



Energy and Development: A Review of Challenges on Household Energy Use in Nigeria and South Africa

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Abstract

Nigeria and South Africa are considered two countries of high economic relevance in Africa and the globe, but there has been no attempt to understand the challenges of household energy use despite their significant position. Household energy use and economic development are interrelated, meaning that household energy use is co-integrated with economic growth. Against the backdrop of the intricate relationship between economic development and household energy use, this study reviews the challenges of household energy use in Nigeria and South Africa using fuelwood, kerosene, LPG and electricity that are commonly used for cooking, heating, and boiling. In regards to this, the study reviews the economy and household energy consumption, the patterns of household energy consumption as well as the modern energy use challenges in the two countries. The paper will assist the investors and policymakers to understand the level and significance of household energy use so that they can strategically invest to address various household energy challenges, thereby increasing economic growth.

Keywords: *Household energy use, challenges, Nigeria, South Africa, review*

Introduction

Increasing economic development in Africa is automatically increasing the demand for energy, and consumers can use energy portfolios to satisfy their growing energy needs. As a result, modern and traditional energy

is being used to satisfy the energy requirement of the households of the emerging economies such as that of Nigeria and South Africa. However, the nexus between household energy use and economic development has

indicated a serious challenge that households in Nigeria and South Africa are facing on energy use. For instance, despite Nigeria is the energy giant in Africa and an oil-rich country, the majority of the poor households earn less than 2 dollars per day and out of that, 0.4 dollars is spent on energy every day. This implies that approximately 20-40% of the income earned by the households is being spent on energy alone (Olisa and Nria-Dappa, 2009) giving rise to conflict on household spending on the day to day requirements. Also, 40 percent of the population of the country does not have access to electricity supply due to poor energy infrastructure, while the supply of fossil fuels is so precarious. In South Africa, even though there is adequate electricity access, but the majority of households are living under the burden of high energy prices. A study has shown that an average South African household spends 14% of total monthly income on energy needs, and the international benchmark is 10% for energy poverty (HSRC and DoE, 2012:1). Meaning that many households have fallen in the category of energy poverty. Presently, 74% of the households in the country are in the poorest quintile and are energy poor. Even among the high-income households, 13% of rich quintiles are energy poor because of the burden of high electricity prices. Generally, limited access to modern energy has been reported to have increased the level of fuel-wood consumption in these countries. In Nigeria, Oluwagbenga et al. (2015:57) have attributed an increase of fuel-wood consumption to unstable electricity and petroleum products supply. While Aitken (2007:24) and HSRC and DoE (2012) have reported extensive use of fuel-wood across households due to a lack of connection and burden of electricity bills in South Africa. Against the backdrop of these challenges, a review is needed to provide information that can help both the private and public sectors to develop a realistic energy master plan that will promote business development within these economies.

Economy and household energy use

The economic situation prevailing in Nigeria and South Africa is a significant variable in current energy use and the expected future trend. Nigeria is the most populated country in Africa with an estimated population of over 172 million people (NPC, 2015), a GDP of \$568.5 billion and a per capita income of \$1,430 (World Bank, 2015). Strong export of crude oil, but still the country remains among the poorest countries in the world. The level of poverty in Nigeria is very high that in 2013 about 112 million people or 70% of the population were living

below the poverty line (Anyebe, 2015:13). Poverty has attained endemic proportions and it is becoming worrisome in Nigeria. However, there was a drop-in poverty rate between 1999 and 2007 to 56.1% due to serious measures taken by Obasanjo administration against corruption, robust agricultural policies, and increased foreign direct investment (Inibehe and Ibrahim, 2014:6). Given the aforementioned statistics, it is no longer debatable that poverty is equally high in Nigeria. While the South African economy is still a dual economy with the highest and striking inequality rates in the world. Only 3% of the total expenditure is being consumed by 20% of the poorest population in the country, while 65% of the expenditure is used for the wealthiest 20% (World Bank, 2016). The rate of poverty has barely changed in 2016 from 16.6% since 2011 to just marginally to 15.9% (World Bank, 2016:1). Even though the level of poverty fell from 33.8% in 1996 to 16.9% by 2008. This is an indication that some progress was made in addressing the issue of absolute poverty in the past decade primarily through extensive social safety net programs but slow employment growth negatively affects household consumption leading to reduced consumption of the households.

The relationship between poverty and household energy use is quite clear in Nigeria and South Africa. The Nigerian National Bureau of Statistics (2013) revealed that households in the North-east and North-west regions where the level of poverty is highest consume less modern energy and more fuel-wood than the rest of the regions (95.9% and 95.3%). The Southwest and South-east regions that are economically better up consumes more modern energy and less fuel-wood (54.9% and 78.0%). In the case of South Africa, the notable studies of Human Science Research Council HSRC and DoE (2012:1-118) and ProBec (2009:1-66) have reported poverty among the poorest sectors of the South African population makes the proportion of the households unable to meet the basic modern energy needs, the consumption of cheaper fuel-wood is common among the poor and low-income households.

In terms of the prices of energy, studies point market prices for fuel-wood, kerosene, LPG and electricity as a major determinant of household energy use (Akputa et al. 2011, Zhang and Koji, 2012, Muller and Yan, 2016). Empirical evidence had shown a negative own-price effect on the quantity of fuel consumed and the probability of choosing the fuel. Electricity costs in South Africa have the potential effect of pushing poor households to either change their behavior through energy savings or switch back to unsafe and insufficient

fuels such as fuel-wood or paraffin. Millions of South African households that have a connection to the national grid are not able to pay for electricity because electricity tariffs have tripled in real term since 2005. Even though, since 2003 Free Basic Electricity (FBE) allocated 50kWh free to assist the poor to mitigate the effect of high electricity price towards meeting their basic need for lighting and media plus a limited amount for water heating and cooking has not addressed the household energy challenge. Evidence emerging shows that not all indigent households receive the FBE subsidy due to implementation failure at the municipal level (SALGA 2012). About 3.3 million poor households earning less than R4150 a month that is connected to electricity but are not benefiting from the FBE program (Franks and Prasad, 2014:1).

Almost a similar situation was found in Nigeria, the electricity supply is very low and the price of fossil fuels is high due to the deregulation of the oil sector. The increase has put households at risk of using energy for their daily needs. For instance, Abd, Razack et al. (2012:18) reports that the price of 12.5kg cylinder of LPG rose to N3900 in 2012 from N200 naira in 1991. Meaning that the price has skyrocketed within ten years. The cost of kerosene had risen to N180 per liter while at the black market a liter can reach as high as N300. Similarly, electricity tariff has also been continuously on the increase without even being noticed by the consumers. Therefore, over 73% of the Nigerian households were affected by the increase in the cost of modern energy, and this predicament necessitated many households to abandon modern energy and shift to fuel-wood and other biomass products.

Household energy use patterns in Nigeria and South Africa

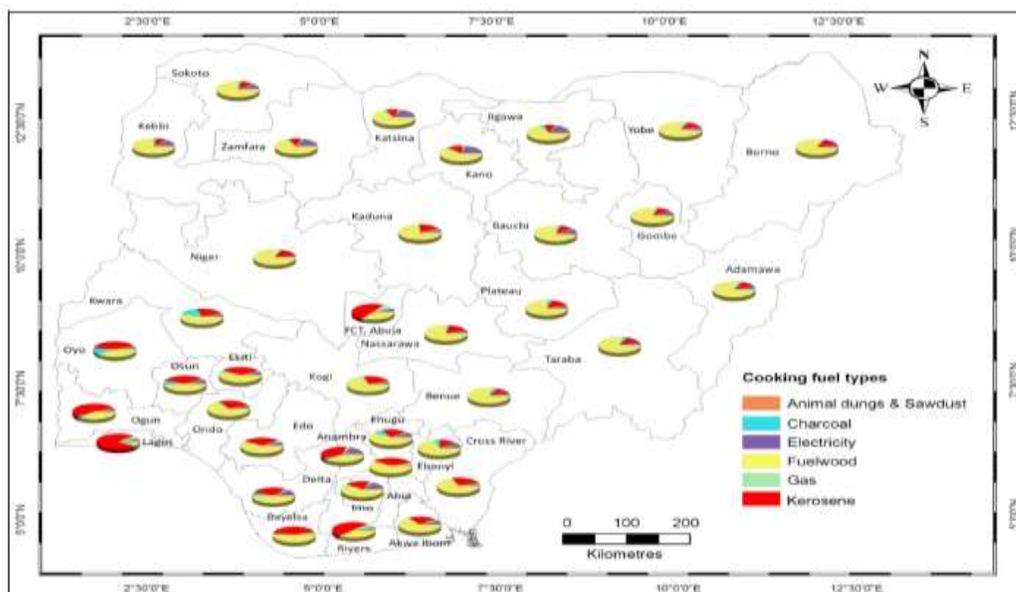
In comparative terms, Nigeria's energy use is slightly different with South Africa, the household sector accounts for the largest share of energy use by about 65% and cooking accounts for a staggering 91% of the household consumption, then followed by lighting 6% (Oyedepo, 2012:11) while in South Africa industrial and transport sector have a larger share of energy use (ProBec, 2009). However, they still have almost similar household energy use patterns because urban households in both countries utilize different energy sources to satisfy their day to day energy requirements. Even though there is a remarkable difference in the ways energy is being utilized. In Nigeria, fuel-wood, kerosene, and LPG are the dominant energy sources in urban areas with little electricity due to unreliability in supply. In the rural areas due to lack of electricity and

precarious fossil fuel supply driven by poor transportation and middlemen malpractices, fuel-wood energy is second to none in Nigeria. In South Africa electricity dominate urban with less of fuel-wood, kerosene, and LPG. Even though there has been progressing in modern energy supply, fuel-wood use is well established in the rural areas of South Africa.

Analysis of household use of different fuel types by Nigerian households revealed that more fuel-wood is being used for cooking than any other fuel type (see figure 1 below). According to the Nigerian National Population Commission (2010) of 28,197,085 households in Nigeria, only the Lagos state uses less fuel-wood. Out of 2,195,842 households in Lagos State, about 1,771,100 households (more than 80%) solely rely on Kerosene for their domestic cooking and boiling, and Northern Nigerian households are the major users. This goes to show that fuel-wood is the most important source of energy followed by kerosene (modern fuel) as the second most important fuel after fuel-wood (in terms of usage among households), the use of kerosene dominates the southern part of the country, particularly in the states of Lagos, Oyo, Rivers, and Ogun. In contrast, more than 70% of households in most northern states use fuel-wood for their domestic cooking and boiling.

In South Africa, despite the availability of electricity, there is a considerable difference in the ways electrified households consume energy to meet their basic energy needs from those households that are not connected to electricity (non-electrified). Therefore, households connected to electricity utilize electricity for either lighting, cooking, or heating and in most cases, they avoid activities that require high thermal energy by using fuelwood instead (HSRC and DoE, 2012:19). This could be the reason the use of other forms of energy do not decline even when electricity becomes available. In most of the rural areas of South Africa, HSRC and DoE (2012) and ProBec (2008) alluded that electricity has played a very little impact in displacing fuel-wood due to affordability reasons. Table 1 below shows that electricity use is dominant in the urban formal and informal settlement of South Africa (fuel-wood in the informal areas came third after candle and paraffin). In rural areas and farm centers, fuel-wood is the dominant energy source. The provincial pattern of consumption shows Limpopo province consumes more fuel-wood than other provinces despite the electrification, followed by North West, Eastern Cape, and Mpumalanga. Gauteng and Western Cape Provinces have the least household fuel-wood consumption.

Figure 1: Map of Nigeria showing the pattern of household energy use according to states



Source: Naibbi (2013:127).

Table 1: Household energy use pattern by geographical location and province in South Africa.

	Electricity	Candles	Paraffin	Firewood	Gas	Coal	Drycellbatteries	Solar system	Generator	Car batteries	Base N
South Africa	88	47	37	32	19	7	3	3	1	0	3000
Geographic location											
Urban formal	98	30	25	11	22	5	4	4	2	0	1885
Urban informal	70	51	62	17	12	12	4	2	2	0	243
Rural, trad. auth. areas	79	77	50	74	15	7	2	2	1	0	626
Farms	70	66	45	58	17	13	2	5	3	0	246
Province											
Western Cape	99	24	26	14	19	0	2	1	0	0	393
Eastern Cape	78	48	72	48	16	5	2	3	2	0	337
Northern Cape	98	52	16	37	25	4	3	4	2	1	157
Free State	96	35	66	19	26	6	7	11	5	1	224
KwaZulu-Natal	80	57	37	37	26	9	3	3	1	0	579
North-West	85	77	42	51	18	6	6	5	1	0	218
Gauteng	89	30	28	8	19	7	5	3	2	0	590
Mpumalanga	89	70	23	45	12	26	1	3	1	0	232
Limpopo	91	75	20	70	6	1	2	1	0	0	270

Source: HSRC and DoE (2012:22).

Household modern energy use challenges

Generally, limited access to modern energy has been reported to have increased the level of fuel-wood consumption in African countries. Therefore, it is pertinent to discuss the challenges surrounding modern energy use that are making households in Nigeria and South Africa to shift to the use of fuelwood.

Electricity: Before 1994, the minority white population living in South Africa were the beneficiaries of government energy infrastructure investment to the detriment of the majority of blacks (HSRC& DoE, 2012:1). However, ANC Power Sector Reforms has greatly assisted many poor black households to have access to electricity since 1994. The reform shifted the policy towards making provision of electricity to the disadvantaged blacks as the cornerstone of the development policy of South Africa under the slogan “Access to electricity for all”. The grid electricity became for all including people in the remote areas of the country. In 1998, the Energy White Paper was released to provide a framework and guidelines to achieve the goal of universal household access to electricity putting more priority on the poor households at the same time alleviating negative environmental impact. The white paper contains the following;

- a) Tackling the challenges facing poor man’s energy requirements
- b) Provision of low-cost but high-quality energy to industrial, mining, and other sectors as a way of enhancing the economy.
- c) Providing ways of achieving resource management and environmental sustainability.
- d) Providing level playing ground that will attract foreign energy investments.

Furthermore, 1995 a regulator is known as National Electricity Regulator (NER) was established to succeed Electricity Control Board that was established in 1987 under Act No. 41 to regulate the electricity supply industry in the country. The mandate of NER is to exercise its power through national jurisdiction by licensing of generators, transmitters, and distributors across the country. NER is also to ensure customer's electricity requirements are met and the electricity supply industry is regulated. Initially, the NER task was the development of a financial model that will lead to electricity connection to many households for the National Electrification Programme.

However, it is worth noting that as South Africa is recording successes in electricity access due to policy shift, Nigerian on the other hand is battling with electricity shortages. Electricity supply in Nigeria is consistently erratic and epileptic. Studies have shown that the electricity-generating figures of Nigeria are very poor that it cannot meet half of the demand of Nigeria in the last two decades (Sambo, 2008:33, Naibbi and Healey, 2013:161, Nwachukwu et al., 2014:7). Oyedepo (2012:13) asserted that the electricity generation in Nigeria cannot be compared with what is obtained in other African countries particularly Southern Africa Development Community (SADC) countries such as Botswana and South Africa.

Given the electricity challenges facing Nigeria, a serious move for the rehabilitation of existing power infrastructure started in 1999 during the administration of President Obasanjo. The National Electric Power Policy (NEPP) was developed in 2001 and culminated in the Electricity Power Sector Reform Act, 2005 and finally led to the formation of the Nigerian Electricity Regulatory Commission (NERC) that provided the statutory basis for the privatization of the power sector leading to setting up Power Holding Company of Nigeria (PHCN). This also led to the unbundling PHCN into 18 successor companies that formed six generating companies (GENCOS) and eleven distribution companies (DISCOS) and establishment of the Transmission Company of Nigeria (TCN). The economic rationale of this policy was to establish an electricity market that has long term effects in Nigeria through efficient services by multiple operators under a competitive environment. However, despite that, the success of electrification in Nigeria remains a big challenge (Adeniji and Osisiogu, 2014). For instance, the vision of Electricity Power Sector Reform was to generate 40,000MW of electricity by 20:20 but as of 2016 Nigeria could only generate less than 6,000MW due to insufficient supply of gas to thermal plants and funding constraints. Unlike Nigeria, South African access to electricity is overwhelming due to government commitment in the energy sector, thereby making households electricity access an important government policy agenda. In achieving this, the National Electrification Program was initiated since 2001 under Energy Department named Integrated National Electricity Programme (INEP) to give low-income households electricity. ESCOM (South African Electricity Company) targeted 1.75 million households at 300,000 households per year. The project intended to raise the level of South African national electricity access to about 66% by 2001 (rural

46% and urban 80%) (NER, 2002). Also, the program targeted all schools and clinics as well as formerly disadvantaged communities. The outcome of the above policy was overwhelming, as it dramatically increased household electricity access to 87% in 2012 from 36% in 1994 (5.7 million households), (DoE, 2012). Even though, presently, ESCOM is in a deep financial crisis that can undermine these achievements and more importantly high electricity tariff has pushed many households to shift to the use of fuelwood that is easily available and affordable.

Despite the ESCOM's deep financial mess, one can still argue that the energy policy in South Africa appeared far better than what is obtained in Nigeria. For example, the policy that brought about the GenCos, DisCos, and TCN and mandated them to generate, transmit, and distribute electricity to urban and rural areas of Nigeria has woefully failed. They could only generate 4000MW or 6000MW daily from the estimated 8039MW of installed capacity. According to (Olise and Dappa, 2009:3 and Odularu and Okwokwo, 2009:), out of the meager megawatts that are generated, the electricity remains of poor quality and supply. As a result, many people have to depend on their power generators to meet their demands. Recently, Ohiare (2018:17) reported in Daily Trust Newspaper that Nigeria spends an estimated 5trillion Naira (\$14billion) annually for importing, fueling, and maintaining generators. It is for this reason that the majority of the households in Nigeria have to shift to the use of fuelwood because they cannot afford the cost of generator purchase, fueling, and maintenance.

Liquid Paraffin/ Kerosene: In Nigerian, paraffin (popularly known as kerosene or HHK) is used for lightening in the rural areas, while for cooking and boiling in the urban areas (Olise & Nria-Dappa, 2009:3). In 2016, the Nigerian National Bureau of Statistics revealed that the declining household disposable income had lowered down the amount of kerosene being used from 195.8 million liters in the third quarter, against 263.5 million recorded in 2015. The high cost of kerosene is due to a constant increase in price by successive governments by way of de-regulation and wholesalers hoarding. Abd'razaq et al (2012:20) explained that price increase on kerosene has made households drastically reduced kerosene consumption. Between the period of 2004 and 2008, kerosene price per liter jumped from N 24 to N 50 naira, and between 2009 and 2012 skyrocketed to N150 and N200 respectively. De-regulation and malpractice of kerosene middlemen have been the major challenge of kerosene used in Nigeria.

In the same period, the country witnessed an unprecedented consumption of fuel-wood from 10% in 2000 to 45% in 2008 and 65% in 2012. In South Africa, kerosene is one of the widely used conventional energy for lower-income households. According to Statistics South Africa (2007), approximately, 14.8% of households living in South African consume paraffin as energy for cooking, representing approximately 1.8 million households. Moreover, the study of PASASA by Paulsen et al. (2010:21-22) showed significant levels of paraffin consumption among households. According to them, paraffin and electricity were the popular energy types among South African households, while fuel-wood; gas, coal, and candle were less widely used. This study corroborated the data provided by Statistics South Africa (2007) that showed paraffin is used for cooking (85%), lighting (41%), and heating (32%). The reason for the wide usage of paraffin by South African households despite the widespread electrification is that electricity alone is unlikely to satisfy the household energy needs especially with continuous ESCOM crisis (insufficient generating capacity, aging infrastructure, reliance on coal high emission levels, financial challenges and hike in tariff structure, etc. However, a recent study by Franks (2014:82) in Cape Town had presented a different scenario on paraffin use among households in South Africa. The findings show that Integrated National Electrification Program (INEP) has successfully displaced paraffin as the main fuel for lighting and cooking for many poor urban households in Cape Town city, as it can be seen in the decline of kerosene expenditure between 2005/06 and 2010//2011. The study however clarified that in winter, households consume paraffin and fuel-wood for space heating. Other reasons for the decline in paraffin usage include the Free Basic Electricity Programme (FBE) for the poor households and the escalating cost of kerosene as well as limited availability and suitable appliances (Statistics SA, 2007). As reported by Trura (2009:3) that the reduction in the consumption of paraffin by the households experienced in 2008 was due to the escalation in the price of paraffin. The price of paraffin is driven by a violent spike on the prices of oil making it difficult for consumers that do not have the disposable income to cope, many of them have no option than to cut back their supplies. The difference between South Africa and Nigeria in terms of kerosene consumption is that South Africa is only confronted with high prices of kerosene while Nigeria is faced with both high prices and shortages in supply as a result of hoarding by the middlemen. Furthermore, South African households are less dependent on kerosene – it is

not their primary source of energy. Conversely, the higher-income households in urban and rural areas of Nigeria use kerosene as one of their main energy sources.

Liquefied Petroleum Gas (LPG): Liquefied petroleum gas is a clean and efficient energy source used by households with superior burning characteristics, is popularly referred to as cooking gas is not widely used energy for South African households. According to Franks (2014:84), gas is not a likely substitute for even electricity by poor households. Despite this, in KwaZulu-Natal and Eastern Cape provinces, a study conducted by Aitken (2007:23) has indicated some degree of LPG usage, approximately 50% of the households use gas for domestic activities. On the other hand, Nigeria produces LPG in a large quantity as it occupies the sixth position in LPG production in the world, and coming second in the African continent. The gas reserve is estimated at 170million cubic meter feet, making it the tenth-largest gas reserve in the world. Nigeria holds the sixth position in LPG production in the world, unfortunately, it is the lowest country in Africa in terms of LPG consumption. The per capita consumption of LPG in Nigeria is far below South Africa even though about 1.5 million metric tonnes per annum potential exist in the country. For a country of over 170 million that is expected to consume at least one million metric tonnes of LPG yearly, Nigeria's per capita consumption of LPG is far below South Africa. Consumption of cooking gas in Nigeria in 2013 stood at 0.5 kg per capital as against 5.5 kg per capita in South Africa. Based on national consumption estimates of 2013, Nigeria consumes 30% or 250,000 tonnes of LPG. This is low when compared to the production or output of 850,000 tonnes of LPG earmarked for domestic utilization in 2013 (KMPG, 2013). According to Sambo (2008:34), 80% of the gas consumed in Nigeria is for electricity generation but the household sector consumes very negligible quantity. In 2015, some remarkable improvement in LPG consumption has been recorded to about 1.8kg per capital (NNPC, 2015). The Vanguard Newspaper of 30th November 2015 reported the Vice President of Nigeria attributing the high fuel-wood and kerosene consumption due to low LPG usage. The poor and disappointing consumption of LPG in Nigeria may also not be connected to the price of the product which is beyond the reach of the average Nigerian. Another issue is that most of the appliances use in LPG, for example, gas cookers, adaptors/regulators, cylinders, and hoses are all imported products and are priced highly above the reach of many households. Additionally, most Nigerian

families are not fully aware of LPG, even if they are aware, they associate the use of LPG to status thereby giving it an elitist connotation. For both South Africa and Nigeria many households refrain from using LPG due to safety considerations.

Conclusion

It is important to mention that increasing economic development in Africa is automatically increasing the demand for both household and industrial energy. Therefore, consumers will have to leverage on portfolios of energy to satisfy their growing energy needs. Even though modern energy is needed to satisfy the energy requirement of the households of the emerging economies, many people in Nigeria and South Africa will continue to use fuel-wood energy for cooking, heating, and boiling due to the challenges of accessibility and affordability of modern energy. More importantly, there is the perception that the world oil may likely run out in the nearest future, and the cost of generating electricity is becoming very high especially in the developing countries, thus a viable renewable energy system would be needed that is less and less dependent on modern energy. In this regard, there is the need for policymakers and private practitioners of the two countries to develop a realistic energy master plan that will promote business development within their economies thereby attracting investment. This research will assist the investors and policymakers to understand the level of household energy challenges so that they can strategically invest, thereby increasing economic growth.

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