

# Determinants of Energy Consumption in Africa Oil Exporting Countries

## 1. Introduction

The need for countries in the world to achieve sustainable socioeconomic growth and development have been a major concern to energy economists and policymakers, most especially in Africa countries with oil exporting not an exception. The reasons behind this may not be unconnected with some important indicators that have a strong linkage with the developmental process of these economies aimed at eradicating poverty, improving growth and economic development. In this regard, studies have established that vital economic interventions such as provision of good health care, employment opportunities, education and access to constant energy supply must be given a priority in order to reduce poverty with the attendant effect on growth and development (Alam, 2006). Therefore, the role of energy in global settings as an important commodity in the course of output growth and development is extremely essential. Unlike other economic growth factors such as capital and labour, energy development is equally an important determinant of growth and development. Specifically, the development witness by high income countries of North America and Europe could be ascribed to the consumption of modern energy. For Africa oil exporting countries, inadequate access to constant and reliable energy services indisputably act as a burden to socioeconomic growth and development. This is due to an incessant power outage, insufficient supply of energy and the use of obsolete equipment (Khan and Ahmed, 2008 and Alter and Syed, 2011).

Nevertheless, the demand for energy remains to increase as a result of the degree of urbanization, economic structure, industrialization and expansion in the growth of these economies. This has broadened the supply-demand gap in the energy sectors of AOECs, which tied with high intermittency, despite huge energy resources endowed with such as oil, hydro, solar and coal. This suggests that energy consumption should drive economic growth and improve the quality of lives of their citizens, but this has not happened (Kebede *et al.*, 2010). Nevertheless, energy development means an improvement in the provision of energy not only in quantity (biomass) but likewise in quality (modern energy). This can be in the form of power, fuel and light since it is consumed by human being for their daily activities. The low energy consumption of AOECs comes into sharper focus when it is compared with the industrialized economies like USA, Germany and South Africa where coal supplies 75% of total fossil fuel consumption and 91% of electricity generation (NEPAD, 2003). This suggests that the structure of an economy matters for the composition of energy consumption and not the abundance of energy resources especially hydrocarbon. Therefore, the energy consumption design for the AOECs appears to be different from other countries that are not oil exporting countries, this is due to the fact that it is a vital contribution to any analysis of future energy usage and the effect of policy responses. Consequently, factors that affect energy consumption in these countries differ from other countries because they are producer and exporter of an important energy commodity (Bhattacharyya, 2011). According to Olumuyiwa (2008), all these factors that affect energy consumption have implications on energy consumption and economic growth. IEA (2016) call these factors energy

consumption shift-factors and that their identifications can affect both utilization and maximization of energy resources for growth purposes.

Abdel-Aal (2008) provide evidence of the need to have knowledge of current energy demand patterns and the factors influencing the energy consumption of an economy which will then serve as a vital advantage for planning and investment decisions such as distribution, storage, production and transportation. Various studies have been conducted to identify factors influencing energy consumption and how it affects the growth and development of an economy. For instance, a study by Kolawole (2017) shown that basic economic theory suggests that, the demand of a good or service is usually dependent on factors like the price of the good, the income of the buyers, the price of close substitute including other exogenous factors associated to the nature of the good. While Atakhanova and Howie (2007); Nasr et al. (2000); Narayan et al. (2007) opined that income of the consumer and energy price are factors influencing energy consumption. Anderson and Hsiao (1982); Narayan and Smyth (2007) concluded that prices of close substitutes like natural gas and solar are also an important factor determining energy consumption. Other major variables influencing energy consumption as suggested by Samuel et al. (2013), includes real GDP, population, foreign direct investment, industrial growth etc. Hence, findings from these studies are mixed and inconclusive. Therefore, it is quite pertinent to understand the factors that determine the energy consumption of AOECs in that regard and the reaction of citizens to such factors. Having enough understanding of these reactions to the economic factors would serve as an important component of making effective energy policy that will improve access to energy resources and contribute to the extant literature on factors influencing energy consumption in these economies. In view of the increase in energy consumption in the face of limited supply, the study seeks to identify factors influencing energy consumption both in short run and long run, in order to contribute to literature, since no study to the best of researcher's knowledge has been conducted in the context of a group of countries like AOECs.

The rest of this paper is organized as follows: section two reviews the relevant literature and theoretical issues, section three presents the methods used in the study. Results are presented and discussed in section four. Conclusions and policy recommendations aiming at resolving energy are discussed in section five.

### **Consumption Theory**

This study is guided by the neoclassical consumption theory of Varian (1992), that consumption is based on primary economic variables, influencing the demand for a commodity. According to him, consumption is linked to individual preference and other factors affecting demand. In addition to preference, other factors are the prices of commodity and income. Therefore, all these variables are incorporated into conventional energy demand models. Like other goods, energy is consumed primarily because of satisfaction (utility) derived from its service, like input for further production for industrialists and it uses to operate domestic appliances by the households. Therefore, an increase in income could positively impact on consumption of modern energy, including other relevant commodities. The reverse is the case when a consumer's income

falls. On the other hand, an increase in the price of energy consumed would cause a consumer to consume less, seeking for an alternative source. Nevertheless, an increase in the price of energy consumed would negatively affect the amount consumed (see Varian, 1992).

## **2. Literature Review**

There are numerous empirical works of literature on the determinants of energy consumption (Samuel *et al.*, 2013). Notwithstanding the importance of energy as an important resource for meaningful economic growth and development of any nation, coupled with the comfort of its residents, different scholars have made use of various case studies and factors. For instance;

Sarkodie and Adom (2018) used Nonlinear Iterative Partial Least Square (NIPALS) to examine the drivers of aggregate energy consumption in Kenya. The findings revealed that price, population density, urbanization and renewable energies from hydro sources played a vital role in promoting energy demand reductions. Conversely, climate change and higher income are likely to cause an increase in energy consumption. Nevertheless, growth in population rate increases the consumption of the alternative form of energy, this has a contrary outcome in the consumption of electricity which may be described as the replacement to other forms of energy in the existence of the fragile electrical system.

In the work of Azam *et al.*, (2015), they employed Ordinary Least Square (OLS) to explore the confirmation of the empirical impact of the factors that determine the energy consumption in Indonesia, Malaysia and Thailand between 1980 and 2012. The findings revealed that the inflow of foreign direct Investment, economic growth, trade openness, and human capital development index have a positive and statistically significant effect on energy consumption. In addition, urbanization exhibits a significant positive effect on energy consumption in Indonesia and Thailand, also growth in population rate reveals positive and statistically significant effects on energy consumption only in Malaysia.

In the same vein, Keho (2016) investigated drivers of energy consumption in twelve sub-Saharan Africa countries. Bounds test cointegration was employed to test the data set for individual countries over the period of 1970 to 2011. Findings from the study revealed evidence of cointegration with industrial output, imports, income, foreign direct investment, urbanization, population and domestic credit to the private sector. It was further established that the share of the industrial sector in GDP, urbanization, population and per capita income exhibited a long-run relationship with energy consumption. In conclusion, industrial output, economic growth and population were the major variables that have an influence on energy consumption in virtually all the countries.

Azlina *et al.*, (2013) carried an empirical work on factors driving energy demand in 16 developing countries using panel data analysis. Findings from the study suggested that price and income are crucial factors determining energy consumption in these economies. Furthermore, it was also revealed that economic structure and CO<sub>2</sub> have a significant positive impact on energy use.

Similarly, Kolawole *et al.*, (2017) investigated factors that drive energy demand in 16 sub-Saharan Africa countries between the period of 1980 to 2014 using panel cointegration technique. Their results also confirmed income and urbanization as major factors determining energy consumption.

Using ordinary least square, Dalei (2016) investigates what drives energy consumption in open economies namely: China, Japan and India using OLS regression. The findings of the study revealed that trade openness, GDP and carbon emission influence energy consumption in these economies.

In conclusion, findings from the empirical literature revealed that factors influencing energy consumption are still mixed and inconsistent among countries reviewed. These differences could be attributed to the country-specific characteristics, research methods and variables considered. It was also revealed from the literature that, there is a paucity of empirical studies investigating the factors influencing energy consumption in AOECs. Therefore, this study seeks to fill the gap, thus providing empirical evidence on relationships that might exist between energy consumption and its determinants in AOECs.