

SOCIO-ECONOMIC DETERMINANTS OF HOUSEHOLD ACCESS TO IMPROVED ELECTRICITY POWER SUPPLY AND WILLINGNESS TO PAY IN LOKOJA, NIGERIA

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ABSTRACT:

Access to electricity power supply remains a significant challenge in developing countries, with approximately 840 million people lacking reliable electricity supply. With the state of power supply in Nigeria, especially Lokoja City, many micro and medium enterprises as well as the industrial sector became crippled. Several studies have examined willingness to pay for improved electricity service, Households' energy choice but little have been done on households' access and willingness to pay for improved electricity power supply across residential density areas in Lokoja. Therefore, this article investigate households' access to improved Electricity Power supply and Willingness to Pay in Lokoja, Nigeria with a view to provide a practical and policy guidelines that will enhance access to electricity power supply. Robert Willig Theory of Willingness to Pay anchored the study. Cross sectional survey was adopted for the study. A semi-structure questionnaire was administered to 385 households' heads in the residential areas of Lokoja as identify in the Lokoja Urban Master Plan. This was obtained using Yamane sample size calculator base on the 2026 population projection of 64,220 households. Findings reveal Male-head households constituted 64%. Households sourced electricity power from solar (24%), Generator (34%), Power holding company (64%). About 54.4% households sampled indicated that they enjoy power supply less than 4 hours per day, while, 27% households signified that they enjoyed power supply for 4-6 hours per day, 6.2% of the households stated that they enjoyed power supply for 8-12 hours per day. Households' income, level of education and location of property jointly predict willingness to pay and access to electricity power supply in the study area. Dilapidated power infrastructure, huge debt of gas supplied, inadequate and estimated billing, were identified as challenges to households' access to improved power supply. The result obtained indicate that there is spatial variation in duration of power supply across residential area. The authors recommend alternate source of improved power supply, implementation of the Nigerian Gas Master plan and more Investment in the Power Distribution Company to increase access in the rural areas among others.

Keywords: Access to Electricity power supply, willingness to pay, Lokoja.

INTRODUCTION

Access to clean, reliable and Affordable energy for all is one of the cardinal goal of the Sustainable Development Goals (SDGs) Goal 7. According to the 2017 World Energy Outlook, about 1.1 billion people were lacking access to electricity in 2015, but their geographical distribution is uneven across the world; More than half live in Sub-Saharan Africa, mostly in rural areas: According to the 2030 projections, while the overall number of people without electricity will drop, In Sub-Saharan Africa, it will actually increase to more than 6,000 million or 90% of the worlds' total, because of population growth. These number explain the increasing attention paid to Africa's rural electrification, but the yearly investment devoted to electrification by 2030 is still less than half of what is needed (International Energy Agency, 2017). In developing countries, access to electricity remains a significant challenge, with approximately 840 million people lacking reliable electricity supply. (International Energy

Agency, 2020). Households' access to electricity in Nigeria stands at approximately 55-61% of the population, with significant disparities between urban and rural areas.

Access to electricity is important in improving the living standards of households, it is crucial to economic development by facilitating production of goods and services, poverty reduction and improved standard of living of citizens. Reliable electricity supply can stimulate economic growth that will have beneficial spillover effects on households living in poverty and helps to ensure environmental sustainability by cutting down the consumption of wood based fuel.

In the last two decade there have been various attempt by the government of Nigeria to solve or at least to reduce the problems of power sector. The electricity power implementation committee was created by the government in 2000 and prepared both the National Electricity power policy of 2001 and the National Energy Policy of 2003. These two policy document had the overall objective of rationalizing the utilization of Nigeria's vast fossil and renewable energy resources, increasing the participation of the private sector in the generation and distribution, both through incentivising independent power producers and through the Privatisation of the National Electrical Power Authority (NEPA), was created in 2004 to fast-track government- backed Independent Power Projects to increase generation capacity, while the following year, the Electric power Reform Act was promulgated to push forward the incorporation of NEPA. (Usman and Abbasoglo, 2014, Ogunleye, 2016). Despite the importance of reliable energy services to consumer welfare, access to uninterrupted electricity remains a crucial problem facing households in Nigeria. Currently, the average Nigerian households' experiences power outages for about 19 hour daily (National Bureau of Statistics, 2012).

Electricity patronage is influence by multiple factors, including: affordability, reliability, service quality and individual socio-economic characteristics, (Adeoti, 2009). Willingness to pay for electricity services is contingent upon various determinants such as household income, educational level and perceived service quality. (Gbakeji and Akinwumi, 2012).

Precious study of household access to electricity focused on willingness to pay, pattern and patronage (Ejiro and Omotosho, 2020), access and satisfaction (Ogunbiyi and Samuel, 2020) without considering determinant and the pattern of urban households' access to electricity power supply based on households' socio-economic characteristics. There exist a gap in knowledge in households' access to electricity and willing to for and improved electricity power supply across residential density areas in Lokoja, Nigeria;

CONCEPTUAL FRAMEWORK/ LITERATURE REVIEW

Willingness to pay within the Theory of consumer choice

Willingness to pay is the amount that a consumer is willing to pay for goods and services as perceived benefits. Han et al. (2007) opined willingness to pay for a particular product as the amount of money an individual or household is willing to pay to purchase a product given a person income, risk preferences and other factors. The two determinants of willingness to pay focused on by economic models are income to the individual or household and the use of the good in question (Liebel *et al*, 2011). When individuals consider paying for improved power supply such as electricity and or some of its products, their choices valuation questions are constraint by their disposable income. Therefore, a household or an individual's income is expected to correlate to be with the amount of money consumer are willing to spend for improved electricity power supply.

Interestingly, income is mostly included in stated preference survey and expected to have a positive effect on consumption and the individual's well-being. This link is expressed by the concept of use value. If an individual does not use the good (Electricity power supply) in question, the only link between the good and the individual's well-being is the 'knowledge' the individual have about the good. Expressed as 'non-use value', which is expected to be weaker than the link base on direct use. It is assumed that the willingness to pay for users is more than for non-users (Shai et al 2020). Willingness to Pay (WTP) is a crucial concept in evaluating consumer demand for utilities like electricity. It reflects the maximum amount of household is ready to spend in exchange for improved Electricity service. Household WTD shaped by multiple factors including income level, the responsibility of the existing power supply, availability of alternative sources, and awareness of long-term benefit.

Geographic location intersects with socio-economic characteristics to create complex patterns of electricity access. Urban-rural divides represent the most obvious spatial dimension, with urban area typically enjoying

superior access due to population densities, greater economic activities and political influence (Ahiborg and Hammar 2014). However, within both urban and rural areas, socio-economic stratification create significant varieties in access, quality and reliability of service. In urban settings, wealthy neighborhoods often receive priority for infrastructure investments and maintenance, while informal settlements and low-income areas experience frequent outage and poor service quality (Silver, 2015). Several empirical studies illustrate the complex relationship between socio-economic characteristics and electricity access.

Olaniyi and Olayemi (2021) conducted a study in the urban slums of Lagos, Nigeria where they found household income, perceived reliability of electricity supply, and family size significantly determined residents' willingness to pay for improved services.

Ejiro and Samuel (2020) examine Electricity usage patterns and payment willingness in south- south Nigeria, in a broader macro-economic analysis of Nigeria's electricity crises, argued that residents' patronage is closely linked to transparency in pricing, improved customer service, innovation in electricity delivery. Their study emphasized the importance of creating a demand driven electricity market where consumers are confident in the services provided.

STUDY AREA

Lokoja is located on the intersection point of longitude $7^{\circ} 49' E$ of Greenwich meridian and latitude $6^{\circ} 44' N$ of the equator. A confluence to river Niger and Benue It is a town situated on the slope of a range of hills called Mount Patti. The town in its growth, runs down the slope and expands into the Niger River valley fig.1. The Niger Dams Authority was established in 1962 with responsibility for the development of hydro power as a component of the energy architecture of Nigeria, its functions include the construction and maintenance of dams and other works on the river Niger, generation of electricity by hydropower and the improvement of water navigation, irrigation and fisheries. (Manafa, 1995). The hydro power plant located in Kaiji/Jebba has an installed capacity of 1,338 MW. Lokoja is also situated 45 kilometer away from Geregu Independent Power Plants with 434 MW installed capacity. It lies on the right-hand side of kilometer seventy-six of the Okene-Abuja Road. Lokoja is presently the administrative capital of Kogi State created in 1991 According to The National Population Commission (NPC) 2024, the population projection for the city is 623,256 people.

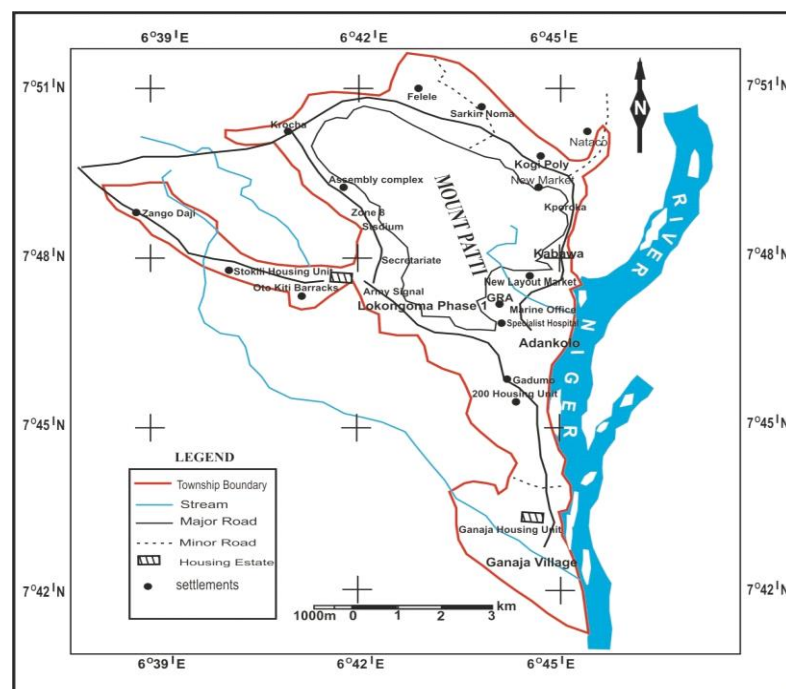


Fig.1 Map of Lokoja

Source: Department of Geography and Environmental Studies, Prince Abubakar Audu University, Anyigba. (2026)

METHODOLOGY

Survey research design was adapted for the study. Primary and secondary data were used for the study. Primary data were sourced through the use of questionnaire. The sample size of 385 households were drawn from the population of 64,220 households base of 2026 Notational Population projection for Lokoja using (Yamane, 1969) calculator. Multi-stage sampling techniques involving four stages. At the first stage, Lokoja was stratified into six zones for ease of data capturing these zones are; zone1 -6. At the second stage, localities with population of over 10,000 persons (Urban localities benchmark as identified by Olatubara (2004) were identified in the study area with the aids of National population figure 2006 projected to 2023. At the last stage, a random choice of 'n' number of households corresponding to 0.006% of the total number of households was selected randomly. 0.006% of the total number of households was selected for the study owing to the fact that 95% of the studies reviewed on household's access to electricity had a sample size between 100 and 150 resulting from the use of 0.06% of the sample frame. Within each community, separate but proportional samples were drawn using the number of households and number of communities. This gave a total of 385 households' heads. Accordingly, 385 copies of the survey questionnaire were administered on households head in the selected communities.

Data collected were analyse using both descriptive and inferential statistics for this study, simple percentages combined with tables, charts and figures were used to analyse the collected data. The Multivariate statistics used is the Multinomial logistic model which was employed to capture the relationship between the socio-economic characteristics of households, their access to electricity and willingness to pay. It is use to estimate the probability that each of the identified variables will be chosen under the effects of residents socio-economic variables. The statistics exists to handle the case of where the independent variables are mixture of continuous and categorical. In this study, each of the identified factors affecting households' access to improved electricity and willingness to pay was selected as the dependent variables. Five sets of variables are the predictor, these are: households income, occupation, level of education, perceived service quality, location of property. There are eleven categories form these set of predictors. Educational background as an independent variable is with four categories, of no formal education, primary, secondary and tertiary. Similarly occupation is categorised into four farming, artisan, trading, and civil service

while location of property is also with three categories of small, medium, and high density areas.

Table 1. Sample frame and size

Residential Zones	Names of Communities in Residential zone	Number of Households	Sample size (0.06%)
Zone 1	Cantonment, Cemetery, GRA, Marine, New Lay-out I & II Old market	9572	57
Zone 2	Angwan Rimi, Galilee, Kabawa, Karaworo, Kporoka	4693	28
Zone 3	Army signal, Lokogoa, Phase I&II, Secretariat Housing Estate	7371	44
Zone 4	500 Housing units, Ganaja I &II. Ganaja extention	19127	115
Zone 5	Crusher, Sarkir norma, Natako, Felele	15028	90
Zone 6	Army Barack, Otokiti, Zango Daji	8429	51
TOTAL		64,220	385

Source: Computed from records of National Population Commission 2025

RESULT AND DISCUSSION

Households Socio-Economics Characteristics

Data gathered on the socio-economic characteristics of households are presented on Table 2. Shows that 63.7% are male headed households. Also from the Table, 8.4 % of the households had no formal education, 18.1% had primary education, 30.2% had secondary education and 43.3 % had tertiary education. This indicate the percentage of literacy of households in the study area is high as typical of a state capital. Similarly, 47.6%of the sampled households indicated that they are civil servant, 18.4% Artisan and self-employed while 34% indicated traders. Income of households were also presented on the same Table. Analysis reveals that 79 % of the households' earned above #200, 000.00 in a month, while 18% of the sampled households earned between #150,000.00-#200,000.00. Also, 6% of the households' sampled earned between #101,000-#150,000.00. The above households' income suggest that if power supply are stable, households should be able to pay for improved power supply..

Table 2. Socio-economic characteristics of Households		
Variables	No of Respondents	Percentage
A. Sex		
Male	247	63.7
Female	138	36.3
B. Level of Education		
No formal education	31	8.4
Primary education	69	18.1
secondary education	117	30.2
Tertiary Education	168	43.3
C. Occupation		
Civil servant	185	47.6
Artisan/self-employ	69	18.4
Trader	131	34
D. Household income in #		
100,000-150,000	23	06
151,000-200,000	58	15
201,00-250,000	166	43
>250,000.00	138	36

N=385

Source: Authors' field survey, 2026

Table 3 below shows the response of the households' electricity patronage and access to electricity. The results indicates that 63.8% of the household patronized Power Holding Company of Nigeria as their source of power supply while 23.7% households patronize solar energy and 33.5% patronize Generator as their source of power supply. Multiple sources of power supply is not uncommon in the study area.

Hour of electricity supply to households is also presented on the same Table. About 54.4% households sampled indicated that they enjoy power supply less than 4 hours per day. While, 20.6% households signified that they enjoyed power supply for 4-6hours per day, 6.2% of the households stated that they enjoyed power supply for 8-12 hours per day. The above corroborate National Bureau of Statistics (2012) that posits that average Nigerian experience power outage for 19 hours per day. Consequently, about 48% sampled households indicate willingness to pay for improved power supply.

Responses of respondents on the challenge to access to Electric power supply in the study are presented in Table 3. Analysis reveals that 17,8% of the respondents indicated billing system inhibit access to electricity power supply, while 43.2% of the respondents implicated unreliability of power supply as bane to households' access to

electric power supply. Also about 28.1% of the respondents indicated collapse of electrical infrastructure as challenge to access to electric power supply.

Table 3. Households' Electricity Patronage

Variables	Frequency	Percentage
Sources of power supply		
Solar energy	92	23.7
Generator	130	33.5
Power Holding company	246	63.8
Durations of power supply		
<4 hours	208	54.4
4-6 hours	37	27.1
6-8 hours	50	12.5
8-12 hours	23	6.2
>12	00	0
Willingness to Pay		
Yes	185	47.8
No	200	52.2
Access Challenge		
Billing	69	17.7
unreliability	170	44.2
Collapse electrical infrastructure	146	38.1

N=385

Source: Authors' Field Survey 2026

Factors Influencing Households' Access to Electricity power supply and willingness to Pay

Multinomial logistics model was employed to capture the relationship between socio-economic characteristics of households and their access to electricity and test the hypothesis in this study

From the Multivariate analysis, it is evident that socio-economic characteristics of households significantly influence access to sanitation services.

The results were presented in Table 4. This results shows that households' income ($P=0.000$) Level of education ($P=0.004$), passive quality of service ($P=.000$) had a positive significant influence on access to power supply and willingness to pay, while sex ($P=0.999$) marital status ($P=.430$) had no significant influence on households' access to electricity power sup. This suggest that as the level of education of households increase their access to improved power supply and willingness to pay. The same applied to level of income. In terms of direction of influence, the regression result reveals that all the socio-economic characteristic of household (level of education, occupation, households' income) had a positive relationship with access to improved power supply and willingness to pay. This corroborate the similar findings of Olaniyi and Olayemi, 2021 that households' income, perceived reliability of electricity supply determined access to electricity and willingness to pay. On the other hand sex of households head either male or female does not influence access to improved power supply and willingness to pay

Table 4 Likelihood Ratio Test on the Multinomial Logistic Model for socio-economic factors influencing households' access and willingness to pay for Electricity power supply

Effects	Model fitting criteria	Likelihood ratio Test		
	-2 Log Likelihood Reduce model	Chi square	DF	Sig
intercept	12.799	.000	0	
income	56.541	43.742	9	.000
Occupation	1.451E2	132.253	9	.000
Education	26.022	13.223	3	.004

Sex	13.178	.378	6	.999
Perceived quality of service	49.581	36.781	9	.000

Source: Author's field survey. 2026

CONCLUSION AND RECOMMENDATION

Access to Electricity Power Supply is crucial to economic development and human welfare. Households in the study area suffered varied degree of irregular power supply. The results of the hypothesis indicates income, location of property and perceived quality of service as factors influencing households access to electricity power supply and willingness to pay. The study recommends the following:

Power Distribution Companies (Disco) should source found from the Capita market in order to inject fund for maintenance, revitalize the power and Energy sector in Nigeria

1. Improved billing efficiency. This is a measure of the efficiency of the proportion of the quantity of power supplied which include both metered and unmetered sales to the consumer.
2. There is the need for committed implementation of the Nigerian Gas Master plan (NGMP). Adequate processing and supply of dry gas, Urgent step need to be taken to develop the national gas grid. Thermal (gas fired) electricity generating companies account for over 80% of current electricity production, however gas supply constraints has resulted in less than optimal production in resent time.
3. Alternate source of clean energy such as Solar grid across the federal constituencies in the State

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