenge of obsolete electricity infrastructure and billing rate, 51.6% and 65.5% strongly agreed or agreed respectively. Also, almost half (43.5%) agreed to sharp practices as electricity supply problem whereas 27.1% disagreed or strongly disagreed. Again, the majority (50.8%) disagreed or strongly disagreed with the vandalism of electricity infrastructure by miscreants as an electricity supply problem while 25.5% thought otherwise. However, a closer examination of the results revealed that “rate of billing” and “climate impacts on electricity infrastructure” are major problems of electricity supply in the study area. In addition to this, respondents greatly disagreed in respect of non-payment of bills by respondents. Greater proportion of neutrality by the respondents regarding the challenge of electricity was reported in the case of vandalism by miscreants (23.8%).

Table 4. Perception on the state of infrastructure, electricity supply rating and impacts.

Variable	Frequency	Percent
State of electricity infrastructure		
Very Good	4	3.3
Good	9	7.4
Satisfactory	11	9.0
Fair	45	36.9
Poor	52	42.6
No response	1	0.8
<i>Total</i>	<i>122</i>	<i>100.0</i>
Electricity supply rating		
Very Good	1	0.8
Good	7	5.7
Satisfactory	9	7.4
Fair	44	36.1
Poor	61	50.0
<i>Total</i>	<i>122</i>	<i>100.0</i>
Impact of state of electricity supply		
Strongly Affected	54	44.2
Mildly Affected	31	25.4
Not Affected	36	29.5
No response	1	0.8
<i>Total</i>	<i>122</i>	<i>100.0</i>
Impacts		
Business	13	24.1
Studies	10	18.5
Social	8	14.8
Recreation	2	3.7
Security	8	14.8
Communication	13	24.1
<i>Total</i>	<i>54</i>	<i>100.0</i>

7.6 Respondents' perception of expected government intervention

The respondents' perceptions on their expectation of government intervention towards rural electrification were examined in this study and results indicated that greater proportion agreed to upgrade of existing facilities (85.5%), expansion of electricity infrastructure (80.3%), safety and security (72.2%), improved billing system (68.9%), and checking sharp practices (58.2%). However, greater disagreements were recorded concerning “checking sharp practices” while respondents' least disagreements were recorded for the item “upgrade existing facilities”. But the respondents' neutrality regarding government intervention was highest for “checking sharp practices” and lowest for “upgrade existing facilities.” The results implied that residents identified obsolete electricity infrastructure as the major problem facing rural electrification.

7.7 Presence of government intervention on rural electrification

Residents' perception regarding if their community witnessed government intervention in electrification were sought and analysis was presented in Figure 2. 77% of the respondents opined there has not been government intervention in their community, 14% said

Table 5. Respondents' perception on the challenges of electricity supply.

Challenges	SA*	A*	U*	D*	SD*	Total
Climate impact on electricity infrastructures	27.0	35.2	9.8	16.4	11.5	100.0
Frequent breakdown of electricity transformer due to overloading	23.8	27.9	12.3	22.1	13.9	100.0
Non-payment of bills by residents	11.5	27.9	8.2	35.2	17.2	100.0
Obsolete electricity infrastructures	13.1	38.5	14.7	19.7	9.0	100.0
Rate of Billing	27.0	38.5	7.4	18.9	8.2	100.0
Sharp practices	22.1	26.2	17.2	18.9	15.6	100.0
Vandalisation by miscreants	6.6	18.9	23.8	20.5	30.3	100.0

*(SA – Strongly Agree; A – Agree; U – Undecided; D – Disagree; SD – Strongly Disagree)

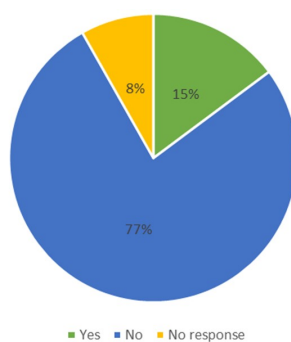
Please note that values presented in the table are in percent

Table 6. Respondents' perception of expected government intervention.

Intervention	SA*	A*	U*	D*	SD*	Total
Upgrade existing facilities	55.7	32.8	3.3	4.1	4.1	100.0
Improve the billing system	27.9	41.0	7.4	18.9	4.9	100.0
Expansion of electricity infrastructure	47.5	32.8	6.6	9.0	4.1	100.0
Safety and security	36.1	36.1	7.3	13.9	6.6	100.0
Check sharp practices	29.5	28.7	13.1	16.4	12.3	100.0

*(SA – Strongly Agree; A – Agree; U – Undecided; D – Disagree; SD – Strongly Disagree)

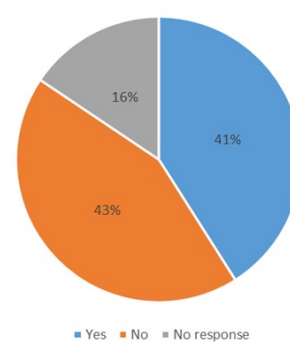
Please note that values presented in table are in percent

**Figure 2:** Presence of government intervention on rural electrification.

there was government intervention, and the remaining 8.2% were indifferent. The interventions witnessed according to some of the residents have been in the form of provision of the transformer and electric poles as well as stable electricity distribution. One of the respondents stated that they received the “promise of community electrification.”

7.8 Presence of electricity self-help projects

As presented in Figure 3, 41% of the respondents reported the community adopted a self-help approach towards electricity provision whereas 43.4% stated there was nothing of sort. The self-help projects embarked upon by the community include the purchase of electricity transformers and poles to replace faulty transformers and damaged poles; repair of faulty electricity transformers; reconnection to the alternative power line and purchase of 30kva generator.

**Figure 3:** Presence of electricity self-help projects.

7.9 Hypotheses testing

Further analyses were conducted to determine if significant relationship or association exists between respondents' income and three other variables - source of electricity, alternative source of energy supply, and daily hourly usage of a power-generating set.

7.9.1 Test 1

H_0 : There is no significant relationship between the residents' income and source of electricity

Decision Rule: Reject the H_0 if p value is less than alpha level of significance ($\alpha = 0.05$) otherwise accept the H_0 .

Since p value (0.629) is greater than 0.05 level of significance as shown in Table 7.

Decision: Accept the H_0 hypothesis

Conclusion: The Spearman's rank correlation is - 0.045 (Table 7) and this means that there is little or no correlation between resident's income and source of electricity. This suggests that residents' income does

Table 7. Correlation between residents' income and source of electricity.

		Monthly Income	Source of Electricity
Spearman's rho	Monthly Income	Correlation Coefficient	1.000
		Sig. (2-tailed)	.629
		N	117
	Source of Electricity	Correlation Coefficient	-.045
		Sig. (2-tailed)	.629
		N	122

Table 8. Correlation between residents' income and alternative source of energy supply.

		Monthly Income	Alternative source of energy supply
Spearman's rho	Monthly Income	Correlation Coefficient	1.000
		Sig. (2-tailed)	.107
		N	117
	Alternative source of energy supply	Correlation Coefficient	.107
		Sig. (2-tailed)	.277
		N	105

not have a relationship or association with the source of electricity.

7.9.2 Test 2

H_0 : There is no significant relationship between residents' income and alternative source of energy supply

Decision Rule: Reject the H_0 if p value is less than alpha level of significance ($\alpha = 0.05$) otherwise accept the H_0 .

Since p value (0.277) is greater than 0.05 level of significance as presented in Table 8.

Decision: Accept the H_0 hypothesis

Conclusion: The Spearman's rank correlation is 0.107 (Table 8) and this means that there is little or no correlation between resident's income and alternative source of energy supply. This suggests that residents' income does not have a relationship or association with alternative source of energy supply.

7.9.3 Test 3

H_0 : There is no significant relationship between residents' income and daily hourly usage of power-generating set

Decision Rule: Reject the H_0 if p value is less than alpha level of significance ($\alpha = 0.05$) otherwise accept the H_0 . Since p value (0.323) is greater than 0.05 level of significance as shown in Table 9.

Decision: Accept the H_0 hypothesis

Conclusion: The Spearman's rank correlation is 0.106 (Table 9) and this means that there is little or no correlation between resident's income and daily hourly usage of power-generating set. This suggests that residents' income does not have relationship with daily hourly usage of power-generating set.

8. Conclusion and Recommendations

This study evaluated rural electrification in Ibogun Community in Ifo LGA, Ogun State, Nigeria. The

study was initiated based on the dearth of study to examine rural electrification since the privatisation of electricity supply in Nigeria. Findings indicated that the majority of residents belong to the working-age group who possess the potential to contribute to community development. Ibogun community is a literate society dominated by the low-income class. The community witnessed an influx of migrants which suggest an increase in electricity demand. 26% of the Ibogun residents relied on electricity service provider (ESP) for electricity supply whereas 69.7% received supply from both ESP and alternatives especially power-generating sets. The majority of residents received less than 5 hours of electricity supply daily. A greater proportion of residents could not specify time of access to electricity although results suggest electricity supply was greater between 6pm and 6am. Most of the residents received estimated bills, thus indicating electricity consumption not metered. Because of the limited electricity supply, about 46% could use power generating set for between 1-4 hours daily to augment shortage. 42.6% conformed electricity infrastructure was in a poor state and 50% rated electricity supply as poor. About 70% of the residents were strongly affected by the poor electricity supply, and consequently, greater impacts were felt on residents' businesses and communication. Other areas of impacts were education, social and security. The major problem of electricity supply was the climate impact on electricity infrastructure while least of the problems identified was vandalism by miscreants. The upgrade of existing electricity facilities was the most desired intervention by the residents though residents considered government role in electricity supply to be marginal hitherto. Ibogun community has since been adopting self-help approach towards electricity supply through the acquisition of electricity transformers and poles as well as carrying out of repairs when nec-

Table 9. Correlation between residents' income and daily hourly usage of power-generating set.

		Monthly Income	Generating set and Hours of usage
Spearman's rho	Correlation Coefficient	1.000	.106
	Sig. (2-tailed)	.	.323
	N	117	89
	Correlation Coefficient	.106	1.000
	Sig. (2-tailed)	.323	.
	N	89	94

essary. Spearman's Rank Correlation results showed that there is no significant association between income and the variables such as the source of electricity, alternative source of energy supply, and daily hourly usage of a power-generating set.

Based on the findings, this study recommends for an improvement in the electricity supply by the ESP to the Ibogun Community. This is because the shortage of electricity supply would undermine the available potentials of both human and natural resources. Increase in electricity supply to the community would translate in mitigating the use of power-generating sets, which has been identified a major source of environmental pollution in Ibogun Community. The ESP should further install prepaid meters so that the issue of overcharging, undercharging and non-payment (default) can be addressed, and more importantly, electricity consumption rate can be monitored for effectiveness and efficient planning. There is a need to upgrade the existing electricity infrastructure especially damaged poles and transformers that breakdown too often. To extend the average life span of transformers and address overloading problems, ESP should see to proper monitoring of electricity consumption and shed load where necessary. It is desirable for the ESP to further liaise with the Physical Planning Authority both at the Local Government and State levels to keep track of physical development in and around Ibogun Community.

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