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AN ANALYSES OF THE EFFECT OF ELECTRICITY AVAILABILITY ON RENTAL VALUES IN BAUCHI METROPOLIS

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ABSTRACT

Access to reliable electricity is not only essential for basic household functions, such as lighting, heating, and powering appliances, but it also enhances the overall livability and attractiveness of residential properties. Therefore, this study aims to fill this gap empirically, by investigating how electricity availability and reliability on residential property affects rental values in Bauchi. The study adopted the quantitative research design and used appropriate procedure to obtain the data from 124 respondents through a structured questionnaire administration. The findings indicated that; the electricity supply is neither consistently reliable nor severely unreliable; highly reliable electricity is rare in the study area, likely limited to well-developed areas probably GRA considering the low density nature of the residence; correlation coefficient of 0.977 indicates a near-perfect linear relationship between residential property rental value and electricity availability, the significance level ($p = 0.000$) confirms this relationship is statistically significant; and the results further indicates that approximately 95.5% of the variance in rental value is explained by electricity availability and reliability, which aligns with the Pearson correlation ($r = 0.977$, since $r^2 = 0.977^2 \approx 0.954$, nearly matching the R^2 from ANOVA). The study concluded that available and reliable energy supply significantly influences rental value and housing choices. Therefore, the study recommends that Estate Surveyors and Valuers should incorporate electricity availability and reliability in their valuations because the strong correlation between electricity availability and residential property rental value.

Keywords: Electricity, Availability, Reliability, Rental Value, Residential Properties

INTRODUCTION

Access to reliable electricity is a cornerstone of modern socio-economic development, influencing various aspects of human life, including housing and real estate markets (Tiwari, Tarekegne and Schelly 2021). In many developing countries such as Nigeria, the availability and consistency of electricity supply remain significant challenges, with profound implications for residential property markets (Adebayo & Ainah 2024). According Leishman and Goel (2025) Electricity is a fundamental amenity in the property market, serving as a critical factor in determining a property's value, appeal, and functionality. Reliable and efficient electrical systems are essential for powering lighting, appliances, heating, cooling, and modern smart home technologies, making them a non-negotiable expectation for buyers and renters (Strengers, 2024). Olatunde, Okwandu and Akande (2024) further argued that electricity is not only essential for basic household functions, such as lighting, heating, and powering appliances, but it also enhances the overall liveability and attractiveness of residential properties. In areas where power supply is erratic or limited, the absence of reliable electricity can significantly affect tenant preferences, property desirability, and also rental values (Best, Burke & Nishitateno 2021).

According to Oyedepo (2012) and Adedeji (2016) household energy consumption in Nigeria serves multiple purposes, including cooking, lighting, heating, cooling, and powering electronic devices and appliances. Recent studies have highlighted several factors influencing household energy use, including income distribution, which affects expenditure on energy consumption and that energy usage patterns also exhibit gender disparities (Abubakar, Alola, Bekun, & Onifade 2024) also Oyeniran & Isola (2023) found out that household attitudes toward energy technologies are influenced by social norms, cultural values, family size, and educational attainment. Additionally, geographic factors such as regional economic development, urbanization rates, vegetation types, and climate conditions—including temperature and rainfall—affect household energy choices (Ochedi & Taki 2022).

In the Bauchi property market, electricity availability plays a critical role in determining rental values due to Nigeria's broader challenges with unreliable power supply, including frequent outages, inadequate grid infrastructure, and reliance on generators or off-grid solution (Misbahu Et al., 2023). Bauchi, like most of Nigeria, faces significant power supply issues, such as shortfalls in production and distribution that force households and businesses to adopt costly alternatives like diesel generators. These problems intensify urban-rural divides and impact real estate development. A study would highlight how these issues depress rental markets in underserved neighborhoods, informing targeted interventions like grid expansions or renewable energy integrations to boost property values

This study seeks to investigate the effect of electricity availability on residential property rental values in Bauchi State. Specifically, it examines how variations in electricity access impact rental value and tenant preferences. Overall, while general infrastructure studies exist, a targeted analysis on electricity in Bauchi would fill knowledge gaps, promote evidence-based strategies, and align with national efforts to improve power access for real estate viability. Therefore, the research aims to provide empirical evidence to guide policy interventions aimed at improving electricity infrastructure, enhancing rental market dynamics, and promoting equitable access to housing in Bauchi State.

Statement of the Problem

Bauchi State, located in northeastern Nigeria, is characterized by a mix of urban and rural settlements, with varying levels

of infrastructure development. The state like other North-east states faces persistent challenges in electricity supply, including frequent power outages, limited grid coverage, and reliance on alternative power sources such as generators and solar systems. These challenges create a unique context for examining how electricity availability shapes the rental value of residential properties. According to Mäntylä (2025) Properties with consistent access to electricity, whether through the national grid or alternative sources, are likely to command higher rental prices due to their enhanced functionality and appeal to prospective tenants, similarly, properties in areas with unreliable or no electricity may experience low rental values, as tenants' factor in the additional costs and inconveniences of providing alternative power supply for themselves.

Despite the recognized importance of electricity as a factor in determining property rental value (Ofetotse, Essah & Yao 2021), there is a lack of empirical research examining its specific effect on rental values in Bauchi State. Existing studies on real estate markets in Nigeria have primarily focused on capital value or urban centers like Lagos, Porthacourt and Abuja, (Ugwuejim & Otegbulu, 2024; Onwuanyi, Chima & Oyetunji 2022; Okwakpam & Okere 2023; Nuhu *et al.,* 2024). with limited attention to rental markets in less urbanized states like Bauchi. Moreover, the interplay between electricity availability and other socio-economic factors, such as household income (Candelise, Saccone & Vallino 2021), property location (Jie *et al.,* 2023), and tenant demographics (Onwuzuligbo, Umeora & Munonye, 2025), these has not been properly researched in the context of Bauchi residential property market by previous studies.

Also, previous studies on residential property markets in developing and some Africa economy such as Senegal by Gafa and Egbendewe (2021), Egypt by Hongyun and Radwan (2021), in Ghana by Adusah-Poku, Dramani and Adjei-Mantey (2022) and Qeqe, Kapingura and Mgxekwa (2022), have highlighted the role of infrastructure, including electricity, in determining property values. However, there is limited research specifically focused on the rental market dynamics in Bauchi local government area of Nigeria, where electricity access varies significantly across socio-economic contexts. This study aims to fill this gap by empirically investigating how electricity availability affects residential property rental values in Bauchi, Nigeria, with a view to enlighten urban planning and real estate investment decisions. The following objectives have been outlined to achieve this aim : To assess the relationship between electricity reliability and rental values of residential properties in Bauchi. To evaluate the influence of alternative power sources (e.g., generators, solar) on rental value premiums in areas with unreliable electricity. And to provide policy recommendations for improving electricity access to enhance residential property market dynamics in Bauchi. By analysing data from a diverse sample of low density, medium density and high-density residential areas, this research explores how the presence, reliability, and source of electricity influence rental value of residential property and tenant preferences. Additionally, the study examines the socio-economic and demographic factors that may influence this relationship, such as income levels, household size, and property location.

Literature Review

Nigeria, the most populous nation in Africa, has one of the lowest per capita energy consumption rates globally, with a significant prevalence of energy poverty (Okorie & Lin 2022). The focus on Nigeria is due to her energy challenges and the broader implications for improving clean energy programs, such as the Nigeria Energy Transition Plan and the National Renewable Energy and Energy Efficiency Policy. Energy deprivation and poverty, particularly in relation to household access to modern, green and sustainable sources, exacerbate socio-economic disparities Hussain, Razi, Hewage & Sadiq 2023). Omer (2017) opined that modern energy sources are more efficient and environmentally friendly compared to traditional sources. According to the International Energy Agency (IEA), (2009), over 2.5 billion people worldwide lack access to clean energy for daily activities such as cooking, while more than 1.3 billion people lack basic energy supplies. A substantial proportion of this population resides in sub-Saharan Africa, including Nigeria.

Despite Nigeria's growing electricity grid coverage, approximately two billion people in developing countries still rely heavily on biomass for their energy needs (Sambo, 2009). The proportion of the Nigerian population with access to electricity was estimated at 60.5% in 2022, reflecting a 1% increase from the previous year, residential power consumption was approximately 58,900 terajoules in 2020, marking the highest volume recorded in recent years (Adeshina et al., 2024). By the second quarter of 2024, nearly 13 million customers were registered with the country's eleven electricity distribution companies (DisCos). Ibadan DisCo had the highest number of registered customers, with approximately 2.5 million, followed by Abuja and Enugu, each with about 1.4 million registered customers (Bello *et al,* 2024)

Energy distribution in Nigeria remains inconsistent, with DisCos supplying over 24,000 gigawatt-hours of electricity in 2023, while approximately 21,820 gigawatt-hours were billed in the previous year (Oyewunmi & Ehanmo 2023). Regional disparities in electricity access persist, with urban areas benefiting from more extensive infrastructure compared to rural regions. According to Onyekachi (2024) a 2020 study found that households in Nigeria's southern states possessed more electrical appliances than those in the northern regions, particularly in the North-East, highlighting significant energy access inequalities.

Brown and Muehlenbachs (2024) quantifies the value of uninterrupted supply through interruption costs and adaptation behaviors, indirectly linking to property values via reduced desirability in outage-prone areas. Residential outage costs range from $3.9 (momentary) to $32.4 (16-hour), or $2.6-21.2 per kW, higher in summer and mornings. Households adapt via battery storage, with willingness-to-pay disparities highlighting inequities in climate resilience. Brolinson, Doerner, Pollestad and Seiler (2024) found out that high electricity prices can shock markets, as seen in Norway's 2021-2022 crisis, where prices fell more in affected regions, with energy-efficient homes less impacted (marginally significant positive effect for single-family houses). Energy-efficient properties command 1-10% premiums, with "A"-rated homes gaining 10% in Europe, due to 25% lower costs. Outages increase fire risks and reduce livability, potentially depressing values, though direct links are understudied.

Ajibola, Awodiran and Salu-Kosoko (2013) found out that that in Lagos electricity reliability emerges as a critical factor, with frequent outages (blackouts averaging 200-300 days/year in some areas) depressing values by reducing livability and increasing operational costs (e.g., generators). Industry reports note that areas with consistent supply command higher prices, while outages lead to value losses due to buyer deterrence. Spikes in electricity costs aggravate this; real estate operators report rising bills and vacancies,

with high costs influencing investment strategies and tenant retention.

Renewable solutions like solar panels mitigate unreliability, with Rashid *et al.,* (2024) shows up to 25% value increases for solar-equipped homes, driven by energy savings and eco-appeal amid grid failures. Infrastructure development blogs emphasize that reliable power, alongside roads and water, raises values in thriving communities.

Adepoju and Babalola (2022) examines the influence of theory of planned behavior constructs as well as introduces uninterrupted electricity supply as electricity availability construct in place of the locational attributes on intention to invest in residential real estate. In addition to the mediation effects of attitude and perceived behavioral control on the relationships between electricity availability and intention to invest in real estate property. The data for this study were obtained from the residents of government-reserved areas in Akure, Ondo State, Nigeria. Based on random sampling techniques, a total of 132 questionnaires were useful for this study. The survey found no direct significant effect of electricity availability on investment intention ($\beta = 0.114$, $p = 0.190$), but indirect mediation via attitude ($\beta = 0.291$, $p = 0.000$), suggesting reliable supply shapes positive attitudes, potentially elevating perceived values. Perceived behavioral control mediated weakly ($\beta = 0.073$, $p = 0.121$), with $R^2 = 0.510$ for intention, indicating attitude's dominance in Nigeria's unreliable context. The results established the indirect-only mediation and the no-effect non-mediation for both paths via attitude and perceived behavioral control respectively. Among other results, the study concluded that attitude is a reliable antecedent of behavioral intention in making a decision to invest in residential real estate in the study area.

MATERIALS AND METHODS

Study Area

Bauchi Local Government Area (LGA) is one of the 20 LGAs in Bauchi State, located in northeastern Nigeria. It serves as the administrative and economic hub of the state, hosting the state capital, Bauchi city. Covering a land area of approximately 3,687 km², Bauchi LGA had a population of 493,810 (NPC, 2006), with more recent estimates suggesting growth due to urbanization and population dynamics, geographically, the LGA lies between 10° 46' 33.825" N and 9° 59' 57.099 E positioned on the northern edge of the Jos Plateau at an elevation of 616 meters (Manga, Buteh, Amusat & Abubakar 2022). The LGA is a heterogeneous region with diverse ethnic groups, including Hausa, Fulani, Gerawa, Sayawa, Jarawa, and others, contributing to a rich cultural tapestry (Bununu & Yunusa 2024).). Within Bauchi LGA the study will consider three areas namely New GRA, Fadaman mada and Yelwa, the choice of these study areas of Fadaman Mada, New GRA, and Yelwa represent distinct residential zones characterized by varying population densities, infrastructure, and socio-economic profiles, making them ideal for examining the effect of electricity availability on residential property rental values.

The choice of Fadaman Mada, New GRA, and Yelwa as study areas within Bauchi LGA provides a comprehensive framework for analyzing the how electricity availability on residential property affects rental values. These areas represent a spectrum of population densities that is medium, low, and high density each with unique socio-economic characteristics and infrastructure challenges. Fadaman Mada offers a balanced perspective with its planned layout and moderate density, New GRA highlights the dynamics of a high-income, low-density area with better infrastructure, and Yelwa reflects the challenges of a high-density, resource-constrained urban settlement. By comparing these areas, the study can capture the diverse ways in which electricity access influences tenant preferences, rentage and overall rental market dynamics in Bauchi.

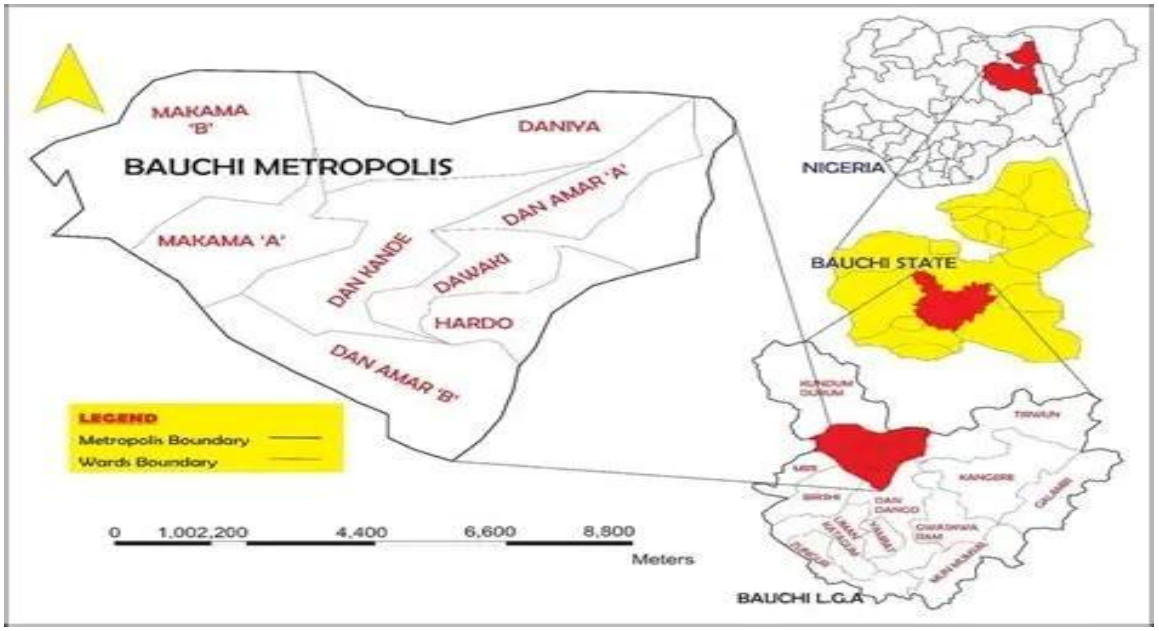

Figure 1: Bauchi Local Government, the Study Area
Source: National Centre for Remote Sensing, Jos

Research Design and Data Collection

A quantitative research approach was employed in this study, incorporating primary and secondary data sources. Primary data were obtained through structured questionnaires, while secondary data were sourced from books, journals, and theses. The study adopted a structured 5-point Likert scale questionnaire to collect data on electricity and rental value because it provided a balanced range of responses to capture nuanced perceptions. A structured questionnaire was used because it is easy for respondents to understand, ensures consistency in data collection, and allows statistical analysis of ordinal data. This scale effectively measures attitudes toward electricity reliability and its influence on rental preferences in Bauchi. The questionnaire was designed to gather information on the nature of electricity supply and rental value within Bauchi Metropolis from household. It was administered to households in the study area.

Sampling Frame and Sample Size

The study focused on three areas reflecting density and socio-economic characteristics of the areas: GRA, Fadaman Mada and Yelwa. The sample size was determined using the Krejcie and Morgan (1970) sampling method, which yielded a total of 131 which were administered on respondents proportionally based on population size of the selected areas. Out of this, 123 questionnaires were executed and returned after one week as presented in Table 1.

The population disparity across the districts as shown in the table 1 below for Yelwa (4,574), Fadam Mada (2,075), and GRA (1,153), as furnished by the Bauchi State Urban Development Board in their 2024 projections, stems primarily from historical residential segregation patterns in Bauchi metropolis. These patterns are driven by socioeconomic factors (e.g., income levels and occupational differences), individual preferences, and ethnic/religious affiliations, leading to spatial separation where larger, mixed-density areas like Yelwa accommodate higher populations compared to smaller, affluent, low-density zones like GRA (Kayode, Muhammad and Bello, 2021). This is compounded by urban development dynamics, including limited land availability in premium areas and ongoing migration influenced by economic opportunities.

Participants were fully informed about the study's purpose, procedures, and potential impacts before participation. A consent form, written in clear and accessible language, was provided, detailing the voluntary nature of participation, the right to withdraw at any time without consequences, and the study's objectives. Verbal explanations were used to supplement written consent to ensure comprehension, especially for participants with varying literacy levels in Bauchi's districts (Yelwa, Fadam Mada, GRA). Consent was obtained from all 131 respondents prior to data collection via the 5-point Likert scale questionnaire and the information was collected within the months of March to May 2025.

Table 1: Sample Population Distribution

District	2024 Projection	Number of Respondents
Yelwa	4,574	68
Fadama Mada	2,075	36
GRA	1,153	27
Total	7,802	131

Source: BSUDB (2014) & Ismail (2015)

To ensure representative sampling, a stratified random sampling technique was employed. Each district was stratified, and respondents were randomly selected from each stratum. This approach ensured that all segments of the population were adequately represented, thereby enhancing the reliability and validity of the study findings.

Table 2: Questionnaire Administration

	Frequency	Percentage
Questionnaire Administered	131	100
Questionnaire returned	124	94.7

The table Bove shows that 131 questionnaires were distributed to respondents across the three districts in Bauchi (Yelwa, Fadam Mada, and GRA), as previously specified with a stratified sample of 68, 36, and 27 respondents, respectively. The 100% figure simply reflects that this is the total number of questionnaires distributed, serving as the baseline for calculating the return rate. Out of the 131 questionnaires administered, 124 were completed and returned, yielding a response rate of 94.7%. This high return rate suggests effective survey administration and respondent engagement.

RESULTS AND DISCUSSION

Table 3: Demographic Information

AGE	Frequency	Percent	Cumulative Percent
Under 18	10	8.1	8.1
18-25	24	19.4	27.4
26-35	18	14.5	41.9
36-45	19	15.3	57.3
46-60	30	24.2	81.5
above 60	23	18.5	100.0
Total	124	100.0	
GENDER			
Male	103	83.1	83.1

AGE	Frequency	Percent	Cumulative Percent
Female	21	16.9	100.0
Total	124	100.0	
OCCUPATION			
Student	25	20.2	20.2
Employed full term	39	31.5	51.6
Employed part time	18	14.5	66.1
Self employed	20	16.1	82.3
Unemployed	9	7.3	89.5
Retired	13	10.5	100.0
Total	**124**	**100.0**	
LOCATION			
Fadaman mada	63	50.8	50.8
GRA	32	25.8	76.6
Yelwa	29	23.4	100.0
Total	124	100.0	
ROLE			
Tenant	84	67.7	67.7
Landlord	4	3.2	71.0
property manager	36	29.0	100.0
Total	124	100.0	

Table 3 which represented the demography of the respondents of the study shows that the age bracket (46-60 years) has the highest percentage (24.4) in terms of the respondents, which implies that the respondents are matured in age and their response is reliable, this is followed by 18-25 years (19.4) percent, which shows that youth in the study area were not left behind in responding to the questionnaire. The third age bracket is Above 60years (18.5) percent with under 18 years (8.1) percent being the least age bracket to respond to the questions.

In terms of gender of the respondents, 103 of the respondents representing 83.1 percent are male, this shows that more men being head of the family respondent to the questions than female than the female 21 of the representing 16.9 percent.

With respect to the respondent employment status 39 of the respondents, representing 31 percent are fully employed, which means they can fully foot their bills in terms of rent, this is followed by 25 respondents representing 20.1 percent who are students, this is because Yelwa has two federal tertiary institutions namely; Abubakar Tafawa Balewa University and Federal polytechnic Bauchi and also one State tertiary institution that is Bauchi state college of agriculture, the presence of these tatiery institutions with majority of the students staying off campus had an influence on the employment status of the respondents. Also unemployed having only 9 respondents representing 7.3 percent of the total respondents. In terms of the location of the property, majority of the respondents that is 63 of them are situated in Fadaman Mada representing 50.8 percent, also 32 of the respondents representing 25.8 percent of the students are residents in GRA and only 29 of the respondents representing 23.4 percent are resident in Yelwa.

Regarding the role of the respondent in terms of the properties, 84 of the respondents representing 67.7 percent of the respondents are tenants, this is to say that the tenants who are the occupants of the property are in the best position to provide answers to the questions as they are the inhabitants of the residents, they are the ones paying the rent and are thereby in a better position to ascertain if the rent is commensurate the electricity gotten in their various neighborhood.

Table 4: Showing Response on Reliability of Electricity Supply in the Study Area

Variable	Frequency	Percent	Cumulative Percent
Very unreliable	15	12.1	12.1
Somewhat unreliable	18	14.5	26.6
Neutral	48	38.7	65.3
Somewhat reliable	24	19.4	84.7
Very reliable	19	15.3	100.0
Total	124	100.0	

Table 4 provides insights into the perceived reliability of the electricity supply:

The majority of respondents (48 out of 124) rated electricity availability as neutral, suggesting that the electricity supply is neither consistently reliable nor severely unreliable for most. This reflect a situation where outages occur occasionally but are not pervasive, or where infrastructure meets basic needs but falls short of high reliability.

While “very unreliable” (12.1%) and “somewhat unreliable” (14.5%), when combined together gives over a quarter of respondents perceive the electricity supply as unreliable. This indicates notable issues in certain areas or for certain respondents, such as frequent outages or voltage fluctuations in the study area. The “somewhat reliable” (19.4%) and “very reliable” (15.3%) categories together account for about a third of responses, showing that a substantial portion of the sample experiences consistent electricity. These might represent more urban areas or regions with better infrastructure such as GRA within Bauchi metropolis, which tend to have better electricity supply.

Table 5: Showing how often there is Power Outage within the Study Area

Variables	Frequency	Percent	Cumulative Percent
Multple times daily	25	20.2	20.2
Once daily	18	14.5	34.7
A few times perweek	64	51.6	86.3
Once a week	14	11.3	97.6
Rarely or never	3	2.4	100.0
Total	124	100.0	

Table 5 shows that 25 of the respondents representing 20.2 percent experience outages several times a day, indicating severe reliability issues in terms of electricity issues in these areas or for these respondents. This could reflect regions with unstable electricity supply. While 18 respondents that is 14.5 percent of the respondents face daily outages, still a significant disruption, suggesting consistent but slightly less severe issues. While 34.7 percent experience outage ones daily, highlighting a substantial portion of the study area with reliable electricity. 11.3% that is 14 respondents report outages ones a wee, indicating better but not exceptional reliability. Only 3 respondents that is 2.4 percent experience minimal outages, suggesting that highly reliable electricity is rare in the study area, likely limited to well-developed areas probably GRA considering the low density nature of the residence and the caliber of residence in the area.

Table 6: Sources of Electricity

Variable	Frequency	Percent	Cumulative Percent
Grid electricity	42	33.9	33.9
Solar power	29	23.4	57.3
Generator	4	3.2	60.5
Inverter/battery Storage	8	6.5	66.9
Hybrid	41	33.1	100.0
Total	124	100.0	

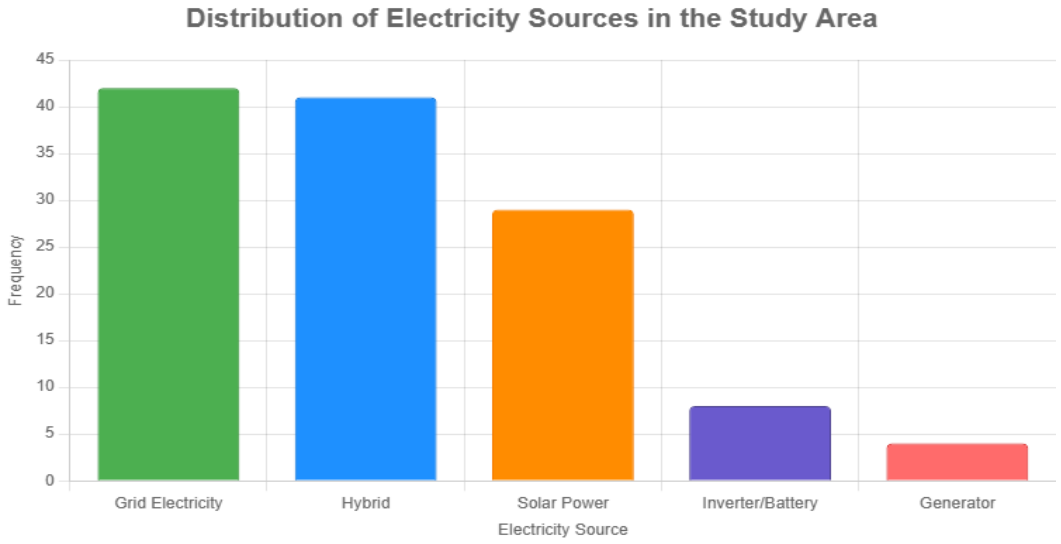

Figure 2: Electricity Sources in the Study Area

Figure 2 shows the dominance of grid (33.9%) and hybrid (33.1%) systems, followed by solar (23.4%), with minimal use of inverters (6.5%) and generators (3.2%).

Table 6 shows that Grid electricity, supplied by the national grid, is the most common source, used by 33.9% of respondents. This suggests a significant reliance on the national power grid, this implies gthat despite being the top source, the high frequency of outages reported previously (51.6% "a few times per week," 34.7% daily) in table 3 indicates that the grid is unreliable for many. This aligns with the suggesting (in table 3) that grid-dependent respondents likely contribute to the 20.2% "multiple times daily" and 14.5% "once daily" outage categories, reflecting unstable supply.

Hybrid systems, combining multiple sources (e.g., grid + solar, grid + generator, or solar + battery), are nearly as common as grid electricity, used by 33.1%. This indicates a widespread practice of supplementing grid power with alternatives to mitigate outages. This means the high prevalence of hybrid systems likely reflects a response to grid unreliability. Respondents using hybrid sources may experience fewer outages than grid-only users, contributing to the 11.3% "once a week" or 2.4% "rarely or never" outage categories. Hybrid systems could boost electricity availability and in turn increase residential property rental value in these properties. Solar power systems, is used by 23.4% of respondents, indicating significant adoption of renewable energy. This implies that Solar power offers independence from the grid, potentially reducing outage frequency for these respondents, aligning with higher electricity availability scores (e.g., "somewhat reliable" or "very reliable" in the prior table 2, 34.7% combined). Areas with solar adoption may have higher residential property rental value due to reliable electricity, appealing to environmentally conscious

and high-value property owners.in the same vein inverter/battery storage systems, which store electricity for use during outages, are used by 6.5%. These are likely paired with grid or solar inputs to provide backup power. This small group likely experiences fewer disruptions, as inverters can bridge short outages, contributing to the "rarely or never" (2.4%) outage category. These categories of properties may have higher rental value scores due to enhanced reliability, though the low percentage suggests limited adoption, possibly due to cost.

Finally, Generators, typically diesel or petrol-powered, are the least common source, used by only 3.2%. This suggests limited reliance on fossil fuel-based systems. Generators are likely used in areas with frequent outages (e.g., 20.2% "multiple times daily" as seen in table 3) to provide backup power. However, their low usage may reflect high fuel costs, noise, or environmental concerns.

Table 7: How Electricity Availability Influences the Choice of Accommodation

Variable	Frequency	Percent	Cumulative Percent
No influence	7	5.6	5.6
Slight influence	12	9.7	15.3
Moderately influence	23	18.5	33.9
Strong influence	27	21.8	55.6
Very strong influence	55	44.4	100.0
Total	124	100.0	

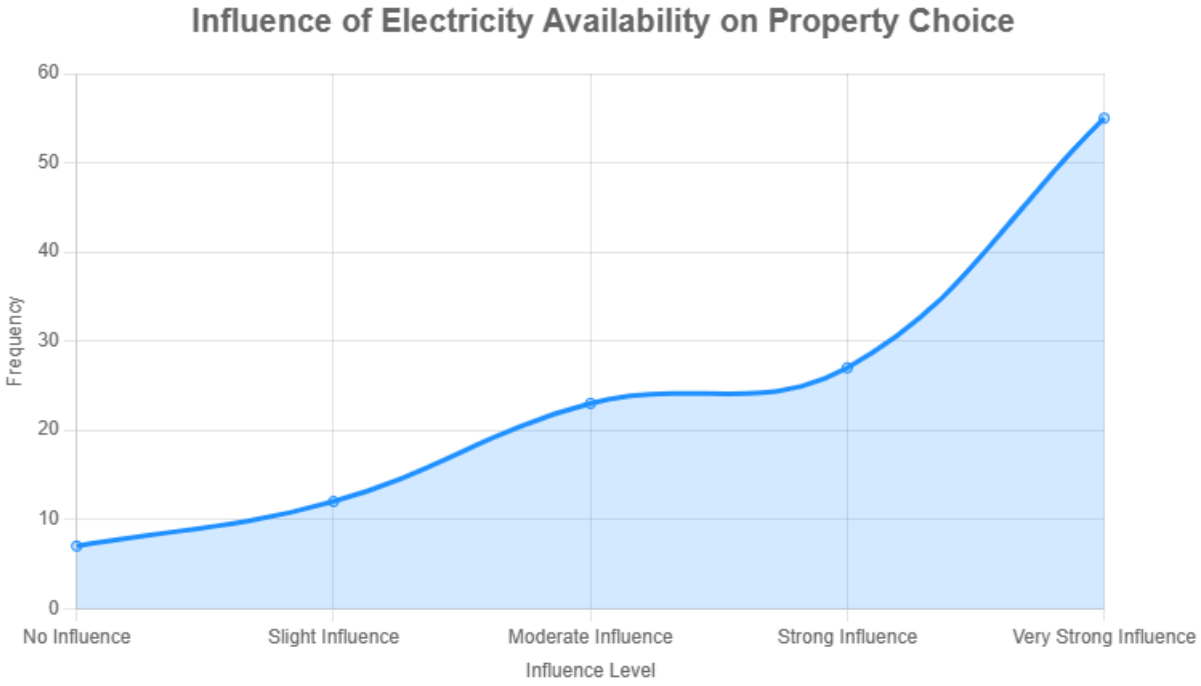

Figure 3: How Electricity Availability Influences the Choice of Property

Figure 3: shows a rising trend from "no influence" (7 respondents) to "very strong influence" (55 respondents), emphasizing that most respondents (66.2%) consider electricity a strong or very strong factor, reflecting its critical role in property choice.

Table 7 shows that 55 respondents (44.4%,) almost half of the respondents consider electricity availability a very strong factor in choosing a property. This suggests that reliable power is a top priority, likely due to its impact on daily life, safety, or comfort. These respondents will prioritize properties with stable electricity (e.g., those using hybrid or solar sources, as seen in the 33.1% hybrid and 23.4% solar from table 4 the electricity sources table). Also (21.8%) of respondents view electricity as a strong influence in the choice of residential property, reinforcing the importance of electricity on rental value. When put together with the "very strong" group, 66.2% (44.4% + 21.8%) the respondents rate electricity as a strong or very strong factor, indicating that for the majority, reliable power is critical when selecting a property. Here 12 respondents (9.7%) opined that electricity has slight influence with respect to their decision in choice of property. While for No influence7 respondents (5.6%,) which is a small minority arem of the view that electricity availability has no influence in their choice of residential property, perhaps because they assume basic reliability, have personal backup systems (e.g., generators, 3.2% from the sources table, table 6), or prioritize other property attributes.

Table 8: Rental Value of Residential Property with and Without Electricity

SN	Variables	Estimated Rental Value (N) of residential property with Electricity	Estimated Rental Value (N) of residential property without Electricity	Difference	Percentage increase (%)
1	One room	55,000.00	30,000.00	25,000	83.33%
2	Two rooms	75,000.00	70,000.00	5,000	7.14
3	One room and parlour	110,000.00	90,000.00	20,000	22.22
4	Two rooms and Parlor	120,000.00	100,000.00	20,000	20.00
5	Room self-contained	150,000.00	120,000.00	30,000	25.00
6	One bedroom flat	300,000.00	170,000.00	130,000	76.47
7	Two bedroom flat	420,000.00	250,000.00	170,000	68.00
8	Three bedroom flat	550,000.00	450,000.00	100,000	22.22
9	Four bedroom flat	710,000.00	500,000.00	210,000	42.00
10	Three bedroom duplex	1,000,000.00	750,000.00	250,000	33.33
11	Three bedroom Bungalow	800,000.00	600,000.00	200,000	33.33

Source: field survey; 2025

Table 8 depicts the difference between rental value of properties with electricity and those without electricity and their difference in percentage, this information was sourced from property managers who are the responsible for rent collection from tenants and remmitance of same to the Landlords, the table shows that higher rents for properties with electricity confirm that tenants prioritize reliable power, and this is express in their willingness to pay premiums (e.g., N250,000 more for a three-bedroom duplex). This can be link to table (7) which showed that 44.4% of the respondent opined that electricity availability in a property has a very strong influence in their choice of property and 21.8% opined that electricity availability has strong influence on their property choice, reflecting its critical role in desirability. The table also showed that high-end properties (e.g., three-bedroom duplex: N250,000 less for those without electricity, one bedroom flat: N130,000 less for those without electricity) indicates substantial discounts, as electricity is critical for larger properties with higher power needs (e.g., for appliances, air conditioning). While smaller properties (e.g., two rooms: N5,000 less, 7.14%) show minimal differences, suggesting tenants who just needs basic accommodations may prioritize affordability over electricity, aligning with the 15.3% (slight/no influence) from the influence table (5).

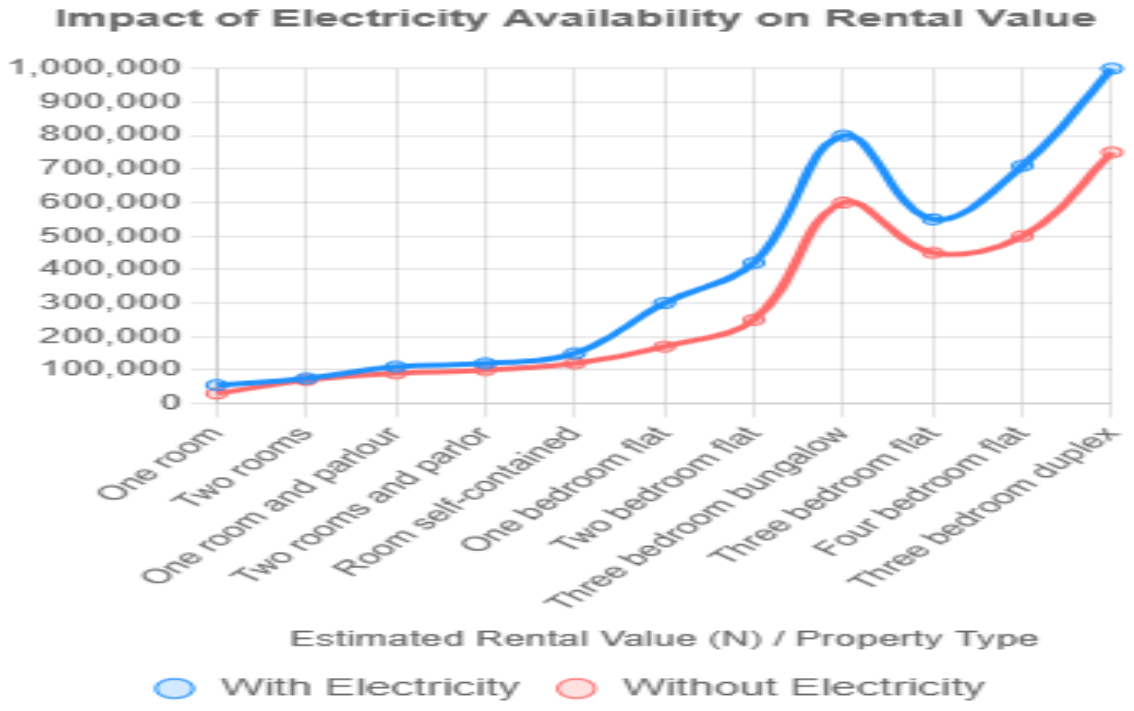

Figure 4: Impact of Electricity Availability on Rental Value

From figure 4: The blue line (rental value with electricity) consistently lies above the red line (rental value without electricity), showing higher rents across all property types. The gap widens for larger properties (e.g., three bedroom duplex: N250,000 difference) and is smallest for two rooms (N5,000), reflecting varying electricity importance to the tenants. The upward trend in both lines shows that rent increases with property size, but electricity availability amplifies this, especially for bigger properties.

Table 8: Descriptive Statistics

	Mean	Std. Deviation	N
RPV	2.43	0.753	124
EAR	2.74	1.074	124

RPV (Residential Property Value): Mean = 2.43, Standard Deviation = 0.753, N = 124
EAR (Electricity Availability): Mean = 2.74, Standard Deviation = 1.074, N = 124

Table 7 above shows that on an average, residential property value scores are 2.43, and electricity availability scores are 2.74. electricity availability has greater variability (higher standard deviation) than residential property value.

Operational Definition of terms:

i. RPV represents the reported residential properties rental value in Bauchi, as assessed by respondents using a 5-point Likert scale. Given the study's focus on rental value, RPV is defined as the respondents' perception of the monetary worth or desirability of residential properties, influenced by electricity availability. The Likert scale ranges from 1 (very low rental value) to 5 (very high rental value), capturing subjective evaluations of rental prices or property desirability in districts like Yelwa, Fadam Mada, and GRA.
   Measurement: The mean of 2.43 suggests that, on average, respondents rated the rental value of properties in Bauchi as slightly below the midpoint (3) of the Likert scale. This indicates a perception of moderate to low rental values, possibly reflecting the economic context of Bauchi or the negative impact of unreliable electricity. The standard deviation of 0.753 indicates moderate variability in responses, suggesting some consistency in perceptions but with differences likely due to district-specific factors (e.g., GRA's affluence vs. Yelwa's mixed density) or property characteristics.
   Contextual Relevance: In Bauchi, where electricity shortages are common (4-6 hours of daily supply), lower perceived rental values may reflect reduced desirability due to unreliable power or proximity to infrastructure like high-voltage lines, which can depress values by 1-5%.

ii. EAR measures respondents' perceptions of the availability and reliability of electricity supply in their residential areas, also using a 5-point Likert scale. It is defined as the extent to which electricity is consistently available (e.g., hours of supply per day) and reliable (e.g., frequency of outages). The scale might range from 1 (very unreliable/scarce) to 5 (very reliable/abundant), capturing subjective assessments of power supply quality in Bauchi's districts.

Measurement: The mean of 2.74, slightly below the midpoint (3), indicates that respondents generally perceive electricity availability and reliability as moderate to poor. This aligns with Nigeria's broader context of chronic power shortages, where actual generation is often below 5,000 MW for a 200-million population. The higher standard deviation of 1.074 (compared to RPV's 0.753) suggests greater variability in perceptions, possibly due to differences in electricity access across districts (e.g., GRA may have more reliable supply or alternative sources like solar, while Yelwa and Fadam Mada face more outages).

Contextual Relevance: The moderate to low EAR score reflects Bauchi's electricity challenges, which likely depress rental values by reducing livability and increasing costs for alternatives like generators. Studies show reliable power can boost property values by 10-25% in Nigeria, underscoring EAR's importance.

Also, the difference in means (2.74 – 2.43 = 0.31) implies that electricity availability is usually considered as better than residential property value, but both are quite minor scores.

iii. ***RPV (Residential Property Value):*** Cronbach's Alpha ≈ 0.70

Interpretation: Acceptable reliability, indicating that the items measuring perceived rental value are moderately consistent, suitable for hedonic pricing analyses.

iv. ***EAR (Electricity Availability and Reliability):*** Cronbach's Alpha ≈ 0.65

Interpretation: Questionable reliability, reflecting potential variability in electricity perceptions across Bauchi's districts (Yelwa, Fadam Mada, GRA), but acceptable for exploratory research.

Table 9: Correlations

		RPV	EAR
Pearson Correlation	RVP	1.000	0.977
	EAR	0.977	1.000
Sig. (1-tailed)	RVP		1.000
	EAR	1.000	
N	RVP	124	124
	EAR	124	124

a. Dependent Variable: Rental Value of Property
b. All requested variables entered

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.977[a]	.955	.955	.160	.955	2615.340	1

The Pearson Correlation indicates that within Bauchi metropolis residential property rental value and electricity availability have a very strong positive correlation (r = 0.977, p < 0.001, one-tailed). The correlation coefficient of 0.977 indicates a near-perfect linear relationship between residential property rental value and electricity availability. The significance level (p = 0.000) confirms this relationship is statistically significant

Correlation Coefficient (r = 0.977): A value of 0.977 indicates a very strong positive correlation, meaning that within Bauchi

metropolis, as electricity availability increase within an area, residential property rental value also tend to increase in a near-linear fashion. This is exceptionally close to a perfect linear relationship (r = 1), suggesting that the two variables move almost in lockstep. Statistical Significance ($p < 0.001$, one-tailed): The p-value of less than 0.001 indicates that the correlation is highly statistically significant, meaning there is less than a 0.1% chance that this relationship occurred by random chance. The one-tailed test suggests that higher electricity availability is associated with higher residential property rental values (positive correlation). The r = 0.977 value implies that electricity availability and residential property rental value are strongly intertwined. This implies that areas with better electricity availability almost always have higher property rental return in terms of rental property investment, and vice versa. For example, a neighborhood with reliable electricity supply is very likely to have properties rated highly in terms of rent, while areas with poor electricity, have lower residential property value scores. The near-perfect correlation suggests that electricity availability is a critical factor influencing property value perceptions. Reliable electricity likely enhances the desirability of a property, making it more valuable (e.g., for comfort, safety, or economic activity).

Table 10: ANOVA[a]

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	66.589	1	66.589	2615.340	.000[b]
	Residual	3.106	122	.025		
	Total	69.695	123			

a. Dependent Variable: RVP
b. Predictors: (Constant), EAR

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.555	.039		14.112	.000
	EAR	.685	.013	.977	51.140	.000

The extremely large F-statistic (2615.340) and small p-value (< 0.001) indicate that electricity availability is a highly significant predictor of residential property value. The model explains a substantial amount of the variance in residential property value, which is dependant on the location, consistent with the near-perfect Pearson correlation (r = 0.977). The regression SS (66.589) is much larger than the residual SS (3.106), suggesting that the model captures most of the variability in RVP. To quantify this, we can calculate the coefficient of determination (R^2):

i. Total Sum of Squares (SST) = Regression SS + R
ii. Residual SS = 66.589 + 3.106 = 69.695.
iii. R^2 = Regression SS / SST = 66.589 / 69.695 ≈ 0.955.
iv. This means approximately 95.5% of the variance in RVP is explained by EAR, which aligns with the Pearson correlation (r = 0.977, since $r^2 = 0.977^2 \approx 0.954$, nearly matching the R^2 from ANOVA).

CONCLUSION

The findings of this study revealed that the soil around the hostels were not contaminated as most the parameters analyzed were within the accepted limit established by the FAO/WHO Therefore it does not pose an environmental or health risk.

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