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NOTES AND REFLECTIONS

ENVIRONMENTAL AND SOICIO ECONOMIC IMPLICATIONS OF ENERGY USAGE IN KWALI TOWN, FCT, ABUJA, NIGERIA

YAHAYA NASIRU
nasmannasir2012@gmail.com
Zonal Advance Space Technology Application Laboratory (ZASTAL) NASRDA, Gombe State (Nigeria).

OGUCHE CHRISTOPHER JOSEPH
christodreams1@gmail.com
Department of Seed Information, Data Mgt & Capacity Building, National Agricultural Seeds Council, Abuja (Nigeria).

Introduction

Energy resources in Sub-Saharan Africa (SSA) is more than enough to satisfy its overall energy requirements if they are well developed and evenly distributed, but unfortunately SSA remains the central point of global energy poverty. Presently, around 588 and 783 million persons in SSA do not have access to clean energy sources like solar powered electricity, wind, and geothermal energy for lighting and cooking fuels respectively. The situation even becomes overwhelming in the context of climate change given the fact that the current energy system of most SSA countries is dominated by fossil fuels and traditional biomass.

Air pollution occasioned by the use of unclean energy has become an environmental challenge worldwide. Air pollution is one of the most common forms of environmental problems especially among the third world countries. In Nigeria, air pollution is a concern because it is hazardous to man and his environment (Geissler et al., 2018; HEI, 2018; Vanguard, 2018; World Health Organisation, 2018; Guo, Wei, Li, 2019). Experts have found that air pollutant (aerosols) can accumulate in the tissues of living organisms and the environment. It is also linked with global warming and climate change phenomenon (Gerson, 2008; Idoko, 2019). This scenario occurs when the green houses gases is trapped in the atmosphere (Seppälä et al., 2019). Thus, growing concerns about this issue has made the United Nations sustainable development goals (SDGs) to capture energy access, renewable energy, and energy efficiency as its goal number 7 (SDG7) (UNDP, 2013). Experts in advanced countries have realized this and have put clean energy at the top of their agenda. In spite of this, only a very few studies have been conducted to highlight the issue in the context of energy in Nigeria, by extension FCT, Abuja (Onoja and Idoko, 2012).

Unclean energy use in the residential sector is mainly consumed in the form of traditional solid fuels that is animal dung, charcoal, coal, and fuel wood, for cooking and heating, and this contributes significantly to ambient air pollution, global warming and climate change. Onoja, Idoko, & Adah (2008) identified cooking fuel as one of the leading factors responsible for the rate of deforestation in FCT, Abuja. Therefore, providing all households with modern energy will reduce environmental pollution and energy consumption will require effective policy reforms. Apart from the lack of adequate finance, a key obstacle to facilitating sustainable energy development is the lack of proper information by policymakers about the possible impacts of different energy policy pathways (WHO, 2017).

Studies from one of the countries in SSA, Nigeria is the most populous and largest economy in Africa, endowed with a large menu of energy resources, but only about 61% and 6% of its entire population have access to electricity and clean cooking equipment respectively (Ogie and Oghogho, 2013). The country is currently struggling to provide modern energy for all its citizens. Realizing this ambitious goal will require the triangulation of policies, coordinated support, and strong political will from the government. However, the design of such policies for a successful energy transition needs to be informed by quantitative assessments which consider the role of technologies towards de-carbonizing the household sector and ensuring energy security. Energy system models can be applied to explore the future energy pathways of a sector or region.

Evidently, Kwali town has been witnessing rapid growth over the years since the establishment of Federal Government College and Government Secondary School Abuja in 1986. The change has also translated to the increasing energy demand and consumption pattern in the town. Access to energy and electricity is basic human right that is threatened by the increasing demand and consumption pattern by the teeming population.

Accessing energy is a more prominent challenge in Kwali as with other cities in Nigeria, and the cost of environment impact of energy usage is very high. Due to poor access to clean energy resources by the teeming population, it's usage have being posing negative impact on several communities in Kwali namely; Ashara, Dafa, Gumbo, Kilankwa I & II, Kundu, Kwali, Pai, Wako, Yangoji and Yebu. Consequently, many households resolve to several alternative sources for their day-to-day activities. The increasing demand for energy in Kwali has resulted to severe environmental challenges such as changes in ambient temperature, visibility and decline in the quality of air.

Several researchers have studied and reported works relating to energy conservation and environmentally friendly energy strategies in countries across Europe, Asia and Latin America (Epe Shari et al., 2020; Halbe, 2013; Newsom, 2012; Teng et al., 2012; Zerinou et al., 2020). The following scholars have focus on energy types, energy consumption and economic development. Specifically, Osueke and Ezugwu (2011) investigated 'Nigeria energy resources and its consumption, Onoja and Idoko (2012) worked on 'Econometric analysis of factors influencing fuelwood demand in rural and peri-urban farm households of FCT, Abuja, Kayode *et al.* (2015) did theirs on 'Analysis of Household

Energy consumption in Nigeria' using residents of Ibadan, Nigeria, Awosusi and Oriye (2015) worked on the economic development of Kwali, while Ibrahim and Cudjoe (2021) focused on 'The Environmental Impact of Energy Consumption in Nigeria: Evidence from CO_2 Emission'. However, none of these studies have looked at assessment of energy usage and its environmental implication on Kwali Town, FCT, Abuja. It is against this background that the study is pertinent. Hence, this paper tends to fill this gap.

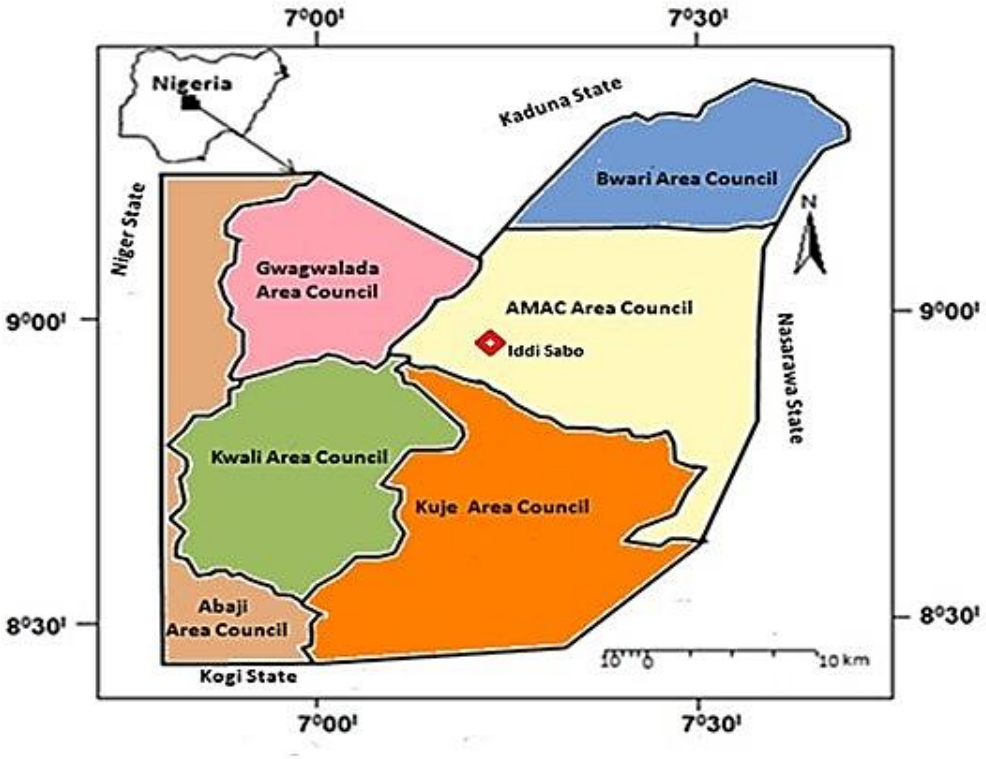
1. Study area

Kwali is located in FCT, Abuja, Nigeria (see figures 1 & 2). Its coordinates are: latitude 7^O 15' to 7^O 29' N, and Longitude 7^O 11' to 7^O 32' E and is one of the rapidly urbanizing towns in Abuja, Nigeria.

Figure 1: Nigeria showing FCT, Abuja

Source: Department of Geography and Environmental Mgt, Uniabuja (2019)

Figure 2: FCT showing Kwali Study Area

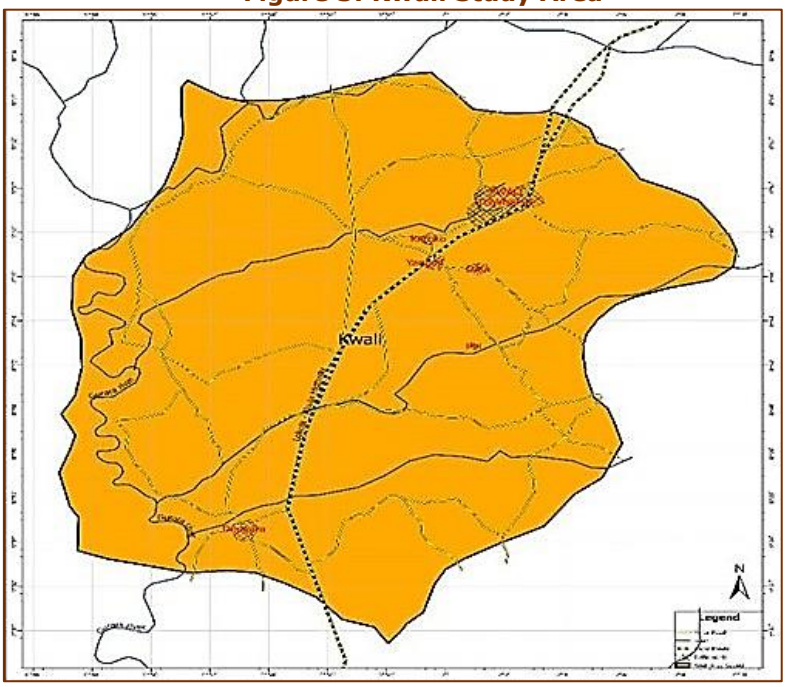


Source: Ishaya (2013)

Kwali lies within tropical hinterland climate. The climate region is characterized partly by double and single maximum rainfall patter with about four months of dry season. In the mornings, Relative Humidity generally rises to over 80% and falls between 50% -70% in the Afternoon during the wet season. Rainy season occur between April through October and the peak is September. Heavy rains of conventional type fall sometimes amount up to about 978.5mm. The mean rain days for this area are approximately 73.90days. The rate of rainfall generally decreases inland from the southern part of the region. The mean monthly temperature ranges between 21°C and 32°C (Awosusi and Oriye, 2015).

The landform of the study area undulates gently with less developed valleys. However, there is a visible valley to the North of Kwali town and with little exposed bedrock (Awosusi and Oriye, 2015). Equally, the vegetation of Kwali consists of tropical woodland, savannah and grassland, with notable economic trees such as Ebony (Iroko), Mahogany (Teak), Cordia (Melina), Cedrela (Eucalyptus), and whole food crops such as cassava, soya bean, cereals, maize and leguminous crops. A few cash crops such as Cashew, Oil palm, Neem and lots more are also found in the area.

Figure 3: Kwali Study Area



Source: Geography & Environmental Mgt Department. University of Abuja (2023)

Importantly, Kwali are largely farmers but since the establishment of some governments institutions, some of the settlers moved to other occupation such as trading, construction work, and auxiliary services such as barbing salons, dressmaking, shoe-making, computer and business services. It is important to state here that, some of the institutions in the area such as the government-owned and private hospitals, bank, and post-office have absorbed a great number of Kwali's population into non-agrarian economy. Its market has also greatly enhanced trading within the area.

2. Methodology

The paper adopted a survey design format. Reconnaissance survey was embarked upon to enable the researcher to examine the sources of energy that could have severe impact and risk to the environment within Kwali town. Furthermore, household categories that consumed energy types that posed threat to Kwali environment were identified. The data required for the study includes

Socio-demographic data of the respondents in Kwali, sources of energy and frequency of usage in Kwali, energy application and implication in Kwali and household consumption of energy-types that posed threat to Kwali

The study used both primary and secondary sources of data. Given the fact that Kwali current settlement population cannot be ascertained, the researcher applied Hanlon and Larget (2011) formulae for calculating sample size, thus:

$N > (ZP/M)^2 - 4$

Where N= the required sample size

Z = the alpha level at 95% Confidence level which is 1.96

P = the level of precision (0.25)

M = the desired margin of error (0.05)

4 = constant

Therefore, the required sample size was

$N > (1.96 \times 0.25/0.05)^2 - 4$

Therefore, N > 92

Therefore, a total of 100 questionnaires were distributed to respondents. Simple random sampling was used in the distribution of the questionnaire. The data returned was coded and analyzed. The result was presented using table and simple percentage. The underlying consideration to present the results in table was to ensure that readers find it easy to understand. It also assists the author to present data in a way that would catch the reader's eye, hold his interest and enhance his understanding Sandeep (2015).

3. Result and discussion

Table 1 shows the percentage frequency distribution of some bio-data characteristics of the respondents. Equivalent numbers of male and female respondents were administered questionnaire and who were predominantly below thirty years of age, constituted 63% of the population. Those in the upper age bracket of thirty years and above constituted 37%. This ratio of about 3:2 was also reflected in the marital status of single: married. The observed relationship, however, had no correlation with their tribal status. There are four tribes among the residents in Kwali, but gwari (76%) and Igbo (14%) tribes are major. It was note-worthy that nearly half of the population had acquired secondary school or a tertiary level of education. This status of education was adjudged sufficient to enable energy consumers to distinguish between hazardous and relatively safer energy types. About 27% were still students at the period of study while those engaged in various trades or businesses were up to 70%. The list is in-exhaustive but includes commercial motor-cycle riding, salon activities, tailoring, carpentry, automobile repair, marketing, farming, photography and employees in confectionery sector. About 50% to 60% residents owned their houses while about 40% were in rented apartments. In either of the scenarios, there appeared to be sufficient accommodation for every individual in a household as an average of 89 rooms was available for 80 persons.

Table 1: Socio-Economic characteristics of respondents in Kwali, FCT,Abuja, Nigeria

Variables		Frequency	Percent
Gender	Female	46	46
	Male	54	54
	Total	100	100
Age	1-19 years	29	29
	20-29 years	34	34
	30-39 years	21	21
	Above 40 years	16	16
	Total	100	100
Marital Status	Single	59	59
	Married	40	40
	Divorced	1	1
	Total	100	100
Tribe	Gwari	76	76
	Igbo	14	14
	Yoruba	6	6
	Hausa	4	4
	Total	100	100
Educational Level	Informal	2	2
	Primary	8	8
	Secondary	45	45
	Tertiary	45	45
	Total	100	100
Occupation	Business	69	69
	Student	27	27
	Civil servant	4	4
	Total	100	100
House Status	Rental	38	38
	Owner-occupier	56	56
	Others	6	6
	Total	100	100
Number in household	1-5	40	40
	6-9	40	40
	Above 10	19	19
	Total	100	100
Number of rooms	1-5	69	69
	6-9	20	20
	Above 10	11	11
	Total	100	100

Source: Field Survey (2023)

Table 2 presents the responses to some energy characteristics which Kwali residents' experience. The results indicated that the preferred energy source of use is electricity accounting for 72%, compared with kerosene 14%. Before the twenty-first Century, more than 1.6 million people globally were still without access to electricity and in Nigeria, about 60 – 70% of the population were in this category (Osueke and Ezugwu, 2011). However, by the early twenty-first Century, sub-Sahara African population of about 46% used electricity (Treiber, 2013). The trend had improved remarkably in recent years, as 72% of residents in Kwali town have access to electricity. Only 2% of the residents still applied the classical energy types of firewood or candle. As also seen in figure 4.

Table 2: Energy Characteristics of Kwali Residents

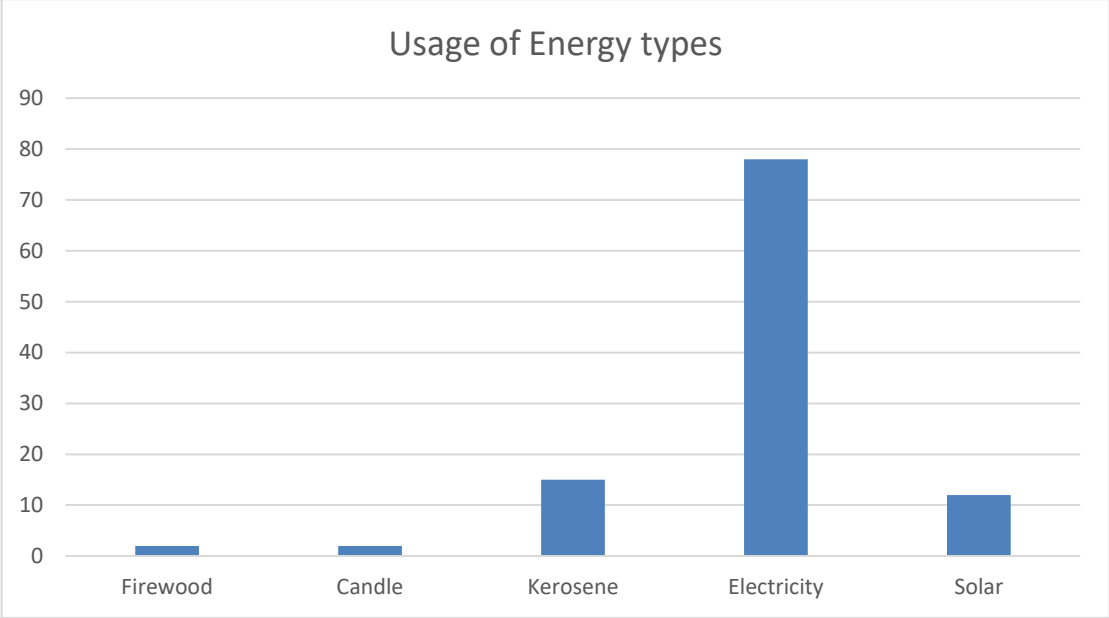
Variables		Frequency	Percent
Usage of Energy types	Firewood	2	1.8
	Candle	2	1.8
	Kerosene	15	13.8
	Electricity	78	71.6
	Solar	12	11.0
Reasons	Availability	27	33.3
	Affordability	26	32.1
	Convenience	28	34.6
Cost Importance	Yes	76	89.4
	No	9	10.6
Income (₦) per month	≤ 4,999	18	21.7
	≤ 9,999	22	26.5
	≤ 49,999	25	30.1
	≤ 99,999	11	13.3
	≥ 100,000	7	8.4
Source OF FUEL for Cooking	Firewood	45	42.9
	Coal	3	2.9
	Kerosene	12	11.4
	Gas	44	41.9
	Electricity	1	1.0
Source for Lighting	Solar	3	2.8
	Firewood	0	0.0
	Kerosene	17	16.0
	Gas	5	4.7
	Electricity	81	76.4
Purpose for Electricity	Lighting	53	41.4
	Appliances	72	56.3
	Heating/Warming	3	2.3
Most risky source	Firewood	1	1
	Coal	1	1
	Kerosene	3	3
	Gas	63	63
	Electricity	32	32
	Solar	0	0
Least risky source	Firewood	43	43
	Coal	4	4
	Kerosene	33	33
	Gas	4	4
	Electricity	4	4
	Solar	12	12

Source: Field Survey (2023)

The transition to usage of modern energy sources was further illustrated by 11% solar energy application. A critical review of the data obtained from the field also revealed that 9% of the residents combined usage of kerosene and electricity. While cost was the baseline in decision-making, reasons adduced by respondents were principally availability, affordability, and convenience of usage. These three factors were rated similarly. The respondents were majorly identified with various businesses indicated earlier, accounting for 78% of the population and with monthly income of less than fifty thousand (N50, 000.00) naira. The breakdown indicated that 22% earned below N5, 000.00, 27% earned between N5, 000.00 – N10, 000.00, while 30% earned below N50, 000. However, only 22% of the respondent falls into the category of those earning above

N50, 000 monthly. This class of people is likely to have the economic capability to purchase solar equipment for use in their households. The influence of income level on switch between uses of energy types had been reported by Vander Kroon *et al*. (2013) to explain the Energy Ladder theory.

Figure 4: Showing Usage of Energy Types



Source: Author Field Work (2023)

Bearing in mind the chosen factors of availability, affordability, and convenience of usage, respondents were further presented with different scenarios of application if the different energy types were to be readily available. For the purpose of cooking, 42% indicated interest for firewood like those for gas (that is, the liquefied petroleum, LP). The observation was a further reflection of household transition from classical to modern energy consumption, possibly for reasons of affordability and convenience of usage. In similar vein, 76% preferred the use of electricity for lighting purpose and activities that needed appliances.

Finally, respondents' level of education was tested on the factor of risks inherent in the application of the different energy types. The benefits and hazards of various energy sources have been extensively reviewed by Vieira (2021). The most environmentally friendly energy source identified is gas (63%), followed by electricity (32%). On the contrary, the most eco-harmful energy source was firewood (73%), followed by kerosene (33%). Therefore, the energy ladder/energy–mix transition for Kwali could be inferred as firewood – kerosene – solar – electricity – gas. The firewood and gas supplies were readily available to the two classes of residents who could afford their energy source of choice and its convenience.

Conclusion and recommendation

It is imperative to note that energy usage will be on the increase as population increases. It is however, necessary to be conscious of its environmental implication for sustainable development. Most developing countries are yet to key into clean energy as there still patronize the use of firewood and kerosene. Indeed, Kwali is not an exception. One of the major drawbacks is the fact that electricity is not generated at full capacity. This has affected both domestic and industrial activities particularly small-scale business (SME). It is worthy of note that the use of firewood has greatly affected the ecosystem as more trees are being cut down. Consequently, improvement in the amount of voltage generated and poverty reduction strategies in among energy users in Kwali will improve the environmentally friendly energy consumption outlook of the area. It is therefore necessary that all stakeholders in energy provisions should strive to provide clean energy to sustain the environment.

But to achieve this, efforts should be made to encourage energy users to transform from relying heavily on hydrocarbons to take advantage of sustainable or environmentally friendly energy sources. This can be done by developing new technology and design of energy systems. Energy policies and management strategies aimed at achieving efficient and sustainable should also be designed and encouraged.

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