A REVIEW OF DOMESTIC HOUSEHOLD ENERGY USE IN URBAN/RURAL SETTLEMENTS IN NIGERIA

Mohammed Umar, A. S. Grema Murtala A. Musa, Sahabo Abubakar & Godwin Maina
Department of Mechanical Engineering, Ramat Polytechnic, Maiduguri
Department of Chemical Engineering, University of Maiduguri
Email: umar20054@gmail.com

Abstract: *Concerns for energy required for the running of homes, industries and the economy generally has been of global concern for some decades. Domestic household energy has influence on environmental conservation and sustainable development. This paper reviews the domestic energy consumption in urban/rural settlements of Nigeria. Our study takes an explicitly longitudinal and multilevel approach to understanding this fundamental energy use transition. For this study, a narrative approach was employed. Selected studies were compared and summarized on the basis of existing literature, theories and models. This review explores the differences in influences on fuel use between rural and urban areas. It also evaluates and identifies patterns and trends in domestic energy in urban/rural areas of Nigeria. From the literatures reviewed, it was seen that domestic energy is energy used at homes for cooking, heating, lightening, cooling, powering electrical appliances and pumping water. These energies can be sourced from different energy sources ranging from traditional energy (wood waste, animal dung, crop waste fuel wood, sawdust and charcoal) to the modern energy source (kerosene, liquefied gas and electricity). Looking at the two energy models used for this research, it was seen that electricity ranks the highest in energy ladder model and energy stack model, yet most households in Nigeria, approximately 100 million people lack access to it. It was noted that the key factors in the growth of household energy consumption are the number of households with access to energy supply, penetration rates of electric appliances, and the mount and efficiency of energy sources. The findings have shown that a lot should be done in ensuring that safer and cleaner sources of* *energy are available to rural households. Conventionally, availability, affordability and convenience of usage are critical issues to be taken into consideration when making choices among alternative energy sources that are available. There is the need for government's intervention in making kerosene available to rural poor. This is the source of energy that was mostly used.*

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INTRODUCTION

Access to energy is a pre-requisite of economic and social development because virtually any productive activity needs energy as an input. Concerns for energy required for the running of homes, industries and the economy generally has been of global concern for some decades (Stern, 2007).Policies are being put in place in many countries aimed at expanding domestic energy provision, but the current state of the sub-Saharan energy system is a major threat to the region's economic hopes. Energy demand in sub-Saharan Africa grew by around 45% from 2000 to 2012, but accounts for only 4% of global demand despite being home to 13% of the global population. The region's largest energy demand centres are Nigeria and South Africa, which together account for more than 40% of total energy demand. Two-thirds of total energy use occurs in the residential sector – mostly biomass used in an inefficient and hazardous way for cooking – compared with an average of 25% in other developing countries. Energy consumption in other end-use sectors is much lower than in other world regions, reflecting the very low availability of energy services (IEA, 2014). In terms of utilization, household energy accounts for about forty percent of the total energy consumption in developing countries (Obueh, 2008). Households use energy for lighting, heating, cooling, ironing, food and drinks preservation, powering electronic devices, cooking and vacuum cleaning. Therefore when energy shortage occurs or prices rise, many things may go wrong. This in part explains why members of the public show serious concerns when prices of energy rise. Nigeria is rich in energy resources and huge renewable resources remain untapped (solar, hydro, wind and geothermal). Oil resources in Africa are being developed, with production of 5.7 mb/d of crude oil in 2013, primarily in Nigeria and Angola. In the last five years, nearly 30% of world oil and gas discoveries were made in sub-Saharan Africa; but the challenge to turn these discoveries into production and the resulting revenue into public benefits is formidable. Low incomes, coupled with inefficient and costly forms of energy supply, make energy affordability a critical issue. Energy tariffs are often very high by world standards, despite often being held below the cost of supply. Oil products are subsidized in many oil-producing countries. Where subsidies exist, they are often designed to support energy access for the poor, but they are frequently not well targeted. Across sub-Saharan Africa, the wealthiest 20% of households account for about half of total residential spending on energy (IEA, 2014). The question to be asked is how can this energy crisis be addressed? In order for this question to be answered, the knowledge and understanding of the energy trend in Nigeria is of vital importance towards the improvement of the energy sector. This paper aims to review the domestic energy demand and consumption in urban/rural settlements of Nigeria. Selected studies were compared and summarized on the basis of existing literature, theories and models. The result was based on qualitative rather than a quantitative level.

A critical, constructive analysis of literature on the topic was given through summary, classification, analysis and comparism. This review explores the differences in influences on fuel use between rural and urban areas. It also evaluates and identifies patterns and trends in domestic energy in urban/rural areas of Nigeria.

CONCEPT AND EVOLUTION OF ENERGY

Over time, humans have developed an understanding of energy that has allowed them to harness it for uses well beyond basic survival (World Wind Energy, 2009). The first major advance in human understanding of energy was the mastery of fire by James Prescott Joule. Human use of energy per capita remained nearly constant until the Industrial Revolution of the 19th century. This is despite the fact that, humans learned to use energy from other sources such as sun, wind, water, and animals for endeavors such as transportation, heating, cooling, cooking and agriculture. After a long period of relatively cheap energy prices, the tightening of global energy markets in recent years has led energy consuming nations to realize how dependent they are on energy exporting nations that may not share their foreign policy and security agendas. This sense of uncertainty is deepened by the knowledge that many of these exporters are acutely vulnerable to a variety of disruptions beyond their control. The key to understanding the concept of energy interdependence is realizing that producers desire security of demand just as much as consumers want security of supply

TYPES OF ENERGY USE IN NIGERIA

Crude Oil

Petroleum products are probably the most widely studied and measured type of energy in the global economy. They come in many different forms, though this is not immediately obvious from news reports that lump them all together under the banner of "oil." Crude oil is extracted through wells that tap into underground reserves where oil has been discovered. The extraction process is facilitated by the intense pressure found beneath the earth's surface. The Nigeria economy is heavily dependent on its oil sector which accounts for 85% of government revenues and is the second largest contributor to GDP following agriculture. Nigeria produces over 2.17 million barrels of oil per day (bbl/d) making it the largest producer of oil in Africa. The large majority of this oil is exported to other countries. Oil exports are approximately 1.9 million per day. In 2008, Nigeria consumed about 286,000 bbl/d of oil. This accounted for nearly 53% of the energy consumption in the country (EIA, 2003). Although Nigeria has four refineries with a combined capacity of around 500,000 bbl/d. However, theses refineries are not fully functional in order to meet up with the country's energy demand.

Natural Gas

The next largest contributor to total energy consumption in Nigeria is natural gas. It makes up about 39% of energy consumption in the country. Nigeria has the largest natural gas reserve in Africa, but the country has limited infrastructure in place to develop the sector. With over 184 trillion cubic feet of proven natural gas, Nigeria is the seventh largest natural gas holder in the world. Most of the natural gas reserves are in the Niger Delta. Gas discovery in Nigeria was incidental to oil exploration and production. In 2007 Nigeria produced 1.20 trillion cubic feet of natural gas while consuming 465 billion cubic feet of natural gas. Approximately 794 billion cubic feet of natural gas was exported. Issues with the production of natural gas center around the flaring of Nigeria's oil fields. Due to the lack of adequate infrastructure, refineries are unable to sufficiently capture the natural gas that is given off during the refining process. This gas instead burns up as flares. These oil fields often flare because they lack the infrastructure necessary to efficiently produce and market associated natural gas (IEA, 2006).About 80% of the natural gas that Nigeria produces is used domestically for electricity generation while the remaining is used mostly for other purposes in the industrial sector. A negligible amount of the natural gas is used for other purposes in households (Ajoa et al. 2009).

Hydro Energy

Hydro energy is the largest source of renewable energy. This renewable source of energy provides 10% of the nation's electricity. As of now, there are 77,000 Megawatts of hydropower, enough to provide 35million homes with energy. Converting the flowing water into usable energy produces hydropower. Most of this water comes from river and is released through turbine to produce energy. The steam pressure from the boiling water turns "properties" called turbines spins coils of wire between magnets to produce electricity (Oracle, 2009). Hydro powered system also make use of turbines to generate electrical power, however, they do so by using the energy in moving water to spin the turbines. The three major sources of hydro-energy are as in Table 1 (Sambo 2006):

Table 1: Major Sources of Hydro energy

S/N	Name of hydropower plant	Year established	Installed capacity (MW)	Availability as of June 2006 (MW)
1	Kainji	1968	760	465
2	Jebba	1986	578	482
3	Shiroro	1990	600	450
		Total	**1938**	**1397**

The total technically exploitable hydropower potential based on the country's river system is conservatively estimated to be about 10,000MW of which only 19% is currently being tapped or developed.

Biomass Energy

Biomass is simply the conversion of stored energy in the plant into energy that can be used. Burning wood is a method of producing biomass energy. Biomass is the most commonly used resources of rural energy in Nigeria because fuel wood is the cheapest and most accessible source of fuel even in the urban household. Fuel-wood is the traditional fuel source, which in spite of the availability of conventional domestic fuels, remains in high demand at the expense of Nigeria forest. Plant biomass can be utilized as fuel for small-scale industries.(Osueke & Ezugwu, 2011).

Coal

Coal is the oldest commercial fuel, dating in Nigeria from 1916 when 24000tons were produced. Production peaked at near one million tons in 1959, before declining to the present insignificant level. This is due to the reduction in the demand for coal and switching from coal to gas for thermal power generation. Nigeria's coal reserves are large, over two metric tonnes of which 650 million tonnes are proven. Coal productions are from the cretaceous Anambra Basin and extend to Dekina in the northern part of the basin of Benue state and to okigwe in the south. The coal in the basin is subbituminous and occurs principally at two levels, the lower coal measures (Mamu formation) and the upper coal measures (Nsukka formation). Mine production capacity after full rehabilitation and privatization at major minning sites in Nigeria could attain the following level: Onyeama and Okpara (150,000-400,000 tonnes/year), Owukpa (2500 tonnes/year) and Okaba (15,000-300,000 tonnes/year) (Osueke&Ezugwu, 2011). The four types of coal are as follows; Lignite is the soft, brownish-black coal that forms of the lowest of the coal family. The sub bituminous is a dull black coal which gives off a little more energy than lignite when it burns. Bituminous is sometimes called "Soft coal" and it has more energy packed in it. Nigeria sub bituminous coal has a high calorific value (5,000-6,000 cal/g or 5500-6500 airdried), low ash and low sulphur content, with good storage characteristics. Anthracite is the hardest coal and it gives off a great amount of heat when it burns (USDE 2011).

DEMAND FOR ENERGY IN NIGERIA

Population has been established as one of the key drivers of energy demand. According to the United Nations (UN) Population Division, global population is expected to increase from over 7.2 billion in 2014 to almost 9.0 billion in 2040. More than 90 percent of the rise in population is expected to come from developing countries. As population increase over time, the provision for better standards of living drives increase in energy consumption. Therefore, in the long-run, the impact of population growth, including changing age structures will have implications for energy demand and economic growth. The energy landscape of Nigeria remains uncertain with low oil price, increasing divestment in the oil and gas industry, unresolved host community issues and poor regulatory framework. The implication is a decline in investment, which heightens energy insecurity and the eventual slide in the sector's operational activities. A cursory analysis of the energy conditions in Nigeria revealed that the country had not optimised its huge energy potentials significantly (Rapu*et al,* 2015).

DOMESTIC ENERGY USE IN RURAL AND URBAN AREAS

According to Onyekuru (2008), the energy requirements in both the urban and rural areas consist of two different and distinct components. Each possesses a unique characteristic which reflects the economic and social conditions of its inhabitants. One component follows patterns that are similar to cities (urban areas) in industrialized societies. The energy demands of those areas are similar to those of urban settlements in developed countries and reflect energy consumption patterns of the urban well-to-do, who use energy for commercial buildings, amenities, recreation and transport.

Thus, the energy problems in that component of human settlements in developing countries are similar to those found in many developed countries (EIA, 2006). The other component (rural areas) involves the slums and squatter settlements whose energy-related problems bear a close resemblance to those of the rural population. The energy requirements of the low-income population, whether living in urban squatter's settlements or rural areas, can be narrowed down initially to domestic needs. The rapid growth of concentrated populations in urban centers has led to an extreme scarcity of housing, deterioration of living conditions and the breakdown of infrastructure and services, especially transportation, Household and industrial energy supply, water reticulations and health care (Onyekuru, 2008). The annual per capita energy consumption of the urban poor in the city does not differ significantly from that of the rural poor, since the main share of energy consumption in both cases goes to cooking (Govinda*et al.,* 2001). However, with rising incomes, the energy consumption patterns of urban households in urban areas of many developing countries tend to increase. Cooking and lighting account practically for all the energy consumed by people in the lowest income group (Sambo, 2008). Appliances and space and water heating account for up to 60 percent of the energy consumed by the rich in the cities. With rising incomes, fuel wood tends to be replaced by kerosene and kerosene replaced by gas/electricity for cooking and lighting (Onyekuru, 2008).

THEORETICAL FRAMEWORK

A lot of theories have been adopted in the past on domestic energy use in households both in urban and rural communities. For the sake of this particular research work, the research will adopt two theories namely, 'Energy ladder theory' and 'Energy Stack models'.

Energy Ladder Theory

An interest in the idea of an energy ladder emerged with the perception of a fuel wood crisis in the 1970s and 1980s (Kowsari*et al.* 2011; Taylor 2011). Energy researchers posited a hierarchical relationship of fuel types that a household follows with rising economic status. Hosier and Dowd's 1987 paper is credited as one of the first academic papers to discuss this relationship

(Arthur et al. 2010). The idea extends consumer economic theory to energy, assuming that households act as utility maximizing neoclassical consumers (Hosier and Dowd 1987; Kowsari and Zerriffi 2011; Van Der Kroon et al. 2013). With increasing income, the consumer chooses to purchase more of some goods and less of the inferior goods. In the context of the energy ladder, as income rises households consume fuels that occupy higher rungs, ascending the energy ladder. A fuel's rung is dictated primarily by its cost, a reflection of its cleanliness and efficiency (Goldemberg 2000). Hosier and Dowd present a five-rung ladder: gathered fuel wood, purchased fuelwood, transition fuels, kerosene, and electricity. Subsequent papers propose slight variations of the ladder's structure. Reddy's 1995 paper relies on a six rung ladder: dung/waste, fuel wood, charcoal, kerosene, LPG, and electricity. Van Der Kroon separates fuels into three classifications, primitive, transition and advanced, with multiple fuels under each. The United Nations Development Programme's World Energy Assessment describes separate ladders for cooking, lighting, and mechanical uses (Goldemberg 2000). The figure below shows a simple illustration of the energy ladder model.

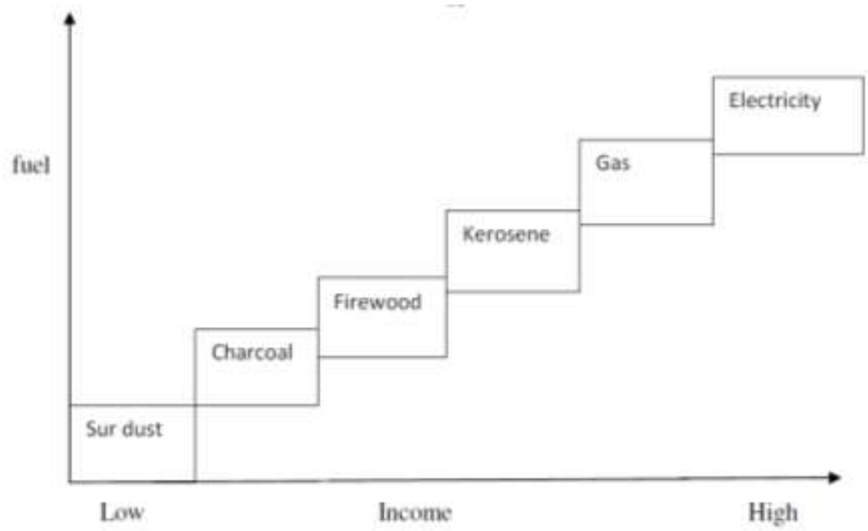

Figure 1: Energy Ladder Model

Later literature proposed a critical modification of the energy ladder hypothesis, termed energy stacking or fuel stacking. This model still constructs a hierarchical relationship of fuel types, but counters that households do not immediately ascend to improved fuels and simultaneously abandon inferior ones. Rather, the fuel stacking hypothesis conjectures that households rely on multiple types of fuel, consuming a higher proportion of superior fuels with rising income.

Energy Stacking Model

According to Maserea*et al.*(2000) rural household do not switch fuels entirely, but more generally follow a multiple fuels or fuels stacking model. Energy Stack Model is ability of households to combine both traditional and modern fuels to meet their domestic energy needs. The so called fuel switch is actually a step towards multiple fuels cooking or fuel stacking; Fuel stacking is also a step towards fuel switch, because by stacking, households start the process of de-stacking of conventional fuels (Maserea *et al.,*2000). Fuel stacking and energy ladder is not contradictory rather complementary to elucidate fuel switch process and direction. This model rejects the linear simplification of the energy ladder, suggesting that households do not wholly abandon inefficient fuels in favour of efficient ones. Rather, modern fuels are integrated slowly into energy-use patterns, resulting in the contemporaneous use of different cooking fuels (Nicolai *et al.,*2008). This model is supported by empirical data presented by Masera*et al.* (2000) and has been confirmed by further studies of the dynamics of fuel switching (Pachauri and Spreng, 2003).

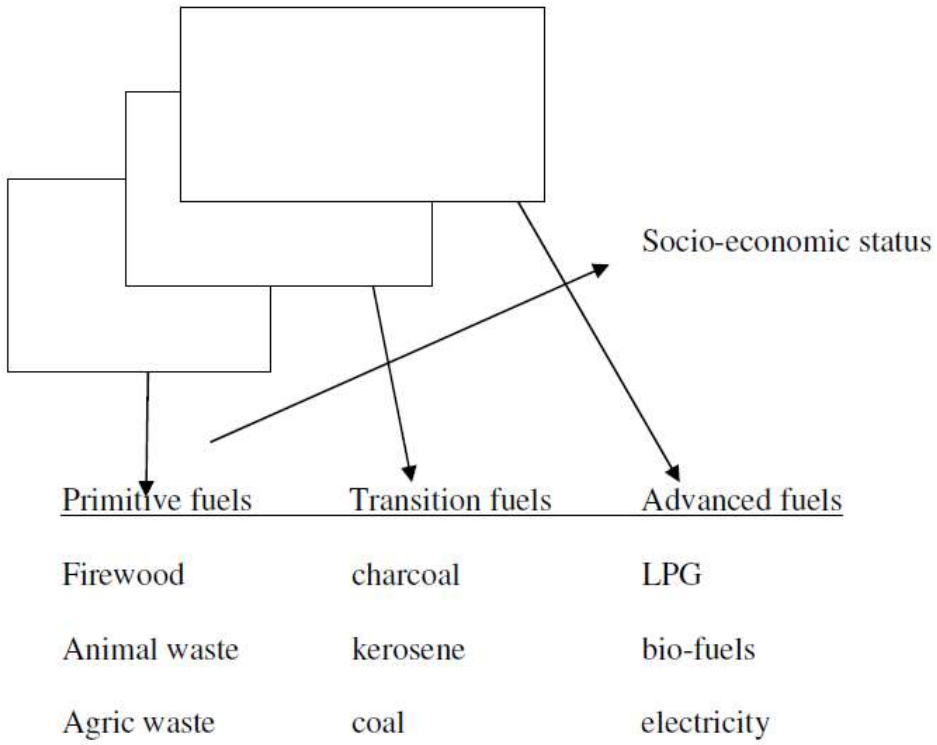

Figure 2: Energy Stack Model

While moving up the energy ladder suggests greater fuel efficiency and thus reduction of total emissions, this multiple fuel use or 'fuel stacking' strategy may instead lead to greater energy use by the household in the process of moving 'up the energy ladder' (Masera*et al.*, 2000). Thus, a multiple fuel use pattern challenges the capacity of rural energy development to alleviate any existing pressure on the environment. This pattern of multiple fuel use has been documented since the 1980s (Masera*et al.*, 2000). Moreover, it is noted as the rule rather than the exception in many urban and rural areas of the developing world. Review of energy ladder and energy stack model

Researchers point to the reluctance of households to completely abandon biomass even when consuming fuels on the adjacent, or an even higher, rung as evidence contradicting the energy ladder. Masera *et al.*, (2000) one of the

earliest critics of the energy ladder model, notes that between 1992 and 1996 in three Mexican states, the proportion of households that abandoned biomass ranged from zero to 16 percent. Peng *et al.* (2010) observe less than 10 percent of their sample of households in rural Hubei, China fully abandons biomass and a decline in its use only occurred in the wealthiest households. Taylor *et al.* (2011) find that despite the nearly universal ownership of LPG stoves amongst migrant households in Guatemala, 77 percent maintained fuelwood as their primary form of fuel. In Nansaior *et al.* (2011) study, a decline in the use of biomass occurred only in an urban community within the study area of northern Thailand. Suburban households within the sample actually consumed more biomass per capita than 5 those in rural areas. Campbell et al. observe a similar resistance to abandoning fuel occupying the middle rungs of the ladder in Zimbabwe. Households did not abandon kerosene even after they adopt electricity (Campbell *et al.* 2003). The fuel-stacking hypothesis captures the tendency for households to continue to consume inferior fuels along with new, superior fuels. Masera proposes that stacking fuel types provides households greater energy security in the face of uncertain and volatile supply, prices, or incomes. Other authors discount the energy ladder for its failure to incorporate the influence of cultural or habitual factors, instead focusing exclusively on income. Recognizing that far more personal and contextual factors than income dictate fuel choice and transition, Kowsari and Zerriffi (2011) reject both models and instead propose an energy profile cube. The dimensions are the quality of the fuel itself, the efficiency of the conversion technology and the extent of the demand for energy (Kowsari and Zerriffi 2011). Papers differ substantially in their working definition of energy ladder and fuel stacking, which contributes to the debate between proponents of the two hypotheses. Some researchers reject the energy ladder on the assumption that the model dictates a linear, unidirectional relationship, while other researchers still invoke the energy ladder hypothesis to situations where households do not fully abandon inferior fuels, nor rely on one source of energy alone. The applications of the latter cohort essentially incorporate the characteristics of fuel transitions that 6 critics argue the energy ladder lacks. For instance, Nansaior*et al* (2011) seek to determine whether the energy ladder hypothesis or fuel stacking more appropriately fit the trends of energy use in the KhonKaen province of northern Thailand. Within their sample, the share of biomass did decline with rising income as spurred by urbanization, consistent with the energy ladder. The decline, however, was gradual and continuous rather than sharp and discontinuous as the energy ladder hypothesis predicts. Most households continued to use biomass in addition to kerosene, LPG, or even electricity. Nansaior*et al.'s* relatively flexible definition of the energy ladder leads them to interpret these results as supportive of both models.

Review of Empirical Literature

The nature of demand for domestic energy influences environmental conservation and sustainable development. The formulation of feasible and pragmatic policies that mitigate climate change would require a thorough understanding of the interconnectivity that exists between environment, energy, and the composition of our settlements both urban and rural.

A lot of researchers have carried out research related to this research topic both within and outside Nigeria and for the sake of this work, these empirical evidence were reviewed. Table 2 below summarizes the results and findings of the selected literature reviewed for this paper.

Table 2 Summary of Literature

S/N	Author(s)	Findings/conclusion
1	Arbabi, H., & Mayfield, M. (2016)	• The findings show that energy consumption across cities follows common power law scaling increasing sub-linearly with their population regardless of their urban/rural classification. • This is why rural and sparsely populated settlements exhibit sharply different patterns for energy per capita consumption.
2	A.O. Adepoju, A.S. Oyekale and O. Aromolaran (2012)	• Results show that as household heads grow older, their demand for charcoal and kerosene significantly increased. • Households that were using fuel wood for cooking were spending less on kerosene and electricity. • The author concluded that the type of energy used by majority of a population reflects the extent of economic development and civilization already attained.
3	Nabinta, R., Yahaya, M. and Olajide, B. (2007)	• Studies revealed that fuel wood is the primary source of fuel.All farmers stored them for consumption, sale and barter traditionally. • Constraints to effective and efficient rural energy supply and use identified were education, labour, capital, time, credit, decreasing fuel wood availability, and contact with extension. • The study concluded that farmers' participation in fuel wood production and utilization is frequent and continuous.
4	Anyiro, C. O., Ezeh, C. I., Osondu, C. K., &Nduka, G. A. (2013)	• The result showed that urban households utilized modern domestic energy types (LPG, kerosene and electricity) than rural households. • Critical and significant determinants of urban and rural domestic energy use include household income, occupation, quantity of energy, and cost of substitute energy. The combined effect of all the variables explained 66.67% of the total variation in urban domestic energy use and 83.3% in rural domestic energy consumption. • The result of the cross elasticity of demand showed that the domestic energy types are close substitutes to each other in both rural and urban areas.
5	Yaqub J.O., Olateju, A.O. and Aina, B. (2011)	• The findings showed that economic factor plays an important factor in the choice of energy used for cooking. • A significant positive correlation between the type of energy use and dwelling places, education qualification and monthly income of those who live in the urban area place much emphasis on safety and convenience in their choice of energy use.

		• While majority of the rural dwellers emphasized income in their choice of cooking energy. The use of kerosene is common in both urban and rural areas. Wood and charcoal are used majorly in the rural area while electricity and gas are used majorly in the urban area.
6	Desalu, O. O., Ojo, O. O., Ariyibi, E. K., Kolawole, T. F., &Ogunleye, A. I. (2012)	• Majority of rural dwellers used single source of energy for cooking (55.6%) and urban dwellers used multiple source of energy (57.8%).Solid fuel use (SFU) was higher in rural (29.6%) than in urban areas (21.7%) • Kerosene was the most common primary source of energy for cooking in both urban and rural areas (59.0% vs.66.6%) followed by gas (17.8%) and charcoal (6.6%) in the urban areas, and firewood (21.6%) and charcoal (7.1%) in the rural areas. • It was concluded that the prevalence of solid fuel and kerosene use was higher in the rural areas than urban areas while the use gas, electricity was higher in the urban areas.
7	Anthony, C., Ogbonna, O. and Dantong, J. (2011)	• The field study revealed considerable differences in the patterns of energy consumption among householders of different economic bands living in different house types within the same city. • Cooking energy consumption accounts for 42% of the domestic energy demand, while sundry electrical appliances like computers, phones accounted for the least amount of energy demand (5%). • Household cooking and water heating across all house types was characterised by multiple appliance usage and was often driven by appliance cost and the need for security of fuel supply for the particular appliance.
8	Shittu, A., Idowu, A., Otunaiya A., and Ismail A. (2004)	• Results showed that 36% of their average monthly consumption expenditures on the household energy commodities, and about two-third of this goes to fuel (petrol and diesel) for the households' automobiles and generating sets. • The income effects were positive for all the energy commodities, except firewood. • Demand for petrol, diesel and domestic gas were income elastic. Thus, the study concluded that improvement in income would cause increase in demand for electricity and petroleum products in the study area, but worsening real income would place greater demand on biomass fuel.
9	Gujba, H., Mulugetta, Y., &Azapagic, A. (2015)	• The results suggest that both the impacts and costs would increase significantly if the heat demand continued to grow at the current rates.

		• If the current trend continues, cost will be higher by four to five times by 2030.

CONCLUSION

From the literatures reviewed, it could be seen that Domestic energy is energy used at homes for cooking, heating, lightening, cooling, powering electrical appliances and pumping water. These energies can be sourced from different energy sources ranging from traditional energy (wood waste, animal dung, crop waste fuel wood, sawdust and charcoal) to the modern energy source (kerosene, liquefied gas and electricity). At present, one of the most widely used types of renewable energy that is available to Nigeria is biomass. Biomass includes a broad spectrum of energy producing products, including fuel wood, saw dust, charcoal and agricultural residue and municipal waste. Looking at the two energy models been reviewed in this paper, it will be seen that electricity ranks the highest in energy ladder model and energy stack model, yet most households in Nigeria, approximately 100 million people lack access to it. It was noted that the key factors in the growth of household energy consumption are the number of households with access to energy supply, penetration rates of electric appliances, and the amount and efficiency of energy sources. The use of energy by majority of a population reflects the extent of economic development and civilization already attained. Specifically, the nature of domestic energy demand is vital for ensuring sustainable development and reduction of indoor environmental pollution. The results have shown that a lot should be done in ensuring that safer and cleaner sources of energy are available to rural households. Conventionally, availability, affordability and convenience of usage are critical issues to be taken into consideration when making choices among alternative energy sources that are available. As discussed in previous sections, household energy consumption in developing countries has environmental, economic, and gender implications. A number of programs have attempted to encourage households to adopt cleaner and more efficient forms of energy with limited success. With the view of this study, the following recommendations were made:

- There is the need for government's intervention in making kerosene available to rural poor. This is the source of energy that was mostly used. This effort will reduce pressure on the forest and also reduce time for fetching fuel woods.
- Government should improve the electricity by investing and implementing new incentives in order to attract investors to the sector.
- Nigeria is rich in energy resources and huge renewable resources remain untapped (solar, hydro, wind and geothermal). These resources should be explored as another alternative for electricity.
- It was revealed that the country had not optimized its huge energy potentials significantly. Further and frequent research on Nigeria`s energy trends and should be carried out.
- Energy use, sources, and pattern for different locations all over Nigeria can be fully understood by collecting credible data from each specific location and analyzing them. This will aid in resolving the energy crises in both the urban and rural settlements.

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