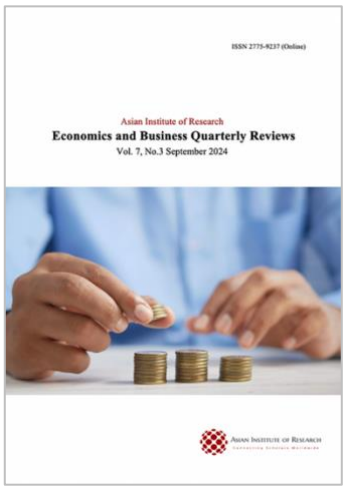

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Assessment of the Impacts of Energy Poverty on Small and Medium Businesses in Benin City, Nigeria

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Abstract
Small and medium enterprises (SMEs) coupled with the availability of stable and affordable electricity grid supply are crucial towards meeting key Sustainable Development Goals, especially poverty eradication, as well as addressing youth unemployment in developing countries. Unfortunately, electricity grid supply shortage remains a major setback to economic growth, where over 70% of Nigeria's population makes their livelihood from SMEs. The present study hence aimed to examine the effects of electricity grid supply inadequacy on daily operations of small businesses in select quarters in Benn City, Edo State. A total of ten (10) small businesses were randomly sampled using questionnaire method across ten (10) quarters in the study area. The study found that majority of business owners (49.2%) rely on electricity grid supply for their daily operations. On whether electricity grid supply is reliable, 49.3% reported that supply is inconsistent (on and off), while 35.4% reported that supply is inadequate for their businesses. A total of 38.6% of the sampled respondents reported that electricity grid supply is only available for a period of 4-5hr/day in their quarters, 28.5% reported 6-10hr/day in other quarters, while 22.9% reported that supply is only available for less than 3hrs/day in their quarters. In terms of the effect of poor electricity grid supply on business operations, declining income level ranked highest (35.3%), followed by extra expenses incurred by business owners on alternative electricity supply especially power generating set popularly known as gen set (24.8%) and low patronage of clients especially soft drink and beer parlour businesses (17.5%).

Keywords: Electricity Grid Supply, Small and Medium Enterprise, Income Decline, SDGs, Benin City

1. Introduction

All over the world, small and medium emprise businesses play a major role in livelihood sustenance and national development especially as such businesses require small amount to set up. According to (Olaye et al. 2018) such businesses have proved to be a major tool adopted by the developed nations to attain socio-economic development. Global statistics acknowledge that small businesses are key providers of employment. For instance, in the United States of America (USA), small businesses accounted for 64% of new jobs created between 1993 and 2011 (Aribaba et al., 2019). Among the Organization for Economic Co-operation and Development (OECD) nations, small businesses account for 60– 70% of jobs created annually (OECD, 2015). In developing economies on the other hand, small and medium-sized enterprises (SMEs) are widely recognized as the engine of economic growth and equitable development (Olaniyi and Adekanmbi, 2022). Aside from the potential for self-sufficient industrialization utilizing local raw resources, SMEs are better positioned to increase employment,

ensure equitable distribution of industrial development, and assist the rise of non-oil exports (Aremu, 2010; John and Willie Ebri, 2022).

In another study, SMEs are considered a veritable tool for economic growth and development. They play a key role in promoting prosperity by creating new jobs and increasing a region's economic prosperity (Maksimov et al., 2017). Due to the importance of small businesses, governments in developing and developed nations see them as a means of employment, innovation and wealth creation (Mills and McCarthy, 2016). Small business are important for the growth of products and services' productivity while it creates employment at a smaller financial cost, particularly in the rapidly developing service sector (Adeosun and Shittu, 2022). More than half of the jobs in developing countries are created by SMEs, and they dominate the private sector space in the same economies (Kumar, 2017; Lorenz and Pommet, 2018).

In Nigeria, small businesses constituting 10 to 99 persons increased from a little above 15 million in 2010 to 36,994,578 in 2013, while large-scale industries constituting 100 persons and above pegged at over 2,000 in 2010 and increased to 4,670 in 2013 (SMEDAN, 2014). Small businesses account for 70% of industrial employment and about 50% of manufacturing output (Ogunmuyiwa and Okunleye, 2019). Despite the strategic role of SMEs in poverty reduction, these businesses in Nigeria continue to face constraints from making meaningful contributions. Apart from financing issues (inadequate access to funding) and high tax rates, poor personnel management, poor marketing, poor management and low entrepreneurial skill base, lack of infrastructure, unfavorable tariff policy affecting SMEs in developing countries as reported by Evbuomwan, et al., (2013); World Bank, (2015), Ilegbinosa and Jumbo, (2015) Aderemi et al. (2019) Aderemi et al. (2020) and John and Ebri (2022), energy poverty and/or shortage is another factor limiting the growth of SMEs. As a result, the Global Entrepreneurship and Development Institute (GEDI) in 2018 ranked Nigeria 101 in the world ranking category and 8 in the regional category, with an overall score of 19.7% (Adeosun and Shittu 2022). Sustainable energy supply is key to business growth. Authors have reported that accessibility to constant and stable electricity is crucial to the performance of SMEs and economic growth (Bank, 2013; Aderemi et al., 2021) especially as unreliable power supply can affect different aspect of business performance, causing damages to machineries, which in turn affects the overall business operation and the ability to ensure delivery times (World Bank, 2018).

In Nigeria, electricity supply system can be grouped into two: Centralised (grid-connected) and decentralised (off-grid) systems. The centralised system consists of the large-scale generation of electricity at centralised facilities such as large hydro and thermal plants, while ''The decentralised electricity supply system consists of a few kilowatts to megawatt capacities such as captive diesel and gasoline generator sets as well as renewable energy technologies (such as solar home systems, streetlights and mini-grids). On the whole however, the total installed capacity of grid-based systems in Nigeria is around 13 GW. Available statistic shows that available on-grid peak generation in the country varies and hovers around 4.5 GW, a situation which has negatively affected socio-economic life of the country, due to chromic supply shortage, power inadequacy etc. According to World Bank Report (2021) 85 million Nigerians don't have access to grid electricity and this represents 43% percent of the country's population.

The implication of this includes economic backwardness, declining GDP, rising unemployment and difficulties achieving the sustainable development Goal of poverty eradication (SDG1). It has also been reported that the lack of reliable power is a significant constraint for citizens and businesses in Nigeria, resulting in annual economic losses estimated at $26.2 billion (₦10.1 trillion) which is equivalent to about 2 percent of GDP (World Bank, 2021), and for SMEs the impact could be worst given that the principal sources of income for most SMEs are from personal savings and retained earnings, to informal external sources, comprising monetary help from family and companions, trade credit etc (Abbasi et al., 2017). In Benin City, over 60% of young people are employed in SMEs and making meaningful livelihood from small and medium businesses. Unfortunately, unreliable and unsteady power supply hypothetically remain a huge challenge to their businesses. Hence this empirical study is aimed to examine the effects of energy shortage on small businesses and how these business owners are responding to the shortage.

2. Materials and Methods

2.1. Description of Study area

The study area is Benin City, which is the capital of Edo State of Nigeria, in West Africa. Its location is within latitude 6º14'N and 6 º21' N of the equator and longitude 5 º35' E and 5 º 44' E of the Greenwich Meridian. The area is put at 1125 square kilometres approximately. Benin City is bounded in the east by Orhiomwon LGA, to the west by Ovia North East LGA, to the north by Uhunmwonde LGA and to the south by Delta State. Benin City cuts across three or four Local Government Areas (LGAs) namely Oredo, Egor, Ikpoba-Okha and to some extent, the Ekosodin axis of ovia Northern East bordering the University of Benin. For the purpose of this study however, five (5) communities in Ovia northeast were selected, including Adolor quarters, 19th and 20th streets, Ekosodin, Idunmwowina and Oluku Quarters. These areas were selected owing to their proximity to university of student's environments.

2.2. Data Collection

Primary and secondary data were used for the study. Primary data was obtained for a period of 3 months (April – June) 2022, through the administration of structured questionnaires and utilization of oral interviews where necessary. Questionnaires made up of 200 structured close and open-ended questions were randomly distributed to respondents with each sampled community/quarter receiving a total of 40 questionnaire (Table 1). The questions cover socio-economic status, reliance of business on electricity grid supply, reliability and frequency of supply and impacts of electricity shortage of businesses and income levels. Businesses sampled include laundry/dry cleaning stores, photocopying/printing stores, photo studios, hair salon shop, barbing salon shop, Point of sale (POS) kiosk, beer parlor bar, soft drink spot, welding outlet and electronics electricians.

Table 1: Number of small businesses sampled

Residential quarters	Number of small businesses sampled	Number of questionnaire retrieved	Percent
Adolor quarters	40	40	100
19th & 20th Street	40	40	100
Ekosodin quarters	40	40	100
Idunmwowina Quarters	40	40	100
Oluku quarters	40	40	100

Data collected from the field were subjected to various statistical analyses, to generate tables, and graphs. All quantitative statistics were performed using Statistical Package for Social Science (SPSS) Version 16.0. The analysis of variance was used to test for variations in business owners' responses to whether power shortage affects their businesses.

3. Results and Discussion

The results of the respondents' socio-demographic survey (Table 2) showed that the majority of the small SMEs owner were females with 122 individuals (61.0%), while remaining 78 respondents were males (39.0%). This finding agrees with the study by Raimi et al (2016) which shows that in Nigeria, approximately 70% of people employed by SMEs are women. In another study Adetoyinbo, (2021) reported that women constitute more than 50% of the population of Nigeria, and about 30% of enterprises registered are owned by women notwithstanding the fact that women entrepreneurs face chauvinism and gender inequality as cultural barriers (Amuchie and Asotibe, 2015). Akanji, (2016) also found that the presence of women in SMEs in Nigeria contributes over 50% of the nation's gross domestic product (GDP) and a higher percentage of the total share of employment creation.

The majority of the business owners were within the age of 31 years to 50years and can be classified as youthful. This finding is a reflection of the role of SMEs in addressing youth employment in Nigeria. According to the

National Bureau of Statistics, the youth-unemployment rate in Nigeria was 34.9% in 2020, an increase from 29.7% in 2018 (Federal Ministry of Youth and Sports Development, 2021). As with most developing countries, it is difficult to achieve full employment which could be attributed to either the trade-off between achieving full employment and other macroeconomic goals or the structural failure of the economy's system or external vicissitude (Raifu, 2019), hence most young person resort to SMEs for livelihood sustenance. Of this total number of business owners, 109 (54.5%) are not married suggesting that a greater population of the study area are either unemployed graduates or young people with basic education who are not able to secure paid employment from government, married business owners with families was 33.5%, while the remaining24 (12.0%) are either widower/widows/divorced.

Meanwhile, the educational level among farmers showed that the majority of business owners are between secondary school 67 (33.5%), and graduates 55 (27.5%). Respondents not having a formal education was 34 (17%). This finding underscores the importance of university of tertiary education in securing well-paid jobs in Nigeria. Studies have shown that job requirements have considerably risen over the last four decades, with jobs demanding more skill and more education to handle sophisticated tasks (Alekseeva et al., 2021; Atalay et al., 2020; Hershbein and Kahn, 2018). According to Autor, (2015), automation and digitalization likely push these requirements to even higher levels. A total of 112 (56.0%) of the sampled business owners reported that personal/family income was their sources of business setup. Similar observation was reported by Quartey et al., (2017).

Table 2: Socio-demographic characteristics of the respondents

Variables	Frequency (n = 200)	Percentage %
Gender		
Male	122	61
Female	78	39
Age Group		
20 years and below	18	09
21 – 30 years	32	16
31 – 40 years	51	25.5
41 – 50 years	47	23.5
51 – 60 years	36	18
61 – 70years	11	5.5
70 years and above	09	2.5
Marital Status		
Married	67	33.5
Never married	109	54.5
Divorced/widower/widow	24	12.0
Highest educational qualification		
No formal Education	34	17
Basic Edu (School Certificate)	28	14
Secondary school	67	33.5
B.Sc./HND	55	27.5
Postgraduate qualifications	16	8.0
No of years in Business/location		
<5	26	13
6-10	101	50.5
10years>	73	36.5
Sources of startup income		
Family/personal savings	112	56
Money lenders	26	13
Loan from meeting	34	17
Informal contribution (Susu)	28	14

In Table 3, it can be seen that SMEs in Benin City rely essentially on electricity grid for their operations. The importance of electricity for SMEs operations has also been reported by Sabo and Lekan (2019), Arumdeben et al., (2023), Adanlawo and Vezi-Magigaba (2021), Arumdeben et al., (2023). However, majority of the business

owners reported that electricity supply is either inconsistent, inadequate or low voltage when there is supply, while the frequency of supply is poor (Tables 4&5). In similar studies, Adewuyi and Emmanuel (2018); Muhammed et al. (2017) in their studies also reported irregular power supply as one of the major challenges confronted by SMEs in Nigeria. In another study Iwayemi (2018), reported that a total loss of output estimated at US$ 470 billion (N71 trillion) in terms of gross domestic product (GDP) has been recorded between 1999 and 2015 in Nigerian economy due to power outages. More so, poor access to electricity supply has also been recognized as a deterrent to growth of business activities (Ugwoke et al., 2016; Doe and Asamoah, 2014). A World Bank Enterprise Survey in 2014 indicated that 35.5% of the small and medium-scale firms in Nigerians reported that electricity outages as worrisome trouble to business operations (WBES, 2014). Similarly, Adisa et al. (2014) in their study reported that fluctuations in electricity voltage and power outages affect the quality of goods and services.

Table 3: Extent of business reliance on National Electricity grid Supply in the Study Area

Business Location	Extent of reliance		
	Strongly	Moderate reliance	Zero reliance
Adolor quarters	116 (68%)	72 (36%)	12 (06%)
19th & 20th Street	109 (54.5%)	84 (42%)	07 (3.5%)
Ekosodin quarters	104 (52%)	69 (34.5%)	27 (13.5%)
Idunmwowina Quarters	72 (36%)	94 (47%)	34 (17%)
Oluku quarters	91 (45.5%)	68 (34%)	41 (20.5%)
Mean %	**49.2**	**38.9**	**12.7**

Table 4: Reliability of Electricity Grid Supply in the Study Area

Business Location	Reliability of Supply				
	Supply is Stable (18-24hrs supply)	Inconsistent (On & Off)	Supply is inadequate	Low voltage	Available in days interval
Adolor quarters	0 (0%)	97 (48.5%)	62 (31%)	29 (14.5%)	12 (06%)
19th & 20th Street	0 (0%)	102 (51%)	69 (34.5%)	18 (09%)	11 (5.5%)
Ekosodin quarters	0 (0%)	92 (46%)	72 (36%)	31 (15.5%)	05 (2.5%)
Idunmwowina Quarters	0 (0%)	104 (54%)	67 (33.5%)	22 (11%)	07 (3.5%)
Oluku quarters	0(0%)	94 (47)	84 (42%)	16 (08%)	05 (03%)
Mean %	**0.0**	**49.3**	**35.4**	**11.6**	**4.4**

Table 5: Frequency of Electricity Grid Supply in the Study Area (hr/day)

Business Location	Frequency of supply			
	<3hrs/day	4-5hrs/day	6-10hrs/day	Available at Night only
Adolor Quarters	36 (18%)	84 (42%)	72 (36%)	08 (0.4%)
19th & 20th Street	44 (22%)	86 (43%)	70 (35%)	0 (0%)
Ekosodin quarters	41 (20.5%)	87 (43.5%)	69 (34.5%)	03 (1.5%)
Idunmwowina Quarters	75 (37.5%)	42 (21%)	26 (13%)	57 (28.5%)
Oluku quarters	33 (16.5%)	97 (48.5%)	48 (24%)	22 (11%)
Mean %	**22.9**	**39.6**	**28.5**	**09**

Respondent views of the impacts of electricity shortage are presented in Tables 6 and 7. Low patronage of clients and income decline were mostly reported. This is true as according to Muhammed et al. (2017) electricity supply determines financial performance of the SMEs, especially, manufacturing sector. The above finding also agrees with the study by Scott et al., (2014), that electricity outages could adversely impact the profitability of SMEs. Nuredeen et al. (2018) also reported that power outages could have affected SMEs expansion and led to untimely liquidation. According to Abotsi (2016), electricity outages diminish production efficiency in most developing nations. Adewuyi and Emmanuel, (2018) found that over the years, electricity outages have continued to frustrate many business activities indifferent parts of Nigeria. Olatunji (2019) has also reported that electricity outages have led to migration of many business organizations from Nigeria to different nations. According to a World Bank prolonged, power outages can have debilitating impacts on the manufacturing process by halting productivity,

causing damages to machineries, which in turn affects the overall business operation and the ability to ensure delivery times (World Bank, 2018; Chad, 2018).

Table 6: Effects of Energy Poverty on Business in the Study Area

Business Location	Level of Effect					
	Low patronage	Work shutdown	Income decline	Product storage challenge	Extra expenses on alternative power supply	Extra expenses on purchasing ice blocks
Adolor quarters	56 (28%)	24 (12%)	52 (26%)	18 (09%)	40 (20%)	10 (05%)
19th & 20th Street	44 (22%)	12 (6%)	59 (29.5%)	26 (13%)	55 (27.5%)	04 (02%)
Ekosodin quarters	36 (18%)	08 (04%)	69 (34.5%)	42 (21%)	34 (17%)	11 (5.5%)
Idunmwowina Quarters	27 (13.5%)	04 (02%)	72 (36%)	18 (09%)	62 (31%)	17 (8.5%)
Oluku quarters	12 (06%)	02 (01%)	101 (50.5%)	12 (06%)	57 (28.5%)	16 (0.8%)
Mean %	**17.5**	**05**	**35.3**	**11.6**	**24.8**	**5.8**

Table 7: Impact of Energy Poverty on Income Level in the Study Area (Weekly)

Business Location	Impact in Naira (₦)				
	< ₦ 20,000	₦ 21,000 – 40,000	₦ 41,000 – 60,000	₦ 61,000 – 80,000	₦ 80,000 >
Adolor quarters	52 (26%)	67 (33.5%)	47 (23.5%)	22 (11%)	12 (06%)
19th & 20th Street	54 (27%)	56 (28%)	52 (26%)	31 (15.5%)	07 (3.5%)
Ekosodin quarters	36 (18%)	74 (37%)	47 (23.5%)	25 (12.5%)	18 (09%)
Idunmwowina Quarters	44 (22%)	66 (33%)	55 (27.5%)	32 (16%)	03 (1.5%)
Oluku quarters	34 (17%)	78 (39%)	49 (24.5%)	28 (14%)	11 (5.5%)
Mean %	**22**	**34.1**	**25**	**13.8**	**5.8**

It was hypothesized that there is no significant difference among business owners in terms of loss due to power/electricity inadequacy. To test the hypothesis, an ANOVA test was conducted; the ANOVA test yielded an F value of 16.4 (Table 8). Thus, since the calculated F-value of 16.4 is greater than the critical F value of 2.6, so we rejected our hypothesis. Therefore, there is some significant difference among business owners in terms of loss due to power/electricity inadequacy.

Table 8: Analysis of variance of variation in the impacts of power shortage on businesses

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	13878.27	5	2775.653	16.43857	0.00004	2.620654
Within Groups	4052.4	24	168.85			
Total	17930.67	29				

In Table 9, alternative to electricity grid as reported by business owners are reported. The fact that majority of the business owners rely on generating sets also known as also known as gensets as alternative to electricity grid supply. Babajide and Brito (2021), also reported that lack of reliable electricity in much of Nigeria and sub-Saharan Africa has driven the need for self-generation and consumption of electricity. A similar study found that even in urban Nigeria, 6.3% of electricity-accessing households rely primarily on generators. The study further showed that primary reliance on generators is highest in the south-south (24.10%) and the south-east (20.70%) regions where generators is central to about a quarter and a fifth of electricity-accessing households (Odeyale et al., 2022). In another study Ibhadode, (2016) found that 12.4% of households in south-south Nigeria count on generators as secondary source of electricity. Adeleru-Balogun, (2019) asserted that there are between 22 and 60 million small, domestic use generators in Nigeria. Similarly, Giwa, et al., (2019) asserted that there are over 50 million units of

generating sets in Nigeria as a result of power outage. Nigeria is already one of the largest importers of diesel generators in the world and is estimated to spend $250 million annually to import gensets and their spare parts (Babajide and Brito, 2021). However, diesel generators carry health and environmental risks because they emit fine particulate matter (PM), including black carbon, which is derived from the incomplete combustion of diesel (World Bank, 2014). According to a World Bank report that inventoried diesel power generation in Nigeria and its emission of various types of pollutants, particulate matter can lead to respiratory and cardiopulmonary disease which in turn can result in more hospital visits and a higher risk of premature death (World, 2014). The report further notes that the residential and commercial sectors of Nigeria are significant users of diesel generators for electricity generation.

Table 9: Practising alternative to electricity supply shortage in the study area

Business Location	Impact in Naira (₦)			
	Generating set	Solar	Buying of ice blocks	Take clients work home
Adolor quarters	74 (37%)	56 (28%)	56 (28%)	14 (07%)
19th & 20th Street	88 (44%)	47 (23.5%)	52 (26%)	13 (6.5%)
Ekosodin quarters	102 (51%)	36 (18%)	44 (22%)	18 (09%)
Idunmwowina Quarters	106 (53%)	27 (13.5%)	47 (23.5%)	20 (10%)
Oluku quarters	112 (56%)	18 (09%)	51 (25.5%)	19 (9.5%)

4. Conclusion and Recommendations

SMEs are considered a veritable tool for economic growth and development especially as such businesses play a key role in promoting prosperity by creating new jobs and increasing the country's economic prosperity. In Nigeria, over 70% of the country's population is engaged in small and medium enterprises which require minimum start-up capital. Unfortunately, electricity supply remains a key challenge to economic development, affecting over 60% of SMEs operations and resulting in economic backwardness, declining GDP, rising unemployment and difficulties achieving key sustainable development goals of poverty eradication (SDG1). The present study hence aimed to examine the effects of electricity grid inadequacy on the operations of small businesses in select quarters in Benn City, Edo state. A total of ten (10) small businesses were sampled using questionnaire method across ten (10) quarters in the study area. The study found that majority of business owners (49.2%) rely on electricity grid supply for their operations. On whether electricity grid supply is reliable, 49.3% reported that supply is inconsistent (on and off), while 35.4% reported that supply is inadequate for their businesses. A total of 38.6% of the sampled respondents reported that electricity grid supply is only available for a period of 4-5hr/day in their quarters, 28.5% reported 6-10hr/day in other quarters, while 22.9% reported that supply is only available for less than 3hrs/day in their quarters.

In terms of effect of poor supply on business operations, income decline ranked highest (35.3%), followed by extra expenses by business owners on alternative electricity supply operations especially power generating sets popularly known as gen set which constitute pollution. There need for the governments to expand and modify the nation's financing policies for SMEs to improve their conditions for accessing loans as well as initiate result-oriented financing schemes for SMEs and entrepreneurs. Such policies and initiatives may help business owners access loans to purchase alternative electricity supply arrangements while at the same time having the capacity to expand their operations. There is a need for government to intervene in the energy sector with the view to making electricity grid supply available and affordable.

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