

## **ENERGY POVERTY AND SUSTAINABLE DEVELOPMENT IN ENERGY-POOR HOUSEHOLDS OF SOKOTO CITY, NIGERIA**

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### **ABSTRACT**

*The ongoing debate on removing subsidies is now a thing of the past. "Subsidy is gone" – and after a month and a half, it is. This review article looks into how previous energy policies and reforms have affected the lower-income population in Nigeria. Access to energy was found to be enhanced by making a particular energy source more affordable and available. A rise in the price of any fossil fuel would likely be good for the environment. Nevertheless, if its renewable counterparts were not made affordable, we are still undermining one of the major reasons why renewables are promoted – the SE4ALL initiative. We concluded that removing subsidies for petroleum products limits the use of cars and petrol generators, but it will also result in inflation, indirectly putting more people in poverty. As established by previous research, energy/income poverty is a stumbling block to sustainable development and GHG reduction.*

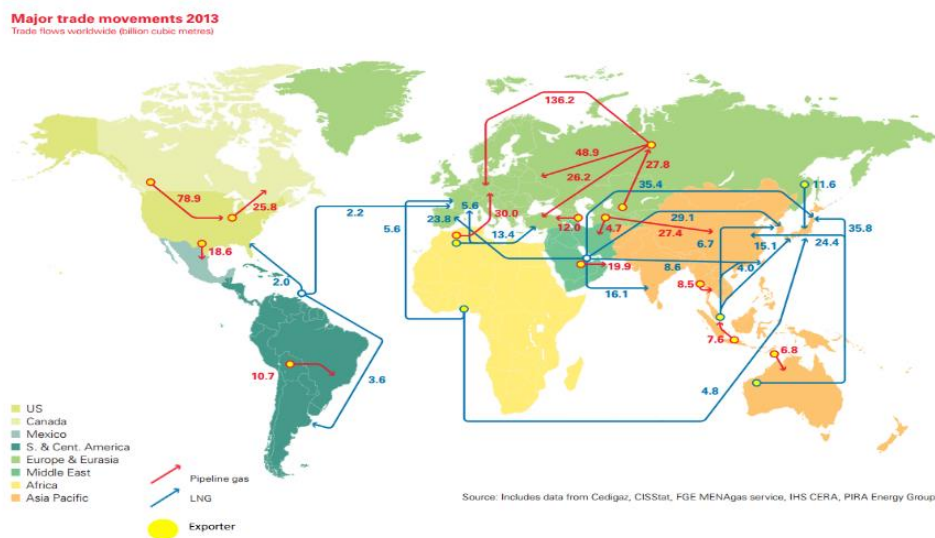
### **INTRODUCTION**

The correlation between energy poverty and sustainable development could be more balanced among researchers. Some believe that to achieve sustainable development, and a given geographical location must have sufficient purchasing power for energy. Others argue that increasing prices of violent energy sources (those harmful to the environment) may push people to use less violent sources of energy (gas and renewables) or at least make them use energy more efficiently, thereby reducing carbon emissions (Zhang & Zhao, 2014). The reality is somewhere in between, and as highlighted by (Zhang & Zhao, 2014) depends on time and geographical location. Energy policies and reforms have been pursued differently by societies on the basis of spatial and socioeconomic peculiarities. Nigeria's response manifests through different intervention strategies at different scales. A number of these strategies are aimed at promoting relatively less violent energy sources such as LPG and electricity.

However, even though some of the undermining factors to properly implement these policies are being taken care of by ensuring a constant supply of natural gas in the country, the other factor in income poverty is still a significant concern. For a policy to be effective in a given society, it must address its peculiar socioeconomic realities. Nigeria has a disparity regarding clean energy access, whether in the form of LPG or electricity (A. et al., 2021). Sokoto being the poorest state in the country, deserves particular attention. The gas industry – through its policies, especially the gas master plan of 2017 is proving to be effective in ensuring gas access within the country. Even with its cheaper rate compared to other African countries, electricity is still unreliable, inadequate, and expensive for an average Nigerian. Firewood, charcoal, and other violent cooking energy sources are still being used heavily in the city, not just because they are cheaper but because they are more available. The energy sector is the most important sector of the economy, but this is arguably the most inefficient in the world to

cater to its citizens. Even if well planned, their policies woefully fail in the implementation stage. One of the factors that are not given its share importance in policy planning is the socioeconomic reality of the society. This paper is going to look at the relationship between income poverty and GHG reduction in Sokoto City and assess the effectiveness of the intervention strategies employed by the Electricity and Gas industries.

The electricity industry and the gas industry operate independently (even though 80% of the generating capacity in Nigeria is gas-fired), which is considered sub-optimal by many (Chen et al., 2017), (Zhao et al., 2017) and (Portante et al., 2017). The gas policy of 2017 needed to be more effective to solve the gas supply crisis in the electricity sector.



*Figure 1: LNG major trade movements*

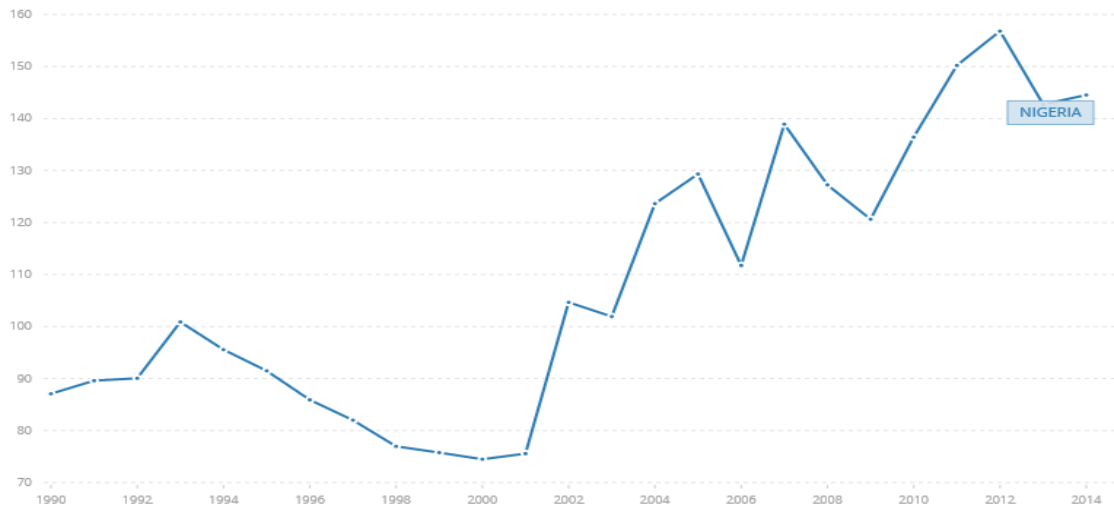
*Source: World Energy Outlook*

The gas industries would export to some parts of Asia and Europe, where the market is more favorable, with significant regulatory certainty and attractive gas prices.

### **Electricity Industry**

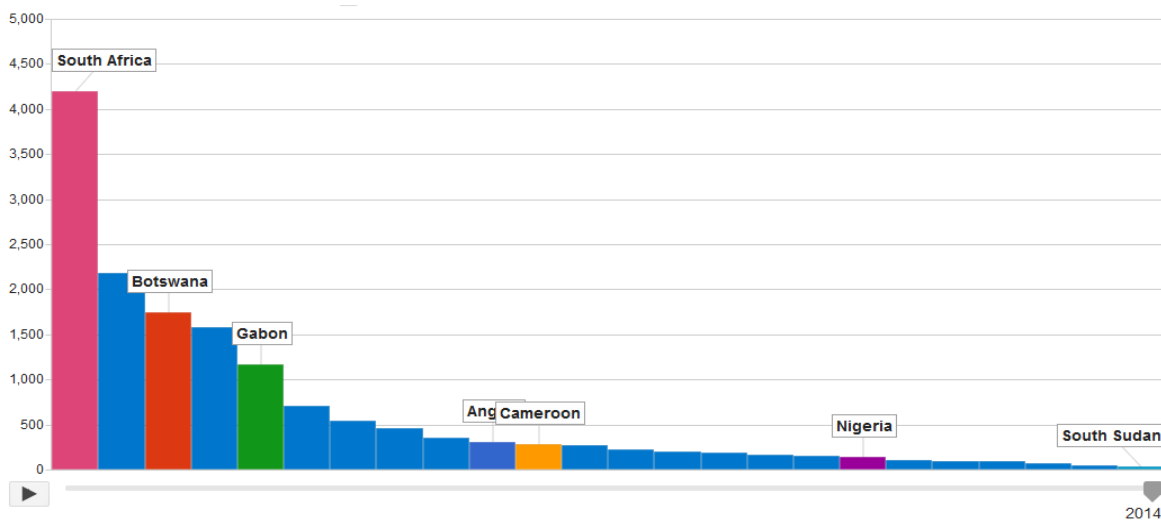
Nigeria's electricity industry is managed at the generation and transmission stage by the PHCN (Power Holding Company of Nigeria) and the Transmission Company of Nigeria (TCN), respectively. At the distribution stage (after the deregulation in 2005), it is partly owned/controlled by private entities (DisCos) (Makanjuola et al.).

Per-capita electricity consumption is low (144KWh in figure 4) in Nigeria compared to other African countries, half of that of Angola and Cameroon, which have 312KWh and 280KWh, respectively (figure 4). It is absurd how a gas-dependent electricity sector cannot adequately supply the nation despite Nigeria being a leader in gas production and export (figures 1 and 3).



*Figure 2: Per capita use of electricity in Nigeria*

Source: World Bank



*Figure 3: Electricity consumption per capita for Nigeria and other African countries*

Source: Google – World Development Indicators/World Bank

### **Pricing Policies in the Electrical Industry**

Two recent policies in the power industry are the Multi-year Tariff Order (MYTO 1&2) and the Feed-in Tariff (FIT).

#### *Multi-Year Tariff Order (MYTO)*

In the MYTO 1&2, NERC establishes the regulated prices payable to electricity generators (GenCos) in providing power to distribution companies (DisCos) for 2012-2017 pursuant to the authority given under section 76 of the electric power reform act 2005. The price tariff was meant to be reviewed bi-annually, while a central review will be carried out after five years. The tariff will be raised gradually to achieve cost reflectivity (NERC, 2015).

### *Feed-in Tariff (FiT)*

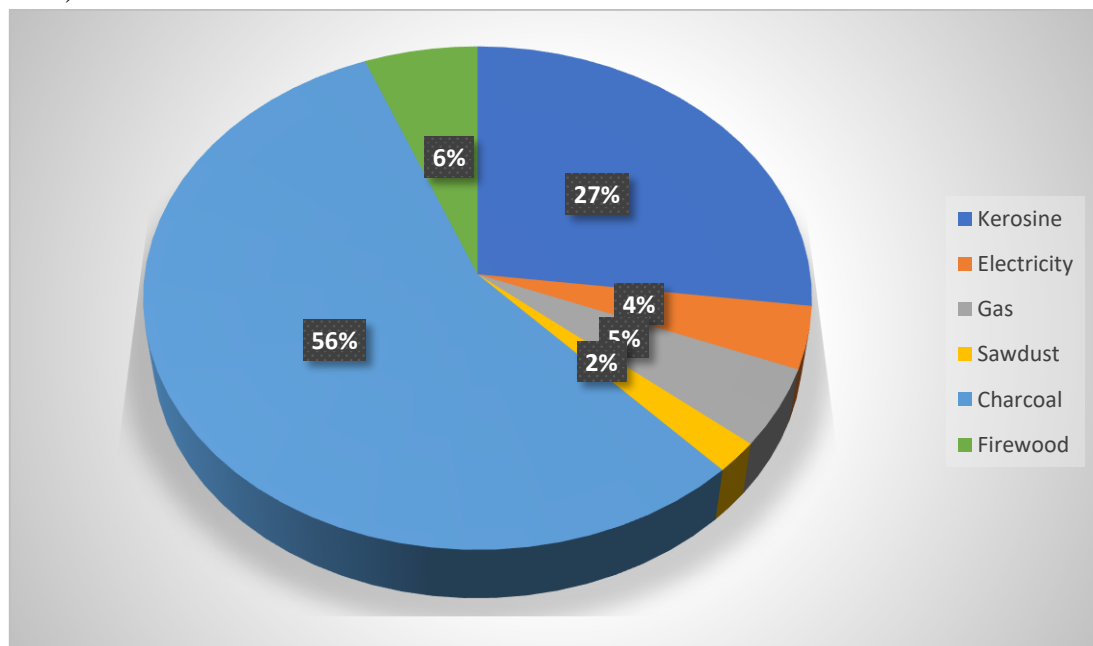
In order to empower its sustainable growth, The Federal Republic of Nigeria, in conjunction with NERC, set up the FIT in the MYTO-2 to compensate for the actual cost of electricity generation by providing investment security and market stability for investors in the renewable energy sourced electricity (NERC, 2015). The two policies were set to attract investors in integrating renewable energy generation, which is one of the targets set to achieve sustainable energy for all. The current electricity tariff stood at 59.68 per kilowatt hour.

### **ENERGY AND INCOME POVERTY IN SOKOTO METROPOLIS**

According to the National Bureau of Statistics, 90.5% are multidimensionally poor. This means that they could be more energy efficient even if they can cater to their immediate food needs. This estimate was before the increment in the electricity price and the subsidy removal. This means that out of 10 people in Sokoto, nine live under the national poverty line of 137,430 naira (\$240 at the time of writing this paper) per year. Nigeria has struggled to revive economic growth since the sharp decline in oil prices in 2014 and the subsequent slowdown of the economy. In Nigeria, high inflation continues, especially food inflation, disproportionately affecting people experiencing poverty since food constitutes almost 70 percent of their expenditure (Bank, 2019).

### **Energy Usage in Sokoto City**

Even in the early years of the MYTO, electricity is rarely utilized for heavy household usage (heating/cooling). The usage of kerosine is also low despite the massive amount of money being spent every year to subsidize it (Abdul-Kadir, 2016). Gas usage significantly improved from 5% in 2016 to 17% in 2020 because LPG was made more available and affordable (A. et al., 2021).



*Figure 4: Nigeria's household energy mix*

Source: (Abdul-Kadir, 2016)

According to (A. et al., 2021), electrical energy in Sokoto is unavailable as it is unaffordable. Therefore, to discuss energy poverty in the context of this city, one must investigate energy access in terms of availability as well as affordability.

### **Expenditure on electricity for the average household in Sokoto city**

From the work of (A. et al., 2021) and (Olaniyan et al., 2018), a two-bedroom flat is considered the average household in Sokoto City. Table 2 summarizes the appliances likely to be found in such a home, rating, and hours of operation under both BaU and Ideal scenarios. The monthly expenditure on electricity is then calculated using the end-use method.

*Table 1: Electricity usage for the average household in Sokoto*

Appliance	Quantity	Rating in Watt	Hours of operation		WattHour	
			BaU Scenario	Ideal Scenario	BaU	Ideal
Lamp	8	25	4	8	800	1600
Fan	4	85	6	10	2040	3400
Television	1	200	3	8	600	1600
Heating/Cooking	1	1200	1	1.5	1200	1800
Desktop computer	1	120	4	8	480	960
Iron	1	1000	1	1	1000	1000

$$E = \sum_i^n [R_i * Q_i * H_i]$$

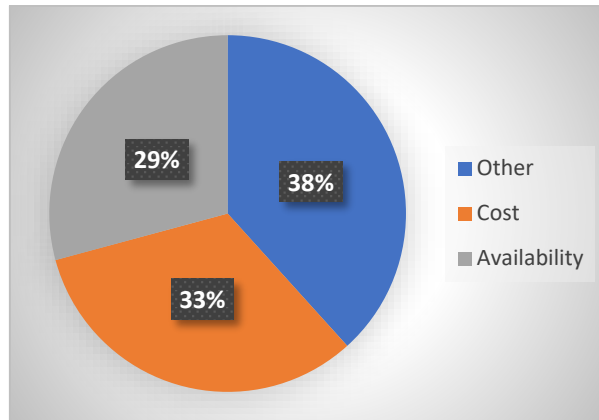
Where  $E$  is the daily energy consumption in Watt-hour, in Table 3, the daily and monthly total energy consumption is given in kWh, and the total monthly energy consumption in Naira is calculated by multiplying the kWh by the unit price of electricity (54.2 naira is the average among the respondents).

*Table 2: Total consumption in kWh and Naira Source: (A Bello & S Bello-Yusuf, 2021)*

	<b>BaU</b>	<b>Ideal</b>
<b>Total Watt-Hour</b>	6120	10360
<b>Daily consumption (KWH)</b>	6.12	10.36
<b>Monthly consumption (KWH)</b>	183.6	310.8
<b>Monthly consumption (N)</b>	<b>9951.12</b>	<b>16845.4</b>

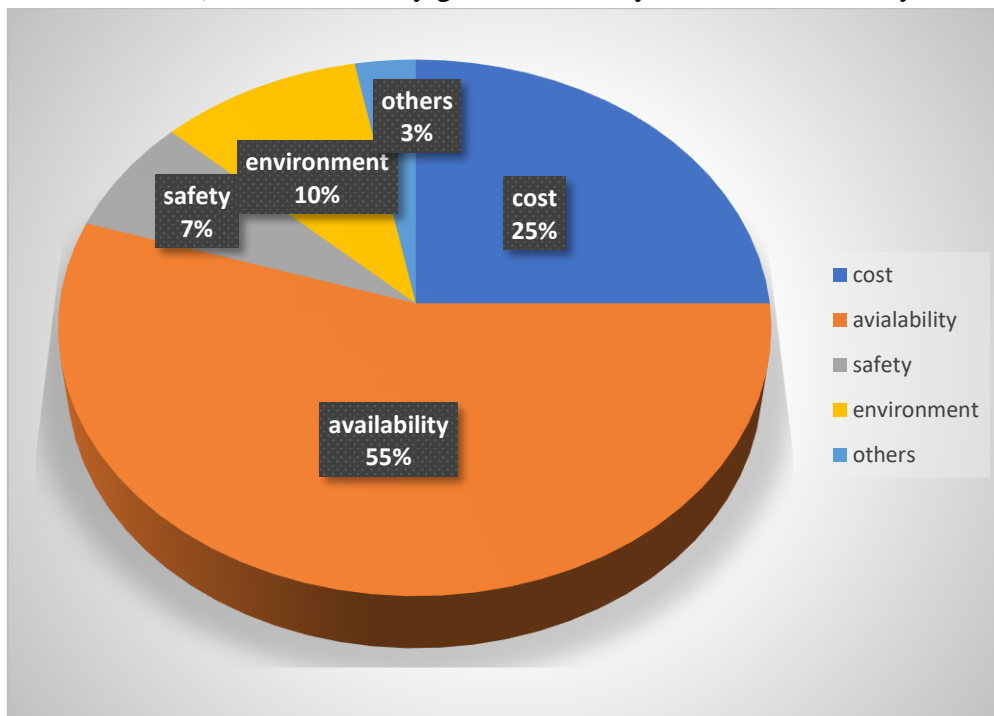
In research conducted by (A Bello & S Bello-Yusuf, 2021), none of the respondents was found to use electricity as their main household energy source. Their reasons for avoiding electricity are shown in Figure 8. For most respondents (38%), their reasons for avoiding

electricity need to be clarified. Nevertheless, according to (A Bello & S Bello-Yusuf, 2021), it results from limited supply and inadequate voltage quality when the supply is available. Thus, these people need to have an adequate supply of electricity to know whether it is affordable.



*Figure 5: Reasons for avoiding electricity*

To determine what informs the respondents' decision regarding their energy source of choice, they were asked, "What is the reason for choosing the energy source?". Even with a high poverty rate in the city, cost is not the major factor in deciding the main cooking energy source, as shown in Figure 9. The major deciding factor is availability which more than doubled that of cost. This indicates that if electricity is to be made available, more people will use it as their main energy source even though, relative to the income of the people, it is costly. The reason is that most people in the city need to be metered; they pay for their electricity using estimated billings. If they were to pay for their electricity accordingly (through a meter or proper load assessment), one would only go for electricity when it is necessary.



*Figure 6: Reason for choice of energy source. Source: (A Bello & S Bello-Yusuf, 2021)*



## CONCLUSION

As established by previous research, if not unmetered, electricity is not a sustainable energy source given the economic realities of the state, which have worsened in the last two years. By increasing the price of petrol and electricity, we might have found a way to push the masses to use renewable energy sources. The other effect of this rise in petrol and electricity is inflation, a continuous problem facing Nigerians. Proper policies should be implemented to improve the average Nigerian's well-being. Removing subsidies will surely phase out petrol generators which are harmful to the environment. However, if the policymakers were to subsidize renewable energy sources and their storage systems, the environment would be saved without compromising peoples' well-being. Nigerian electricity tariff is still one of the cheapest in the world, but relative to our economy, it is still costly. An increase in the price of petrol will result in fewer cars moving around in the city, thus cutting carbon emissions to a much lower level. However, it also negatively affects people's lives by reducing their purchasing power for other commodities, not just petrol. Even though it results in lower carbon emissions, an increase in fuel prices and electricity is detrimental to the SE4ALL initiative.

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