Energy Crisis in Nigeria: Evidence from Lagos State

Isola Wakeel Atanda
Mesagan Ekundayo Peter
Alimi Olorunfemi Yasiru
University of Lagos, Nigeria, Department of Economics
isolawak@yahoo.com
profdayoms@yahoo.com
haleemphemy480@gmail.com

Abstract

This study examined the nexus between urbanization and energy crisis in Lagos State using questionnaire to elicit information from one hundred randomly selected Lagos residents in Akoka and Onike areas. The study identified the energy supply gap within the Lagos metropolis and found that the energy requirement in the state for industrial, commercial, and domestic needs is not met by supply. It was observed that urbanisation is the root cause of energy crisis in the state and generators provides the main coping strategy for residents. It is therefore recommended that Lagos state should be allowed to generate its own electricity and distribute appropriately among the residents as against the current practice of contributing its generated power to the national grid.

Key words: urbanization, energy crisis, electricity, Nigeria
J.E.L. classification: L94, O18, Q42

1. Introduction

Rapid urban growth has outweighed the capacity of several big cities' quest to ensure adequate provision of basic facilities, especially energy, for their citizens (Salau, 2009). In spite of this challenges posed by urbanisation, on yearly basis still, the big cities attract a large number of people mostly from the rural areas who, together with the growing native population, increase the amount of squatter settlements and shantytowns. This culminates into worsening of urban safety and hinders attempts to deliver essential services and improve the provision of basic infrastructure (Salau, 2009). In terms of having access to stable and sufficient energy, in 2009, about 1.5 billion people lack access to electricity in less developed countries (LDCs), while close to 3 billion people rely on solid energy source for cooking (Legros *et al*, 2009). As it pertains to several regions of the world, 625 million and 560 million people respectively are without access to modern fuels and electricity in sub-Saharan Africa. In regions like Asia, the people lack access to modern fuel, though several others have access to electricity.

Furthermore, less than 200 million people in East Asia and the Pacific lack access to electricity, while about 1.1 billion depend on solid energy for cooking. About 79% of people are without electricity access in developing countries. 74%of them are in sub-Saharan Africa, compared to the 28% as a whole in LDCs. This means that access to energy varies widely across LDCs, but energy access is far lower in poorer developing countries than in richer ones. Also, access to modern fuels is just about 17% in sub-Saharan Africa and just about 9% in developing countries (Legros *et al*, 2009), meaning that a large percentage of the population are without access to modern fuels. In 2012, out of the 1.3 billion people who lack access to electricity, over 600 million are in sub-Saharan Africa, while over 300 million come from India alone (USAEE, 2014). However, according to the World Economic Outlook (WEO, 2016), about 16% of the world population (i.e. 1.2 billion people) lack access to electricity in 2016. Over 95% of them reside in developing Asia and sub-Saharan Africa. Also, over 38% of global population (i.e. 2.7 billion people) rely on the

traditional use of solid biomass. About 50% rely on biomass in developing Asia and 80% in sub-Saharan Africa. In total, almost three-quarters of the world population do not have access to clean cooking facilities and this amount to about 2 billion people (WEO, 2016).

In Nigeria, while electricity access has grown from 27.3% in 1990 to 57.7% in 2014 (World Bank, 2016), the problem of urbanisation has continued to play down the impact of such growth over time. Currently, out of the 170 million of Nigeria's population, about 98 million are without access to electricity. The national electrification rate in Nigeria as at the end of 2014 was 45%, out of which urban electrification rate was 55%, while the rural electrification rate was 36%. Similarly, in terms of biomass use for cooking, the population relying on biomass use in Nigeria is 134 million with 76% of this still only relying on traditional use of biomass in 2014 (WEO, 2016). It means that generally in Nigeria, access to modern energy is very low and the energy crisis is very high. Therefore, the low rate of rural electrification in Nigeria and inaccessibility to modern energy make the rural-urban migration a necessity and an unstoppable trend. This has exacerbated the problem of urbanisation and further deepened the energy crisis in the urban areas, especially in Lagos state.

Lagos state has a population of 10.6 million and a density of 20,000 per square metre (Lagos State Government, 2006). Lagos also has a yearly population growth of 275,000(Lagos State Government, 2002; Lagos State Government, 2004).The megacity status of Lagos serves as a major migration destination for most Nigeria's indigenes from the rural areas and neighbouring African countries. This therefore exerts severe strain on existing infrastructure and contributes immensely to energy crisis in the state. The deplorable energy situation of the state has adversely affected the productivity status of the industrial firms in the Lagos metropolis. Most of the slump areas of the state, which include Ajegunle, Mushin, Makoko and others, are the worst hit by this energy crisis. Resolving this urban growth problems vis-à-vis energy crisis should be of paramount interest to Nigeria and most especially Lagos state. This is to fast track the goal of achieving sustainable development in the state and improves the living conditions for the citizenry.

The challenges posed by the rapid urban growth in Lagos State could be enormous particularly with respect to secondary energy, like electricity. Adequate supply of energy has been ascribed as a key input in the day-to-day running of the economy. Nigeria only generates less than 5,000 MW for a population of about 170 million. Incidentally, metropolitan Lagos accounts for about 40 per cent of the total electric power supply for industrial, commercial, and domestic demands as characterized by the power supply companies, thus highlighting the picture of the problem. The relevant questions are: Given the population of the state, what is the ideal quantity of electric power requirement? Is there any gap between the energy supply and the requirement of the city? What are the strategies employed to cope with the incidence of the gap on the households and firms, if any? Therefore, this study seeks to evaluate the pushing effects of urbanization and unstable electric power supply on the growth of Lagos State economy. The study makes use of case study to achieve its objectives. This approach is suitable because it enables researchers to examine data at the micro level. The motivation for the study stems from the realisation that poor electricity supply in the face of a rising urbanization demand poses a problem on growth and accordingly, the need to offer suggestions that can ameliorate the challenges are the expected outcomes of this study for necessary policy options.

2. Literature Review

Owing to increased concern over the problem of urbanisation vis-à-vis energy related crisis, several studies have beamed search light from various perspectives. Parikh and Shukla (1995) employed a multiple regression framework using a cross section data to analyse indicators of urbanisation and other economic indicators. It was observed that aggregate energy consumption increases with urbanisation. Shahbaz and Lean (2012) found that a bi-directional causality exists between industrialisation and energy consumption, while it was also observed that urbanisation intensified the volume of energy consumption in Tunisia. Shen *et al* (2005) analysed the trend between urbanisation and energy demand and concluded that if urbanisation grows faster than predicted, China might face long term resource shortage. Wang (2014) defined two types of energy use in the urbanisation process as residential energy consumption (REC) and production energy

consumption (PEC) observed that growth enhanced by urbanisation increased REC while PEC was consistently reduced by PEC between 2001 and 2005 in China. Jones (1989) conducted a cross-sectional study on 59 LDCs and observed that urbanisation significantly increased energy use. Imai (1997) empirically observed that urbanisation contributed to energy crisis in China. Zhou *et al* (2012) observed a negative relationship between energy demand and urbanisation. Ewing and Rong (2008) observed that more urban areas had very reduced energy consumption per-capita in Canada.

In terms of studies on the causal link between urbanisation and energy consumption, Liu (2009) found that urbanisation have a positive causal effect on energy consumption in China. Fan and Xia (2012) found the same results in China. Mishra *et al* (2009) observed that short term causality exists between energy consumption and urbanisation in the Pacific Island Countries while Halicioglu (2007) observed that causality runs from urbanisation and GDP to energy consumption in Turkey. In terms of Nigerian studies, Babanyara and Saleh (2010) observed that the country lost an annual average of 409,700 hectares of forest to urbanisation while Jiboye (2011) observed that the pervasiveness of urban growth in Nigeria is strongly linked with globalisation, population explosion and industrialisation.

3. Methodology

This study adopted the survey research design and cross-sectional analysis. This design is chosen because of the research questions raised and the stated hypotheses. Moreso, it was chosen because researchers observed the behavioural pattern of one or more variables instantly which will also afford the study to take an informed decision and make appropriate policy options. The population of this study includes the residents of Lagos metropolis. Lagos state was selected because it is the second most populated state and commercial city in Nigeria. The study draws its sample size of 100 from the population of the Lagos residents around Akoka and Onike areas of Yaba Local Government of Lagos state. These areas are selected basically because it is just a pilot study and for the purpose of minimising cost. Akoka and Onike also afford us the opportunity to harvest opinions of a typical residential area of Lagos pertaining to energy crisis and urbanisation. This primary data analysis is conducted using random sampling techniques. The random sampling technique is employed to randomly select our sample respondents. In addition, both qualitative and quantitative methods of analysis are employed. For the former, two different modes of sourcing information are employed. Structured questionnaires which detail the socio-demographic information of the respondents as well as key questions which border on urbanisation challenges and energy issues are asked. Furthermore, statistical analyses suitable for the stated objectives are used to arrive at the findings of the study.

The questionnaire is structured into two sections; the first section dealt with the demographic factors while the second section provides information on energy crisis and urbanization. The validity test computed using Pearson Product Moment Correlation (PPMC) techniques is 0.831 and 0.897 for demographic factors and questions in section two respectively, which is larger than its critical value at 5 per cent. Additionally, the Cronbanch-alpha value used for testing reliability test is 0.92 and 0.95 for demographic data and questions in the second section correspondingly. The values are higher than the benchmark value of 0.78. Thus, the instrument is reliable. The data collected from 100 respondents for pilot study was sorted, edited and analysed using Microsoft Excel and Statistical Packages for Social Sciences (SPSS) for preliminary analyses. The study used graphs and tables to present the response of respondents to the questions. It also employed the Relative Importance Index (RII) to identify and rank the factors to the overall root of energy crisis, migration rate of citizens from other states to Lagos, coping strategies of residents to electrifying purposes and domestic shores, and causes of electricity power supply crisis in Lagos. The equation of RII is presented as:

$RII = \frac{\sum W}{AN}$ The value of RII ranges between 0 and 1 (i.e. $0 \leq RII \leq 1$). Where W = the weights given to each factor by respondents ranging from 1 to 5; A = is the heighted weight i.e. 5; and N = is the total number of respondents.

4. Results and Discussions

This section presents the results to the data collected from the questionnaires administered to respondents. The first part is the presentation of the demographic characteristics of respondents.

Figure no. 1: Demographic Classification by Gender

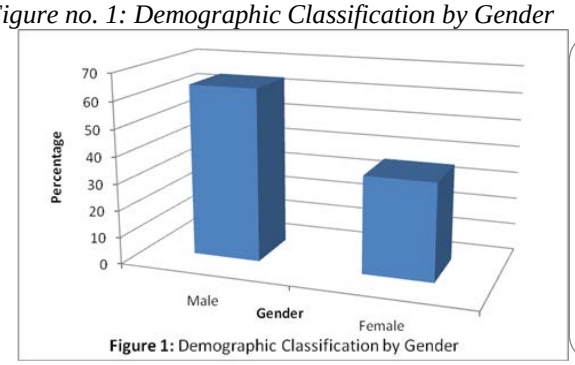
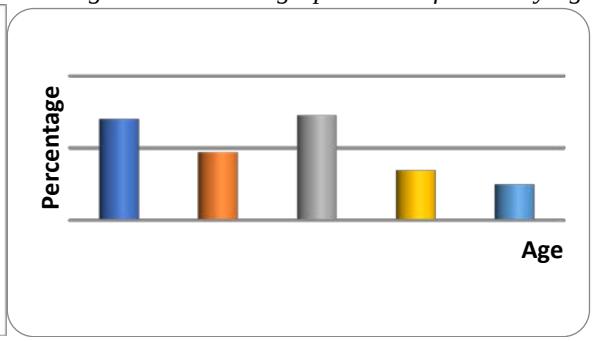
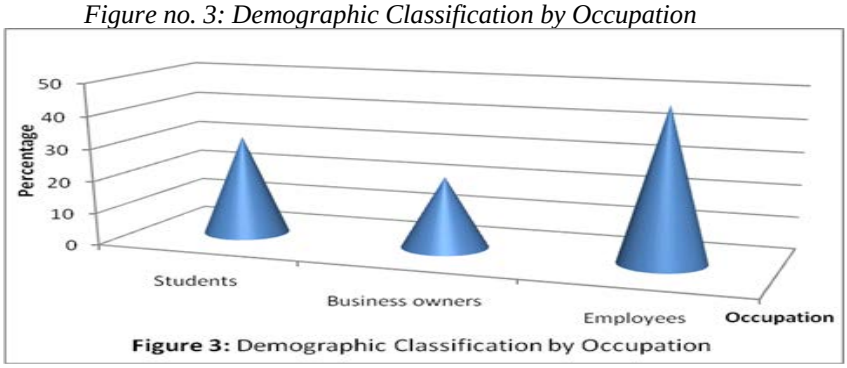


Figure no. 2: Demographic Classification by Age



Source: Authors' computation (2017)

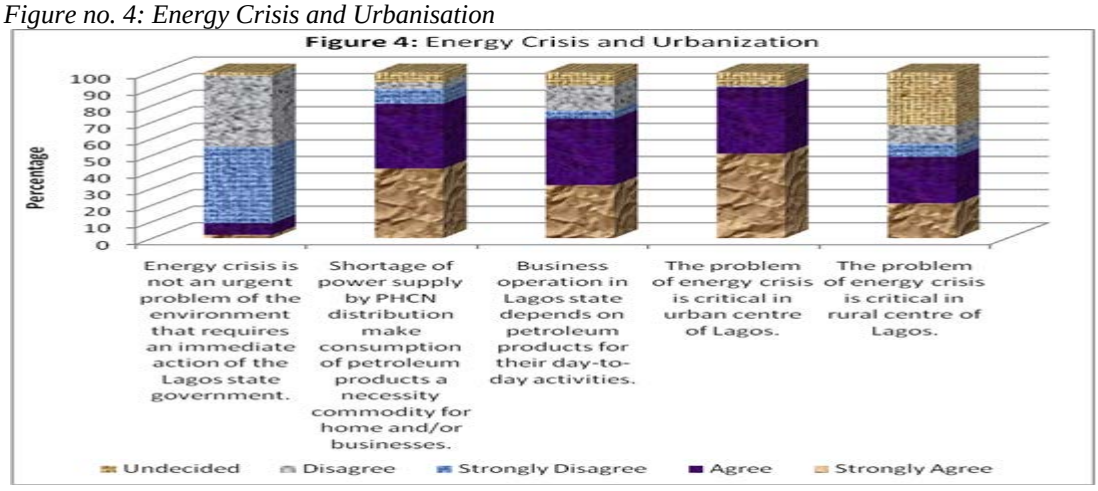
Figure no. 3: Demographic Classification by Occupation



Source: Authors' computation (2017)

Figure 1 depicts the demographic classification by gender, which revealed that 64% and 36% of the total respondents are male and females. The age distribution of our respondent showed that 28%, 19%, 29%, 14% and 10% are within the age bracket of 18–25 years, 26–35 years, 36–45 years, 46–55 years and 56 years and above correspondingly as depicted in Figure 2. The last demographic factors indicating the occupation of the respondents revealed 31%, 22% and 47% are students, business owners and employees respectively. It is shown in Figure 3. The respondents that constituted the study are males who are within the working age and also engaged in business activities. However, employees constitute the larger part of the respondents.

Figure no. 4: Energy Crisis and Urbanisation



Source: Authors' computation (2017)

Figure 4 reports respondents' perception on energy crisis and urbanization. In figure 4, 89% of respondents opined that energy is an urgent problem that requires an immediate action. About 81% of respondents agreed that shortage of power supply makes the use of petroleum products a necessity commodity for home and/or businesses. Also, about 72% of respondents confirmed that business operations in Lagos depend on petroleum products for their day-to-day activities while 91% of respondents opined that energy crisis is critical in urban centres of Lagos. However, about 49% suggested it is more critical in rural areas, 19% disagreed while 32% were undecided.

Table no. 1: The root of energy crisis in Lagos state

	Relative Importance Index	**Ranking**
Price of petroleum products	0.742	6
Migration from other states	0.877	2
Overconsumption of petroleum products	0.864	4
High population growth in Lagos	0.927	1
Poor infrastructure	0.623	7
Wastage of energy resources	0.865	3
Poor distribution system	0.850	5

Source: Authors' computation (2017).

Table 1 report that high population growth was ranked as the root cause of energy crisis in Lagos state with an aggregated relative importance index of 0.927. This is followed by migration from other states (RII = 0.877), wastage of energy resources (RII = 0.865), overconsumption of petroleum products (RII = 0.864), poor distribution system (RII = 0.850), price of petroleum products (RII = 0.842) and poor infrastructure (RII = 0.823), in that order.

Table no. 2: Coping strategies of Lagos residents for electrifying purposes

	Relative Importance Index	**Ranking**
Use of inverter	0.850	3
Use of generating plants	0.854	1
Use of solar energy	0.427	4
Use of tidal waves	0.391	5
Use of wind mills	0.812	6
Use of lanterns/lamps	0.851	2

Source: Authors' computation (2017).

The coping strategies of Lagos residents for electrifying purposes were reported in Table 2 which identified the use of generating plants as the main source of energy residents in the state rely on when there is supply shortage of energy. The relative importance index is 0.854. The remaining coping strategies were the use of lanterns/lamps (RII = 0.851) and inverter (RII = 0.850). The other two coping strategies had low relative importance index indicating that consumers rely less on them for electrifying purposes. The RII values are 0.427 and 0.391 for usage of solar energy and tidal waves respectively. These coping strategies are considered insignificant since the RII values are less than 0.599.

Table 3: Coping strategies of Lagos residents for domestic uses

	Relative Importance Index	**Ranking**
Use of charcoal	0.774	3
Use of kerosene stove	0.895	1
Use of firewood	0.612	4
Use of cooking gas	0.827	2

Source: Authors' computation (2017).

In Table 3, the top-most coping strategy of residents for domestic uses is the use of kerosene stove because it has the highest index of 0.895. This is followed by the use of cooking gas (RII = 0.827), charcoal (RII = 0.774) and firewood (RII = 0.612).

5. Conclusions

This study investigates the effect of urbanization and energy crisis in Lagos state. The study analysed primary data obtained from questionnaires administered to the residents of Akoka and Onike areas of the state and found that there is huge energy supply gap in Lagos state. The study opines that the current coping strategies employed by residents are costly and are also not sustainable. Therefore, from the empirical results presented, we, conclude that the large volume of immigration and urbanisation are the major causes of energy crisis in Lagos state. Hence, to ensure sustainable growth, Lagos state should be allowed to generate its own electricity and distribute among the residents as against contributing its generated power to the national grid.

6. References

- Babanyara, Y. Y., & Saleh, U. F. (2010). Urbanisation and the Choice of Fuel Wood as a Source of Energy in Nigeria. *Journal of Human Ecology*, *31*(1), 19-26.
- Ewing, R., & Rong, F. (2008). The impact of urban form on US residential energy use. *Housing policy debate*, *19*(1), 1-30.
- Fan, Y., & Xia, Y. (2012). Exploring energy consumption and demand in China. *Energy*, *40*(1), 23-30.
- Halicioglu, F. (2007). Residential electricity demand dynamics in Turkey. *Energy economics*, *29*(2), 199-210.
- Imai, H. (1997). The effect of urbanization on energy consumption. *Journal of Population Problems*, *53*(2), 43-49.
- Jiboye, A. D. (2011). Sustainable urbanization: Issues and challenges for effective urban governance in Nigeria. *Journal of Sustainable Development*, *4*(6), 211-224.
- Jones, D. W. (1989). Urbanization and energy use in economic development. *The Energy Journal*, 10(1), 29-44.
- Lagos State Government (2002) Lagos State Development Indicators Report.
- Lagos State Government (2006) Lagos State Regional Master Plan.
- Legros, G., Havet, I., Bruce, N. and Bonjour, S. (2009). The Energy Access Situation in Developing Countries. United Nations Development Programme, (November 2009).
- Liu, Y. (2009). Exploring the relationship between urbanization and energy consumption in China using ARDL (autoregressive distributed lag) and FDM (factor decomposition model). *Energy*, *34*(11), 1846-1854.
- Mishra, V., Smyth, R., & Sharma, S. (2009). The energy-GDP nexus: evidence from a panel of Pacific Island countries. *Resource and Energy Economics*, *31*(3), 210-220.
- Parikh, J., & Shukla, V. (1995). Urbanization, energy use and greenhouse effects in economic development: Results from a cross-national study of developing countries. *Global Environmental Change*, *5*(2), 87-103.
- Salau, T. (2009) Urbanisation and the State of Infrastructure in the Developing World" in Kadiri W. A. (ed.) Our Cities, Our Future: Dialogue on Urban Planning Challenges and Management. Abeokuta: GbengaGbesan Associates.
- Shahbaz, M., & Lean, H. H. (2012). Does financial development increase energy consumption? The role of industrialization and urbanization in Tunisia. *Energy policy*, *40*, 473-479.
- Shen, L., Cheng, S., Gunson, A. J., & Wan, H. (2005). Urbanization, sustainability and the utilization of energy and mineral resources in China. *Cities*, *22*(4), 287-302.
- USAEE (2014). 1.3 Billion are Living in the Dark. The Washington Post. https://www.washingtonpost.com/graphics/world/world-without-power/
- Wang, Q. (2014). Effects of urbanisation on energy consumption in China. *Energy Policy*, *65*, 332-339.
- World Bank (2016). Access to Electricity (% of population). World Development Indicators http://data.worldbank.org/indicator/EG.ELC.ACCS.ZS
- World Economic Outlook (2016). Energy Access Database. http://www.worldenergyoutlook.org/resources/energydevelopment/energyaccessdatabase/
- Zhou, W., Zhu, B., Chen, D., Griffy-Brown, C., Ma, Y., & Fei, W. (2012). Energy consumption patterns in the process of China's urbanization. *Population and Environment*, *33*(2-3), 202-220.