ENERGY CONSUMPTION AND ECONOMIC GROWTH IN NIGERIA

(1970-2019)

BY

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CERTIFICATION

This is to certify that this work was carried out by UNUEVHO RHODA with matriculation number 16020301004 at the department of Economics, Mountain Top University, Ogun State, Nigeria, under my supervision and is approved for its knowledge and literally presentation.

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DEDICATION

This Research is dedicated to God Almighty under whose protection banner and grace through his son Jesus Christ I sleep and wake who made it possible for me to complete my academic program.

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ABSTRACT

This research empirically examines the impact of energy consumption on economic growth in Nigeria for the study periods between 1970 to 2019 employing various techniques of econometric analysis, using macro-economic variables such as RGDP, CO_2, EC, EU, GDP.

Time series data were sourced from Central Bank of Nigeria Statistical Bulletin, world development index. Meanwhile, the study employs Autoregressive Distributed Lag Model (ARDL) as estimation methods.

The results revealed that energy consumption has a significant impact on domestic output in Nigeria while long run relationship is significant at 5per cent level of significance. It also revealed that gross fixed capital formation will negatively and significantly affect gross domestic although the studies of Alege and Ogundipe 2015 revealed that fossil fuel has significant positive impact on gross domestic product in Nigeria.

The study recommended that government should provide a friendly macro-economic indicator to boost the real economic growth and consider other macro-economic driver policies within the study period.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Nigeria is today considered one of Africa's biggest developed countries with heavily stockpiled natural resources, including future oil resources. Increased access to electricity in Nigeria, however, has proven not about being to an ongoing hindrance, but also an urgent problem for the international community (Odularu and Okonkwo, 2009).

For decades, Nigeria has been struggling with circumstances such as black-outs of electricity and omnipresent dependency on self-generated electricity to meet domestic demand and drive the required economic growth. Since 2000, however, recognition of improving the electricity sector as a pivot for economic growth in Nigeria has begun, but the growth in generation capacity is relatively slow (Bernard, (2015).

In most parts of Nigeria today, power outages have metamorphosed into total darkness, while many metropolitan cities and towns across the country barely enjoy three to four hours of uninterrupted power supply. According to experts, substantial economic growth is not supported by the decline in electricity consumption per capita in the face of multiple problems. Through National Integrated Power Projects (NIPPs) and Independent Power Producers (IPPs), through the birth of the Electricity Power Sector Reform Act (2005), bureaucracy and corruption have thwarted the enormous investment committed to make further recovery from existing plant capabilities and increasing generation by various governments (Koledoye et al, 2013). Adegbemi, Adejuwon, Babatunde and Odedairo (2013) are therefore able to ensure a fair allocation and effective utilization of the economy as part of sustainable growth and development in the pursuit of optimum development and efficient management of available energy resources. According to this claim, sufficient energy supply is thus essential to the radical transformation of the economy of the country. Energy in Nigeria serves as an apparent cornerstone of wealth generation by being the center of operations and the driver of growth for all the economy's industries. Energy performance (electricity and petroleum products) typically refers to the oil sector consolidate the activities of the other sectors which provide essential services to direct the production activities in agriculture, manufacturing, refining, company, etc. Nigeria has an abundance of energy resources, but is suffering from a perennial energy crisis that has defied a solutions. Nigeria is plagued by the co-

existence of immense natural resource resources and severe personal poverty known as the 'resource curse' or 'Dutch disease' (Auty, 1993). Masih&Masih, (1996) attributes energy demand growth to the pace of economic development; others claim that economic growth will be driven by a rise in energy consumption. There is therefore a lack of agreement on the relationship between energy consumption and economic growth among economic scholars.

Soytas & Sari (2006) argue that the lack of consensus on the reasonableness between energy and output might be due to the fact that different economies have different energy consumption pattern and various sources of energy; consequently, different sources might have varying impacts on the economy. This argument provides the spring board for our approach in this study.

Mustapha and Fagge (2015) Nigeria's Energy Nigeria profile is fortunate to have vast energy resources that could potentially give the country enough opportunity to transform its economy and the lives of its people. Nigeria is home to more than 35 billion barrels of oil, 187 trillion cubic feet of gas, 4 billion metric tons of coal and lignite, as well as vast reserves of tar sands, hydropower and solar radiation, among others, (Adenikinju, 2008).

Nigeria has not paid equal attention to its plentiful supplies of oil. She based her energies on producing, extracting and using crude oil and gas for fiscal purposes. As of the end of 2011, Nigeria's crude reserves are valued at 37.2 billion barrels of proved oil. Most reserves are situated in the Gulf of Guinea, benin, and the Bay of Bonny, in the Niger River Delta of the nation and offshore. Current exploration activities, some operations are mainly focused on the deep and ultra-deep offshore in the Chad Basin, located in the northeast of the country. For the next two years, the government plans to lift proven oil reserves to 40 billion barrels. According to Mustapha and Fagge (2015), With a combined installed capacity of 445,000 barrels a day, Nigeria has four refineries. Capacity utilization, however is poor. Consequently, the annual demand of petroleum products, which according to government estimates amounted to 34 million litres per day is not entirely covered by domestic production and must be supplemented by imports.

Natural Gas Nigeria's proven reserves of natural gas, estimated at approximately 187 trillion standard cubic feet, are known to be significantly larger than its oil resources in terms of energy. In Nigeria, gas discoveries are incidental to the activities of oil investment and production. More than 50 percent of the gas generated (primarily associated gas) was flared as of 2001. In view of the

increasing domestic oil consumption, an economically optimal strategy to replace oil with gas and gas derivatives will enhance the availability of more oil for export. This will also promote the conservation of the oil reserves.

Since gas is a safer fuel than gasoline, the economic benefit of fuel replacement from oil to gas is more environmentally friendly. Given the current reserves and extraction rate, the estimated life span of Nigerian crude oil is approximately 44 years, based on output of approximately 2mb/d, while that of natural gas is approximately 88 years, based on the production rate of 1850 bscf in 2001. In order to plan adequately for gas as a replacement for oil for both domestic needs and foreign exchange earnings, it is therefore strategically necessary to make significant investments in the gas sector. Coal Recent technological and economic studies have established coal energy as a cost-effective option for power generation; it comes at a cost of about 20% of fuel oil and the gap will continue to expand with the crude oil prices moving to US$100 per barrel. In addition, coal is an abundant domestic resource with over two billion tons of reserves in Nigeria that can sustain the mining and energy industries and provide multiple jobs with potentially strong multiplier effects on local economy. Current technologies allow coal, which t.akes care of its negative environmental impact, to be cleanly burned; indeed, over 50 per cent of the US electricity supply comes from coal resources. Nwasike (2012) Nigerian coal can be used as a heat source and depleting agent for steel production; as a domestic fuel; and as feedstock for the manufacture of chemicals, liquid fuels, gaseous fuels, batteries, carbon electrodes, etc. Through the construction of a vibrant industry, these coal capacity needs to be effectively exploited into the country's energy supply system and export commodity mix. Coal an energy alternative source that could be used with oil and gas to give the nation the desired mix that will ensure a reliable, affordable and environmentally friendly energy medium.

1.2 Statement of the Problem

Energy consumption statistics today in the world suggest that the lowest consumption rates are in Nigeria and indeed in African countries. Nevertheless, due to the increasingly rising demand that is characteristic of a developing economy, Nigeria suffers from an insufficient supply of available energy. The nation is, paradoxically, theoretically equipped with renewable energy options. Nigeria is rich in traditional sources of energy, including oil, domestic gas, lignite and coal. It is also well-off with renewable energy sources such as biomass, solar, hydro, and wind. Nigeria's per capita energy intake is very small-about one-sixth of the energy consumed in developing

countries. This is directly related to the level of poverty in the region. Nigeria's energy needs are on the rise, and its rising population is not properly tackled in the energy growth programme. The root of Nigeria's oil crisis can be characterized by two main variables. The first concerns the persistent serious deficiencies of the demand for petroleum goods, the most popular of which are kerosene and diesel. Nigeria has five government-owned domestic refineries are capable of refining 450,000 barrels of oil a day but imports account for more than 75% of the market for petroleum products. Indicators such as power blackouts, brownouts, and widespread dependency on self-generated electricity exemplify the second dimension of the Nigerian energy crisis. This growth has arisen amid Nigeria's plentiful energy resources. The trends of energy usage in Nigeria's economy can be split into manufacturing, transportation, industrial, agricultural, and household industries, energy use patterns can be divided into manufacturing, transport, commercial, agricultural, and household sectors. The household sector accounts for the largest share of energy consumption in the country - around 65 percent of energy consumption. In all the other sectors, this is mainly due to the low level of growth. Since the advent of the industrial sector, the use of energy by nations has increased dramatically. Energy is of vital importance to countries because it is a crucial contributor to achieving economic, social and industrial growth and to raising the level of welfare. In Nigeria's economy, the patterns of energy usage can be divided into manufacturing, transportation, commercial, agricultural, and household sectors. The household sector accounts for the country's largest share of energy consumption - around 65 percent. This is partly due to the poor growth rate in other industries. Low energy production and supply in Nigeria has been insufficient to meet the level needed to improve productivity in non-household sectors. There is also the issue of growing population with these mentioned problems facing energy consumption in Nigeria, which triggers the per capita reduction of Nigeria's electricity.

Moreover, considering the huge domestic endowments of non-renewable and renewable primary energy resources, the issue of energy in Nigeria is the persistent lack of quantity, low quality and limited access to energy (Iwayemi 2008).

1.3 Research Questions

The following questions will direct the course of this study;

1. What is the impact of economic growth on energy consumption?
2. Examine the impact of energy consumption on economic growth?
3. Does energy consumption cause economic growth or does economic growth cause energy consumption?

1.4 Objectives of the Study

The main objective of this study is to investigate the relationship between energy consumption and economic growth within spanning between 1970 and 2019 in Nigeria. The specific objectives of this study include;

1. Examine the impact of economic growth on energy consumption;
2. To investigate the impact of energy consumption on economic growth; and
3. Investigate the causal relationship between energy consumption and economic growth.

1.5 Significance of the Study

Ever since independence, Nigeria has failed to provide electricity to its large population. According to the Nigerian Electric Power Authority (NEPA), the Niger Dam has a gross output potential of 5900 MW of electricity per day which is way below the total national demand rate of 10,000 MW per day. Over the years, this has caused the NEPA to ration energy supplies. The inability to meet domestic and, to a large extent, industrial electricity needs is stated to have had a weakening effect on the Nigerian economy's growth potential (World Bank, 1991).

Nevertheless, according to Bernard (2015), electricity demand is expected to rise from 5746 MW in 2005 to almost 297,900 MW by the end of 2030, according to NEPA. This implies that to match this estimate, the NEPA needs to add approximately 11,686 MW of electricity to its stock per year. Over the period from 1971 to 2011, electric power generation and Nigeria electric power followed the same trend. With the exception of certain exceptional cases, Nigeria has witnessed a rapid rise in electric power consumption. Low energy production in Iwayemi (2008) has weakened the process of industrialization and weakened struggles to achieve sustainable economic growth, to increase domestic industry competitiveness in the domestic, and national markets, and to generate jobs. The current concern about global warming also raises the issue of how to balance economic development in Nigeria with stability in the use of both conventional and fossil fuels.

It is however, necessary for all such policymaking to determine the causal relationship between energy use and general economic activity. Although the causal correlation between energy consumption and economic development has been thoroughly explored, no consensus on this so-called nexus between energy consumption and growth has yet been reached.

The research examines the causality of GDP and each of the fundamental subcomponents of energy use, consumption of gasoline, consumption of electricity, and natural gas consumption, in Nigeria. However the study aims to find answers to Nigeria's level of energy production; what is the level of Nigeria's energy consumption; what is the relationship between Nigeria's energy consumption and economic growth; and what are the problems associated with Nigeria's energy consumption and economic growth?

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1.6 Scope of the Study

The scope of this study span between the period of 1970-2019. The 49 years periods of study. The study alternative begins with the time when Nigeria entered OPEC or switched from the agricultural sector to the energy sector.

1.7 Plan of the Study

This research is structured into five parts. Chapter one is an introduction to the work that includes the study context, research issue declaration, research questions, study aims, and importance, scope, and limitation of the study. An overview of energy consumption and economic growth in Nigeria and a literature review are given in chapter two. Chapter three focuses on the methodological approach, model specification, estimation techniques and descriptive variables. Presentation of analysis, discussion of findings, comparison of results are explained in chapter four, the research is concluded in chapter five

CHAPTER TWO

LITERATURE REVIEW

The literature review examines the concepts and terminologies that will guide the understanding of the impact of energy consumption on economic growth and also reviewed related literature under the following subheadings- theoretical review, empirical review and appraisal of literature.

2.1 Conceptual Review

This section delineates the concepts that relate environmental quality, energy consumption and economic growth and these concepts include; pollution, industrial activity, population, health sector and economic growth considering how they relate with Nigeria.

2.1.1 Environmental Quality

It is possible to conceptualize environmental quality as the natural features and properties of an environment. It tests the state of the atmosphere in relation to the required environmental requirements of the inhabitants. The ecosystem is the life support system of nature, according to Eneh (2017), and it is composed of soil, water and air systems. The environment in its natural state consists of numerous elements that are of importance to the life of health, but the introduction of foreign or unpalatable matter will alter the environmental quality and may result in environmental degradation. The natural and artificial environment is characterized by environmental quality and includes air, emissions, noise, purity of water and the probable impact and defects that these environmental characteristics can cause on mental and physical health. Man engages in certain practices that intentionally or unknowingly harm the nature of the atmosphere in order to satisfy the needs of his life. There is a wide spectrum of human-related activities, according to Arora et.al (2018), which have contributed to environmental issues, including land destruction, global warming, loss of biodiversity and contamination of the atmosphere. These problems however, results into poor environment quality, which can be conceptualized in terms of presence of sickness and a shorten lifespan which are health implications of degraded environmental quality.

2.1.2 Environmental Quality and Economic Growth

The quality of an environment has a lot to contribute to the extent of growth an economy can achieve especially over a period of time. The quality of the environment is however, tampered with and the state of wellbeing may be affected. As posited by Clayton and Radcliffe (2018), “economic growth is hardly possible without significant deterioration in the quality of the environment as this

is a major issue encountered when assessing the relation between economic growth and environmental quality". Economic growth is a core macroeconomic objective of an economy and it establishes the extent of wealth of an economy. Economic growth however necessitates a lot of economic activities which are industrial and agricultural. The issue of environment quality and the growth in the economy is established in terms of the kinds of pressure likely to emanate at the national and international level due to economic activities of household, business units and the government at large.

As suggested by Deng, Li and Gibson (2016), "the ecology and the economy has a significant relationship that is strengthened as humans gradually take note of the impact of little economic decisions on the sustainability of the quality of the environment". Economy growth is defined in terms of increase in total or average output and usually measured in terms of real incomes per capita of the people which in no time depletes because of the defects brought about by the increase in output. Economic growth is accompanied by transformation of the environment which affects the quality of the environment in different ways. A quality environment that has not lost its natural value will likely cause an increase in economic growth because at its naturally good state, the environment is more productive and will yield more agricultural output and in the other way, the humans that inhabit the environment will maintain good health status and will be able to produce more from the use of the natural resources.

Another implication of the relationship between the quality of the environment and productivity is that economic development will exacerbate the environmental quality, but as the economy develops, they begin to shift in a direct relationship. This implies that at the early stage of economic activities, much is taken from the environment and The importance of natural resources deplete significantly, but this depletion is not sustained if the economic activities are properly controlled by the government by taking out of the returns from the economic growth and spending on the environment to renew its values.

When the environment is exploited aggressively with no check or control by policy makers, there are cases of water and air pollution , encroachment and deforestation where there will be little or no incentive for an individual to invest in maintaining the quality of the environment. These problems can only be mitigated and controlled when countries deliberately set up long-sight policies to ensure that additional resources are devoted to dealing with the problems that arises from the utilization of the environmental resources. As posited by Barrett and Therivel (2019), the environmental quality may also decrease when the economy experiences growth in its economic activities and this is

evident in the inability to preserve the environment vitality of the country. Emissions are generated by the disposal of municipal solid waste and government ensuring abatement is relatively expensive and the costs associated with the emissions and wastes are not perceived as high because they are often borne by someone else. This results in externality usually negative with health implications on the economic agents that bear the consequences. This will definitely lead to a constraint in productivity and the economic output of the economy is most likely to fall aggressively.

2.1.3 Health Status

The health status of a society is not a popular term and normally regarded as a health jargon in most health concepts. According to Corin (2017), this concept has eluded common use due to the lack of an agreed definition. The World Health Organization (WHO) in 1948 made attempt to operationalize the definition of health which is considered very imperative for the health status or health level of a person to be assessed. The shift in emphasis from of medical and health care from mortality issues to health-related quality of life issues have made arriving at an operational definition of health difficult. The length of a person's life is considered an ultimate measure of health status because terminal diseases are concerns of an individual's health status. As revealed by Bergne & Rothman (1987), a research into the measurement of health status provides a review of the state of the art of this field. It proposes that health status measures are developed well and widely tested so as to be employed in evaluating the health of populations and implications of clinical interventions and medical care delivery.

The assessment of health status could be considered as been concerned about several issues which include the examination of the health of the entire population, the assessment of clinical interventions and their effect on the populace, investigation of changes in health care delivery system and activities that health promotion activities are examined. Health status measures are separated into two groups: one which includes measures designed to evaluate the status of health across a variety of populace, and the other that contains measures designed to investigate the health status of a particular patient population with specific type of disease or health condition (Bergne & Rothman, 1987). These two types of health measures have been termed the assessment measures of health status. Indeed, it is inappropriate to classify them with the more general measures of functional health status, mental health status, longevity, wellbeing, social health, because of their very specific interest in a very specific disease, even though some of their elements may be derived from or be similar to the generic health assessment measures.

2.1.4 Health Status and Economic Growth

Toa significant extent, a consensus has been met as to the impact of economic growth on health, but this causation has been somewhat bias, as little has been revealed as to how the health status of a country affects the economy of that country in terms of growth and development. According to Abel (2016), economic growth will lead to increased food availability, improved earnings which will raise standard of living and make health care more affordable and cause a rightward shift of the demand for health services. Investment in health infrastructure by the government may also increase since economic growth means increased revenue and surplus for expenditure. This causality is however, reversal although the significance may be more difficult to measure or its impact. The argument is now that which of this variable has more impact on the other, a resolution of which requires empirical assessment and research for putting in place growth-enhancing policy reforms. It has been observed that enhanced health status of the population is growth enhancing and that economic growth lowers infant mortality and spurs the necessity.

Two approaches are employed when evaluating the effect of health on economic growth (Arndt, Jones &Tarp, 2015). "Firstly, estimates of the effect of health from microeconomic studies are taken and used these to calibrate the size of the effects at the aggregate level. The second is to obtain the relationship in aggregate by using macroeconomic data directly. Investigating the causal link between health and economic growth at both the individual and national level, has generally assessed two aspects of health measures: health outcomes and input into health. Health outcomes are characteristics that are determined both by an individual's health inputs and by his genetic endowment". Examples include life expectancy, height, the ability to work hard, and cognitive functioning. There are two critical issues relating to human capita the extent of education and level of health (Weil, 2007). "Health inputs are those physical factors that have influence on health which include nutrition, recommendable exposure to pathogens, and the availability of medical facilities".

2.1.5 Energy Consumption and Health Status

The living condition of the people which is popular measure health status is to a large extent determined by the quality of the environment which includes the composition of its atmosphere, the extent of deforestation and availability of wildlife and how much the biosphere has been depleted as a result of economic activities. As noted by Tietenberg, and Lewis, L. (2016), environmental Pollution is an international epidemic that affects every part of the world as the impact of economic activities in terms of pollution has health consequences even on organisms that live very deep in the sea. Various environmental pollutants have surfaced over the due to the numerous anthropogenic

activities that have adverse effects on the ecosystem and people's health status. As posited by Landrigan et al. (2019), health and living conditions in underdeveloped nations are more debilitating due to aggressive and rampant industrialization, high deforestation and urbanization tasks that deteriorate the ecosystems.

Approximately 92% of pollution- related deaths are reported from the developing countries the increasing environmental menaces encountered by countries are most times in line with the increasing human economic activities. The scenario of quality environment, land availability and biodiversity has been deteriorating continuously with predictions of even more terminal conditions by 2050 (Arora et. al, 2018). It is important to include the biological and ecological aspects to achieve the objectives of environmental sustainability, which have been non-promising lacking so far. An integrated approach is imperative at a continuous basis to curate the earth of anthropogenic issues. As posited by Williamson (2016), biological approaches have been considered front runners and are to be utilized at maximum to obtain the targets of environmental sustainability. In this review, major environmental issues are discussed in the first half of article, followed by the solutions involving biological approaches so as to achieve environmental sustainability, which have been explored and projected.

Aforementioned environment issues raised debates about the corrective measures that have to be taken so as to prevent further deterioration of environment. Though scientists and environmentalists have documented the magnitude and significance of these environmental problems since decades, little success has been achieved so far in achieving the targets. Apart from this, sustainable solutions of environmental problems are more often overlooked and instead of this, technical approaches are used. Hence, for creating a sustainable environment a corrective plan must be implemented which encompasses biological solutions or greener approaches. This section discusses sustainable solutions, mainly biological approaches, to tackle the various problems caused by anthropogenic activities.

2.2 Theoretical Review

Recent discussions on the gateway between energy consumption, environmental quality and economic development are predicated on the following theories which include; environment Kuznet hypothesis, clean growth theory, low-carbon economy model, bright green environmentalism, human capital theory, modernization theory, dependence theory and other economic growth theories.

2.2.1 Environmental Kuznet Hypothesis

The environment-economic growth relationship was defined by the environment Kuznet curve which was developed by Simon Kuznets in the 1950s and 1960s and the model proposed that in the course of industrialization, especially in the mechanization of agriculture, the center of the economy shifts to the cities and the existing farmers will tend to seek a better-paying job in urban cities which will result into a significant rural-urban inequality gap which will further cause the rural population to decrease as urban population increases. Kuznet opined that "inequality would most likely follow an inverted "U" shape as it rises and the falls again with the increase of income per capita". According to Tiba, and Omri (2017), "the EKC hypothesis postulates that the interrelationship between environment and economic development is analogous to a U-curve since as output level rises, environmental pollution level is assumed to increase i.e., a positive correlation is assumed to exist between economic development and environmental pollution level, while this relationship will cause the increase in productivity to decline since environmental pollution is expected to have a negative impact on the human capital of a nation". Arouri, Youssef and M'henni (2012), investigated the (EKC) hypothesis for Middle East and North African countries over the period and the result of the study. The A estimate of the income ratio going to the highest-earning household and the share of income going to the lowest-earning household. As it delineates the different indices of environmental deterioration, the EKC explains the relationship between environmental sustainability and economic progress and demonstrates that the environmental condition continues to deteriorate as modern economic growth happens before average revenue approaches a certain point in the course of development. The hypothesis however, suggests that the eventual solution to the environmental problem in the form of pollution caused by economic growth is still economic growth.

There remains a strong debate on the EKC However there is important evidence to commemorate the use of the environmental Kuznets curve for different indices of environmental quality, such as air and water emissions, showing the inverted U-shaped curve as per capita income and/or GDP increase. Another major concept usually treated by the EKC is deforestation which the model has argued it is more serious in poorer nations and may aggravate the environmental situation of a nation.

2.2.2 Bright Green Environmentalism

The environmentalism ideology is based on the convergence of technology change and innovation provides the most successful path of sustainable development. The concept bright green was coined

by Alex Steffen in 2003 and this is referred to as" fast-growing new wing of environmentalism which is distinct from traditional forms". The theory of the model of bright-green environmentalism seeks to provide economic growth through the use of emerging technology and built architecture in an ecologically sustainable way. In recent academic works, the hypothesis has been widely used because of the promulgation of its theories in traditional media by recent representation and the internet. The bright green environmentalism places emphasis on design, technological innovation, consumption practices and economic activities that wouldn't degrade the environment and still result in increased output level. As posited by Abdullah, Azam and Zakariya (2016), the ideology stands in contrast with the orthodox anti-modernist and anti-industrial underpinnings of environmentalism. The Bright green environmentalism proposes that economic development and growth which can be conceptualized as economic prosperity are not antithetical to environmental sustainability, that is, it is possible for the economic output of an economy to increase and the environment will not be degraded nor lose its quality. The ideology emphasizes proper consumption practices along with well-designed consumable products that can generate sustainable economic practices and positively affect economic prosperity.

Alex Steffen, the proponent of the bright green environmentalism splits the contemporary environmentalists into three group which includes dark, light, and bright greens. He explained that the light green environmentalists see as a personal responsibility the protection and preservation of the environment. On the transformative radical end of the continuum, the moderate green environmentalists are placed, but these light greens do not pursue substantive political change nor consider environmentalism as a different political philosophy. In the other hand, the Dark Greens environmentalists claim that environmental issues are an intrinsic aspect of capitalist society and emphasize dramatic political action, believing that if a decisive approach would not take the result of environmental destruction, it will be increasingly destructive and could lead to the disappearance of living beings. The dark greens were of the opinion that the dominant political ideologies also called, Industrialism ultimately leads to consumerism, economic waste, overconsumption and natural resource depletion. These environmentalists claimed that these adverse environmental outcomes are caused by the over-emphasis on economic growth and neglect of the effect of economic activities on the quality of the environment.

Bright green environmentalism is more about the instruments, models, and solutions that now exist to solve environmental issues than the environmental obstacles and restrictions. For the energizing faith of positive ideas, it forgoes the bleakness of opposition and dissent.

2.2.3 Health Believe Model

The Health Believe Model originated from the cognitive theory of Lewin who conceptualized the life space in which an individual live as composed of societies which have negative valence in some cases and positive in some cases while in a rather rare case may have neutral valence. Illnesses are conceptualized as the regions of negative valence which exerts a force that moves people away from the regions to other regions with less severe health hazards. The model establishes the behaviour of an individual in an attempt to avoid disease and gains appropriateness as a model for disease preventing behaviour of an individual although it has been criticized as being inappropriate as a model for health-promoting behaviour The model has been used in recent years to forecast general health habits and good health behaviors, while it was intended to predict acts of acutely or chronically sick clients when it was first proposed. A health-related intervention is viewed as more likely in the Health Belief Paradigm when the action is seen as both cost-effective in terms of consequences.

2.2.4 The Tannahill Intervention- Based Model

This model was formulated by Andrew Tannahill in the 1980s to" illustrate the linkages between health education, health protection and disease prevention." Three intersecting sets of circles were employed by the model to illustrate the interrelationship that exists between health education, health protection and prevention. According to Nutbeam (2000), "health education has been designed to improve the knowledge, beliefs, behaviour and understanding of the populace in a way that will improve the health status of the people". Disease prevention on the other hand, will be devised to mitigate risk factors and control the consequences or spread of disease. Health protection however establishes that fiscal or legal control and the voluntary code of practices that are implemented to prevent ill health and enhance the health status of the populace in totality.

The tannahill model has been criticized as being clearly within the reductionist, medical model in that it pays insufficient attention to community – based factors. In response to these critiques, Tannahill (2009) proposed a new definition of health promotion as the sustainable fostering of positive health and prevention of ill - health through policies, strategies, and activities in the overlapping action area of social, economic, physical environmental and cultural factor equity and diversity education and learning services, amenities and products community-led and community-based activity.

2.2.5 Modernization Theory

The modernization theory focuses on how education changes the meaning, conviction and behavior of a person. Western ideals and behaviors are inculcated by proximity to modernizing institutions such as schools, industries and mass media. Openness of new thoughts, freedom from established authority, ability to prepare and measure additional criteria and an increasing sense of personal and social effectiveness are part of this mindset. These normative and attitudinal shifts persist over the life cycle, according to modernization theories, permanently altering the connection of the person with the social system. The higher the number of persons subjected to the institutions of modernization, the greater the degree of human modernity reached by society. Once a crucial section of a populace adjustments on this manner the tempo of society's modernization and financial improvement quickens. Thus, instructional enlargement thru its outcomes on person values and advantages units in movement the vital constructing blocks for a greater effective body of workers and a extra sustained financial growth.

2.3 Empirical Review

A wide gamut of research works has been directed towards examining the energy consumption and environmental quality in different parts of the world. Different methodologies have been adopted which brought about varying outcome, and various regression models have also been specified to illustrate the relationship between them. Some different research delineated the causal dating among environmental quality in general represented via way of means of the CO2 emission from financial activities, get right of entry to easy gas and the winning fitness reputation of the population of a rustic represented through lifestyles expectancy of the citizens. Apergis and Payne (2009), used a panel co integration and panel causality checks in investigating a few organization of nations in South America and determined that power use had a high quality and a statistically great effect on emissions at the same time as, power intake and monetary increase purpose emissions with inside the quick-run, however with inside the long-run, there has been proof of a remarks among electricity intake and emissions, however no comments among actual output and pollutant emissions. This observe extends the current paintings of Ang (2007) which tested the causal courting among carbon dioxide emissions, electricity intake, and output inside a panel vector blunders correction version for 6 Central American nations over the duration 1971-2004. In long-run equilibrium power intake has a fantastic and statistically considerable effect on emissions even as actual output reveals the inverted U-form sample related to the Environmental Kuznets Curve

(EKC) hypothesis. The brief-run dynamics imply unidirectional causality from strength intake and actual output, respectively, to emissions at the side of bidirectional causality among power intake and actual output. In the long-run there seems to be bidirectional causality among power intake and emissions. Abdullah, Azam, and Zakariya (2016) inquired into how electricity intake affects environmental first-rate on nation's boom and the evaluation hired annual time collection information on Health Expenditure (HE), Gross Domestic Product (GDP), Carbon Dioxide (CO2), Nitrogen Dioxide (NO2) and Sulphur Dioxide (SO2) emission in metric tonnes consistent with capita, Fertility Rate (FR) and Mortality Rate (MR) little one in step with 1,000 stay births. The ARDL technique become hired so one can discover the opportunity of estimating each quick and longer term affects of environmental high-satisfactory. The observe discovered that GDP, CO2, MR, FR, NO2 and SO2 can be dealt with as having a dating with fitness expenditure ultimately in Malaysia. SO2, fertility and little one mortality price confirmed a full-size aspect with inside the country's fitness expenses have an effect on substantially.

The new generation is an important element in ensuring the continuance and sustainability of country wide improvement with inside the future. Omojolaibi (2010) explored the connection among environmental first-class stricken by power use and financial boom, wherein carbon emission turned into hired because the proxy for environmental high-satisfactory at the same time as gross home product turned into used to degree financial boom. The environmental kuznet curve (EKC) speculation become followed because the theoretical framework of the look at and the character of statistics hired changed into panel which covers three international locations which consist of Nigeria, Ghana and Sierra Leone over the duration of 1970-2006. The records sourced for this take a look at have been analysed the use of each the pooled normal least rectangular and the constant results method. The look at discovered that the profits consistent with capita is definitely associated with carbon emission and the squared the profits according to capita changed into discovered to be negatively associated with carbon emission. The look at concluded with the aid of using suggesting that the nations explored have to enact rules so that it will make sure performance in electricity use which in a manner lessen carbon emission for you to enhance transport performance, sell opportunity power re-assets and keep away from useless wastage Jerretet al.(2003) investigated the how electricity intake (proxied with the aid of using overall pollutants emissions and authorities costs dedicated in the direction of protecting environmental fine) relate with fitness care expenses. The look at followed cross-sectional statistics from forty nine nations of Ontario, Canada for empirical evaluation. The statistics had been defined statistically and their

ranges of stationarity had been additionally mounted the usage of the Augmented Dickey Fuller Unit root check. The end result of the empirical check found out that international locations with better pollutants stage have better consistent with capita fitness costs and nations that spend extra on protecting environmental exceptional have decrease fees on fitness care. This is without problems interpretable for the reason that excessive degree of pollutants will adversely have an effect on environmental fine that is probably to negatively have an effect on the fitness reputation of the residents of the international locations and necessitate better fitness expenditure with inside the nations. Narayan, Narayan, and Prasad (2008), investigated the implication of environmental great with inside the willpower of in keeping with capita fitness costs and the observe used a panel co integration method that allows you to discover the opportunity of estimating each quick and longer term affects of environmental fine. The co-integration check executed changed into to have a look at if there exists a long term dating the various variables with inside the version at a five percentage stage of importance and the end result of the co-integration check will suggest if the estimation take a look at may be regular least rectangular approach or a extra absolutely changed technique that avoids endogeniety problem. The empirical evaluation is primarily based totally on 8 OECD international locations, specifically Austria, Denmark, Iceland, Ireland, Norway, Spain, Switzerland and the United Kingdom for the duration 1980-1999. They observed that according to capita fitness expenditure, in step with capita profits, carbon monoxide emissions are co-integrated. Adusanya et al. (2014), adopts the ARDL Bounds checking out method to research the consequences of environmental first-class (proxy through CO2 emissions) on healthcare spending with inside the lengthy and brief run periods, discovered that CO2 emission in metric tonnes in keeping with capita have high-quality effect on fitness spending in Nigeria, implying that because the surroundings first-rate deteriorates, fitness spending will increase. Health spending is necessitated to enhance fitness schooling sell fitness safety and beautify the prevention of ailment in a country. The observe made us to recognize that during a few cases, the state can also additionally are looking for overseas resource in an effort to help its fitness expenditure as an example with inside the case of Ebola outbreak that delivered approximately international problem and gave upward thrust to overseas useful resource influx into the nations that have been affected. Yazdiet al.(2014), used co integration and Auto Regressive Distributed Lag Model in an try and discover the opportunity of estimating each brief and long term influences of environmental high-satisfactory in Iran for duration of 1967 to 2010. The observe done pre-analysis checks which encompass correlation matrix to depict the correlation dating the various variables, accompanied with the aid of using the

unit root check to assess the extent of desk bound of all of the variables hired with inside the research. The end result of the empirical evaluation located out that in keeping with capita fitness expenses, earnings, sulphur oxide emission and carbon monoxide emissions are co-integrated. Short and long term elasticity monitor that profits, sulphur oxide emission and carbon monoxide emissions exert a statistically full-size wonderful impact on fitness costs. This end result is as anticipated due to the fact a upward thrust in environmental pollutants goes to degrade environmental first-rate and could have an inverse implication at the fitness repute of the humans for you to always bleed to an growth in fitness expenditure with inside the country. Assadzadeh, Bastan and Shahverdi (2014) made try and look at the position of environmental pollutants with inside the willpower of in step with capita fitness fees. The consistent with capita fitness expenditure refers back to the marketplace fee of all items and offerings bought via way of means of the fitness ministry in an economic system divided with the aid of using populace. Their empirical evaluation is primarily based totally on eight oil exporting nations which spanned with inside the length 2000-2010. The outcomes the brief-run elasticities indicated that profits and carbon dioxide emissions exerted the entired a statistically extensive nice impact on fitness fees however lifestyles expectancy had bad impact. The end result implied that has carbon dioxide emission on the way to negatively have an effect on environmental fine will increase in degree, the consistent with capita fitness expenditure will need to growth to satisfy up with the fitness implication even as lifestyles expectancy which proxy the fitness repute of the citizen is indicated to have a bad dating with fitness expenditure as predicted considering the fact that a great lifestyles expectancy shows that authorities devoted in fitness charges may be relieved. Siti (2015) become performed to take a look at the co-integration among environmental high-satisfactory and socio financial aspect for countrywide fitness expenditure. The observe used secondary facts from the World Bank Indicators and the Department of Statistics Malaysia. The information used with inside the observed had been received from World Bank Development Indicator (WDI) and spanned over the duration 1970 - 2013. This records changed into analyzed the usage of the software program E-perspectives and the technique implemented become a co-integration and ARDL method as a way to discover the opportunity of estimating each brief and long term influences of environmental fine. The have a look at discovered that GDP, CO2, MR, FR, NO2 and SO2 can be dealt with as having dating which fitness expenditure ultimately in Malaysia. SO2, fertility and little one mortality charge confirmed a substantial issue with inside the country's fitness costs have an effect on substantially. Alege and Ogundipe (2015) investigated the connection among environmental nice

and monetary boom in Nigeria the usage of a fractional co integration evaluation over the duration 1970-2011. The have a look at additionally tested the impact of increase on environmental overall performance via way of means of controlling for the function of institutional great, exchange openness and populace density. The paper additionally discovered out that early tiers of improvement in Nigeria intensify the extent of environmental degradation. It additionally unearths that vulnerable establishments and unrestricted exchange openness growth the quantity of environmental degradation because of environmental dumping. Finally, the paper indicates that a bigger populace density complements the promptness of environmental abatement measures and awareness for purifier surroundings. The take a look at, however, did not gain an inexpensive turning factor and for this reason a non-life of EKC in Nigeria. The paper recommends the want to limitation the importation of emission in depth products, test the sports of multi-nationals which spend money on generating excessive CO2 emitting items in LDCs and exports to domestic nations. Finally, there's want to bolster institutional great to make certain adoption of smooth technology as earnings rises.

2.4 Summary of Gaps Identified in the Literature

In a nutshell, diverse empirical investigations were gone through to research the connection among power intake and financial increase, despite the fact that majority of the research had been done to apprehend how electricity use effect financial increase. Further, there has additionally been a version with inside the outcomes of the empirical outcomes of those research, a few found out a great lengthy-run dating among CO2 emission which has popularly been hired to proxy environmental great and lifestyles expectancy, a not unusual place proxy for fitness repute whilst others display a mere longer term courting at a 5 percent degree of importance.

Also, there is the common use of ARDL methodology to examine the long run relationship which indicates that mostly the variables employed are stationary at different orders. The major gap identified from the review of the study however, is that most studies have either been to investigate the impact of environmental quality on economic growth or to evaluate the relationship between health status and economic growth.

This study then intends to fill this gap of scholarly findings by establishing the direct relationship between energy consumption and economic growth in Nigeria.

CHAPTER THREE

METHODOLOGY

3.1 Preamble

This chapter focuses on the theoretical framework and research methodology employed in this study. It presents the theoretical cornerstone used in investigating the relationship between energy consumption and economic growth in Nigeria. Also, explained here are the model specified, a priori specification, technique of estimation, data sources and description as well as other methodological issues.

3.2 Theoretical Framework

From the impression raised in the existing literature, energy use is largely disregarded in most orthodox economic growth models (Stern, Burke and Bruns, 2019) and so fails to feature in research on economic growth. This relegation of energy use to an ignorable background in economic system analysis was argued for on the ground that the quantity of energy required for economic growth relies on the quality of resources and technology, and due to the phasing out of energy intensity in leading economies. Eventually, after a careful inquiry into existing theoretical literature, a modified Solow's neoclassical growth model by Stern and Kander (2012) was resorted to given that it suits the integration of the biophysical and mainstream economic approaches (Stern 2015). The so-called nested constant elasticity of substitution (CES) production model serves as the theoretical guide for this study as we concentrate on one of the two part of the model break down of technological change into innovations that directly increase the productivity of energy (energy-augmenting technological change). It is necessary to emphasize that the model applies differently in a developed economy with an abundant quantity of energy and in an economy with relatively scarce level of energy like in the case of Nigeria which this study focuses on. The model suggests that when the level of energy is not in abundance, the impact of energy use and availability of energy-augmenting technology will exert a much larger effect on economic growth variables in the economy. However, as energy becomes more available for use as it is the case in leading economies the long-run behavior of the model develops into the mainstream Solow growth model where capital stock and output are determined primarily by labour, capital and technology.

3.3 Methodological Approach

This subsection will reveal the methodological approach employed by the study as it pertains to the model specified, and the estimation techniques and procedures employed in this research to examine the impact of energy consumption on economic growth in Nigeria.

3.3.1 Model Specification

This study adapts a model guided by the empirical study of Arouri, Youssef, M'henni and Rault (2012) which was specified to examine the relationship among energy consumption, economic growth and CO2 emissions in Middle East and North African countries. The model adapted as specified in equation (3.1) was

RGDP= f (CO, EC, EU and GFCF)

$RGDP = \beta_0 + \beta_1 CO_2 + \beta_2 EC + \beta_3 EU + \beta 4 lnGFCF + \mu$ …… (3.2)

Where:

RGDP = Real Gross Domestic Product

CO_2 = Carbon mono oxide emission

EC = Fossil fuel energy consumption

EU = Net energy use

GDP = Gross Fixed Capital Formation

β_0 = intercept

β_{1-4}= parameter estimates.

This study however modified equation (3.1) by paying meticulous attention to certain indicators of energy use and consumption by incorporating carbon mono oxide emission, fossil fuel energy consumption and electricity consumption while real gross domestic product is infused into the model to capture economic growth which is the dependent variable in this study. The model is specified in a log-linear form which describes a continuous response variable explained by one or more explanatory variables. The choice of a log-linear model was made in consideration of the difference in measurement scale of the dependent variable expressed in billions of naira and the independent variables usually expressed in indices. The functional form specified in this study was

chosen with certain empirical expectations which include high R^2 as well as making sure that the model has equally distributed residuals around zero.

3.3.2 A priori Specification

This subsection reveals the a priori specification of the expected relationship between each independent variable and the dependent variable

Table 3.1: A priori Expectation

Coefficient	Variable	A priori expected sign
β_0	Intercept	Positive
B_1	CO2	Negative
B_2	EC	Positive
B_3	EU	Positive
B5	GFCF	Positive

Source: Author's computation.

3.3.3 Estimation Technique

The techniques employed in this study include the Phillip-Perron unit root test. Then, Auto regressive Distributed Lag (ARDL) co-integration test was conducted in order to identify the long run relationship among the variables. If there is evidence of one or more co-integrating relationships, then a long-run is estimated. Granger causality test is used to examine the direction of causality between each of CO_2 emission, fossil fuel energy use, clean fuel and technologies for cooking and economic growth in Nigeria, followed with an assessment of the long run sign, size and significance of the explanatory variables using the Fully Modified Ordinary Least Square (FMOLS). Other complementary econometric techniques employed are the correlation test and the descriptive statistics test.

3.3.3.1 Estimation Procedure

Unit roots tests

In time series analysis, before running the causality test the variables must be tested for stationarity. For this purpose, in this current study we use the conventional Phillip Perron test. The ARDL Bound Co integration test is based on the assumption that the variables are integrated at different I(0) and I(1). So, earlier than making use of this, we decide the order of integration of all variables with the use of the unit root tests. In the presence of variables included of order two, we

can't interpret the values of F information supplied via way of means of Pesaran, Shin, and Smith (2001). The consequences of the stationarity checks display that every one variables are non-desk bound at degree however incorporated at the start order I(1).

Co integration Test

To check whether or not the variables are co-included or not, one of the famous assessments is the ARDL Bound Co integration Tests. The Bound co integration is used to check for the lifestyles of co integration and is primarily based totally at the estimation of the ECM with the aid of using the most chance, beneath numerous assumptions approximately the fashion or intercepting parameters, and the quantity K of co integrating vectors, after which accomplishing probability ratio test

Granger Causality Test

According to Granger (2001), causality can be further sub-divided into long-run and short-run causality. Long-causality is determined by the error correction term, whereby if it is significant, then it indicates evidence of long-run causality from the explanatory variables to the dependent variables. Short run causality is however, determined with a test on the joint significance of the lagged explanatory variables using a Wald Test.

3.3.3.2 Diagnostic Test

The Breusch-Godfrey (BG) Test for Autocorrelation

To avoid some of the pitfalls of the Durbin-Watson test of autocorrelation, a more advanced test of autocorrelation that is general in the sense that it allows for non-stochastic regressors, such as the lagged values of the regressand; (2) higher-order autoregressive schemes such as AR(1), AR(2), etc. It tests for the for the presence of serial correlation that has now no longer been included in a proposed model shape and which, if present, could suggest that inaccurate end could be drawn from different assessments.

Normality Test

The normality checks are used to decide if a facts set is nicely modelled with the aid of using a regular distribution and to compute how possibly it's far for a random variable underlying the statistics set to be typically distributed. The Jacque-Bera test that is a goodness of match check will assist decide whether or not pattern records have skewness and kurtosis matching a regular distribution.

Heteroscedasticity Test

The Breush Pagan take a look at is used to test if the if the residuals of a regression have changing variance. In linear regression analysis, the fact that the model (also named residuals) are not homoscedastic has the consequence that the model coefficients estimated using ordinary least square (OLS) are neither unbiased nor those with minimum variance. The estimation of their variance is not reliable. The decision as to whether the data when estimated as a problem of heteroscedasticity or not depends on the p-value which will be compared to the level of significance at 5 percent.

3.4 Description of Variables and Data Sources

Table 3.2: Description and Sources of Data

Identifier	Variable	Description	Sources of Data
GDP	Gross Domestic Product	Market value of all final goods and services in the country at a given time period	CBN Statistical Bulletin
CO2	Carbon mono oxide emission	An index that shows the quantity of gaseous waste in the atmosphere resulting from economic activities	World Development Index
ssssEC	Fossil fuel energy consumption	Measure of the rate of consumption of petroleum, natural gas and coal	World Development Index
EU	Total energy use	The access to clean fuel and technology measures how accessible the society is to electricity, liquefied petroleum gases etc.	World Development Index
GFCF	Gross Fixed Capital Formation	The gross capital accumulation in terms of machineries, technological advancement in a period of time usually annualized.	World Development Index

Source: Author's computation.

CHAPTER FOUR

PRESENTATION AND ANALYSIS

4.1 Preamble

This chapter reveals the descriptive summary of the variables of interest, correlation matrix, unit root test result and co integration relationship of the variables, empirical testing and integration of findings from the model put forward as well as testing of the research hypothesis.

4.2 Presentation of Results

This section concerns itself with the presentation of the results of data analysis carried out in the research to investigate the relationship between energy consumption and economic growth in Nigeria.

4.2.1 Descriptive Analysis

This sub-section presents a descriptive analysis of the variable used. These descriptive statistics reveals the trend and average values of the variables used in this research work.

Table 4.1: Descriptive Summary

	GDP	CO	EC	FFEC	GFCF_CURRENT_LCU_
Mean	175040.9	0.369400	700.1126	17.77620	3195.100
Median	106189.5	0.335000	696.0850	18.88000	1694.500
Maximum	568499.0	0.650000	798.6300	22.84000	9897.000
Minimum	23922.00	0.230000	585.4200	5.970000	1028.000
Std. Dev.	150705.5	0.117202	55.61228	4.213178	2810.316
Skewness	1.078996	0.723316	-0.378681	-1.617892	1.277770
Kurtosis	2.926501	2.525549	2.337149	4.800348	3.115190
Jarque-Bera	9.713183	4.828851	2.110349	28.56572	13.63345
Probability	0.007777	0.089419	0.348132	0.000001	0.001095
Sum	8752045.	18.47000	35005.63	888.8100	159755.0
Sum Sq. Dev.	1.11E+12	0.673082	151543.6	869.7924	3.87E+08
Observations	50	50	50	50	50

Source: Author's computation using E-views 10

Table 4.1 above shows the summary of the various descriptive statistics of all the variables used for the current study.

4.2.1.1 Mean*:* The mean is used to measure the average value of a distribution or what you expect to happen the next time you conduct a similar statistical experiment. The average value of Gross domestic product, carbon mono oxide emission, energy consumption, fossil fuel and Gross Fixed Capital Formation are 175,040, 0.369, 700.11, 17.78 and 3195.10 respectively.

4.2.1.2 Standard Deviation: Standard deviation measures the dispersion of the data set from the mean. It can be thought of as a measure of variability or risk. The larger values of standard deviation imply greater variability in the data. The standard deviation as revealed in table 4.1 above of GDP is 150705; CO is 0.11EC is 55.61; FFEC is 4.21; and lastly GFCF has a standard deviation value of 2810.32

4.2.1.3 Skewness: Skewness is the measure of asymmetry in a distribution. When the distribution is mound-formed symmetrical, the values for the mean, median and mode are the identical or nearly the identical. For skewed-left distributions, the mean is much less than the median and the median is much less than the mode. For skewed-proper distributions, the mode is the smallest value, the mean is the subsequent biggest and the median the largest. GDP and GFCF with skewness of 1.079 and 1.28 shows that the distributions are positively skewed; EC and FFEC with skewness of -0.379 and -1.618 shows that the distribution are negatively skewed and normally; CO also has a positive distribution and normally distributed with skewness 0.72.

4.2.1.4 Kurtosis: This measures heaviness or lightness in the tails of the statistics distribution of the variables. The standard normal distribution has a kurtosis of 3. An affirmative value tells you that you have heavy-tails (a lot of information to your tails), at the same time an undesriable value means that you have light-tails (i.e. little records for your tails). With the kurtosis value GDP, CO, EC and GFCF with kurtosis values of 2.93, 2.53, 2.34 and 3.12 respectively which indicates that the data sets distributions are all platykurtic with thin tailed distribution. While FFEC have kurtosis values of 4.80 have a leptokurtic distribution with fat tailed distribution.

4.2.2 Correlation Matrix

Table 4.2 Correlation Matrix

	GDP	CO	EC	FFEC	GFCF
GDP	1				
CO	-0.2445	1			
EC	0.7266	-0.26227	1		
FFEC	0.2401	0.162485	0.7084	1	
GFCF	0.18958	0.0244	0.351	0.2652	1

Source: Authors Computations using E-views 10

The correlation table reveals the degree or strength of linear relationship between two variables on a scatter plot**.** The values from the correlation coefficients presented above can be determined that GDP is moderately correlated with all the independent variables. It has positive correlation with energy consumption, fossil fuel and gross fixed capital formation while being negatively correlated with carbon monoxide emission.

4.2.3 Unit Root Test

Empirical work centred on time series accepts that the fundamental time series is stationary. This subsection reveals the nature of variables stationarity as concluded using the T-statistics of and P-value of Phillip-Perron unit root test.

Table 4.3: Stationarity Test using Phillip-Perron

	Unit Root Test at level				**Unit root test at first difference**				
Variables	**T-statistics**	**Crit. Value (α = 0.05)**	**P-value**	**Decision**	**T Statistics**	**Crit. Value (α = 0.05)**	**P-value**	**Decision**	**Order of inteegration**
GDP	**-0.606329**	**-2.954021**	**0.8559**	**Non-Stationary**	**-4.356167**	**-2.957110**	**0.0017**	**Stationary**	**I(1)**

CO	**-3.399304**	**-2.954021**	**0.0182**	**Stationary**	**-6.065506**	**-2.957110**	**0.0000**	**Stationary**	**I(0)**
EC	**-1.388787**	**-2.954021**	**0.5757**	**Non-Stationary**	**-7.167726**	**-2.957110**	**0.0000**	**Stationary**	**I(1)**
FFEC	**-2.750878**	**-2.954021**	**0.0749**	**Non-Stationary**	**-6.550092**	**-2.957110**	**0.0000**	**Stationary**	**I (1)**
GFCF	**-2.406951**	**-2.954021**	**0.1476**	**Stationary**	**-28.86415**	**-2.957110**	**0.0001**	**Stationary**	**I(0)**

Source: Author's computation using E-views 10

The unit root test result shown above is generated using Phillip-Perron unit root test statistic and P-value respectively. A variable is said to be integrated of order d, (I (d)) if it is stationary after differencing d times (Engle and Granger, 1987). The result shows that only carbon monoxide emission is stationary at level others are stationary at level. The decision rule when using P-value is that the null hypothesis of unit root is rejected when the P-value is less than the level of significance. The implication of this result for the further analysis is that, the variables now being stationary are now fit to be used for the policy inference and forecasting.

4.2.4 Co integration Test

Table: 4.4ARDL Bound Co integration Test

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signify	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	9.287952	10%	2.2	3.09

K	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37

Source: Authors' computation using E-views 10

The result of the bound test for co integration in table 4.4 above helps to test the null hypothesis of no long-run relationship between the variable under investigation. This leads to the testing of our second hypothesis. When the computed F-statistic is greater than the upper bound critical value, then the $H_{01}$of the second question is rejected. This means that the variables are co integrated and there exists a long run relationship between the variables. From The result of the bound test for co integration in table 4.4 above, the F-statistic value of 9.287952 is greater than the I (0) bound and I (1) bound critical values at both 5% and 10% level of significance. Based on the foregoing, we therefore fail to accept the null hypothesis of no long-run relationships at 5% level of significance.

4.2.5: Estimation using Autoregressive Distributed Lag Model

The summary of ARDL estimation result presented in Table 4.5 reveals that all the variables which include the lag value of gross domestic product, interest rate and gross domestic variables are statistically significant at 5 percent since their individual p-value is less to 0.05 but interest rate and exchange rate are statistically insignificant. Also, all the significant explanatory variables confirmed with their expected sign.

Table 4.5: Estimation of Coefficients

Dependent Variable: LNGDP

Method: Least Squares

Included observations: 50

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CO	2.485222	0.773037	3.214880	0.0024
EC	0.018543	0.002353	7.880317	0.0000
FFEC	-0.101799	0.029152	-3.492016	0.0011
GFCF_CURRENT_LCU_	-4.36E-06	2.86E-05	-0.152185	0.8797
C	-0.363597	1.429112	-0.254422	0.8003

R-squared	0.668218	Mean dependent var	11.71306
Adjusted R-squared	0.638727	S.D. dependent var	0.865916
S.E. of regression	0.520467	Akaike info criterion	1.626460
Sum squared resid	12.18988	Schwarz criterion	1.817662
Log likelihood	-35.66150	Hannan-Quinn criter.	1.699271
F-statistic	22.65785	Durbin-Watson stat	0.316764
Prob(F-statistic)	0.000000		

Source: Author's computations using E-views 10

Specifically, 1 percentage increase in carbon monoxide emission induces 2.485 percent rise in gross domestic product in the long run significantly as revealed by the P. value of 0.0024, a value less than 5% which we have specified as commonly used in social sciences as the level of significance. In addition, the fossil fuel has been revealed to have a significant adverse effect on economic growth. The energy consumption indicator was also revealed to have an important progressive impact on economic growth. The empirical analysis concludes that a one percent rise in energy consumption will cause the economic growth to rise by 0.018 percent. This is a very minimal effect, but it also agrees with a priori expectation that.

4.2.6 Granger Causality Test

This sub-section delineates the causal relationships that exist between each of the following variables. The granger causality test is a statistical hypothesis check for finding whether one-time series is worthwhile in predicting another. It uses empirical data sets to find patterns of correlation.

The result presents the Pair-wise granger causality test to study the causal relationship among each of the explanatory variables and gross domestic product with gross domestic product at 5% level of significance. From the result obtained, it can be established that there does not exist any bidirectional causal relationship among any two of the variable

Table 4.5: Granger Causality Test

Pairwise Granger Causality Tests

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.

CO does not Granger Cause LNGDP	48	0.71065	0.4970
LNGDP does not Granger Cause CO		0.32879	0.7216
EC does not Granger Cause LNGDP	48	0.27213	0.7631
LNGDP does not Granger Cause EC		0.27222	0.7630
FFEC does not Granger Cause LNGDP	48	1.50872	0.2327
LNGDP does not Granger Cause FFEC		0.36377	0.6972
GFCF_CURRENT_LCU_ does not Granger Cause LNGDP	48	0.60783	0.5491
LNGDP does not Granger Cause GFCF_CURRENT_LCU_		0.25864	0.7733

Source: Author's computation using E-views 10

4.3 Discussion of results

The study deploys Phillip- Perron test to study the stationarity of the time series and test the null hypothesis of unit root. It is expected that the series do not contain unit root in mandate to discover the relationship among the variables in the long-run. The test was carried out at level and first difference using 1%, 5% and 10% Mackinnon critical value.

The variables of Gross domestic product, carbon mono oxide emission, energy consumption, fossil fuel and Gross Fixed Capital Formation were tested. The levels of statistics of the test are reported in table 4.3 and the Phillip Perron test reported only CO is stationary at level. These findings imply that there is certainly not a unit root; hence, their seasonal variation has been corrected, making them fit for regression.

Given that all variables were stationary at different orders, this conclusion allowed us to go with the use of ARDL Bound co integration test instead of Johansen Co integration test which could have been employed if the variables were stationary after first difference. The ARDL Bound test however, discovered that there is long run relationship among all the variables of interest. Following the revelation that there exist a strong long run relationship between the variables and all the variables are integrated at different orders the Ordinary Least Square method was employed to estimate the short run and long run relationship. The estimation test reveals that among the four

independent variables which include CO, EC, FFEC and GFCF, only GFCF was found to have an insignificant impact on gross domestic product in Nigeria. This means that an boom in carbon monoxide emission will reason gross domestic product to upward push at the same time as energy intake is likewise projected to have positive and significant impact on domestic output. Gross fixed capital formation on the opposite hand, was discovered to have a undesirable insignificant impact on domestic product in Nigeria. The fossil fuel) that is a proxy of investment was also discovered with the aid of using estimation to have a negative and significant impact on gross domestic product in Nigeria.

4.4 Comparison of Results with Previous Findings

Based on the analysis, the study establishes that energy consumption has a high quality and enormous impact on domestic output in Nigeria even as the long run relationship is significant at 5 percent degree of significance. This end result conforms to the end result of few different research (Abdullah, Azam, and Zakariya2016; Adusanyaet al. 2014). The research also revealed that the gross fixed capital formation will negatively and considerably have an effect on gross domestic even though the research of Alege and Ogundipe (2015) concluded that fossil fuel has enormous positive impact on gross domestic product in Nigeria. Siti (2015) also carried out a similar research with the use of Ordinary Least Square model and posited that gross domestic product is substantially affected by domestic investment which turned into proxied with the aid of using GFCF in this study.

The end result of this research echoes the end result of Omojolaibi (2010) who studied the link between environmental quality affected by energy use and economic growth. The empirical findings of the research advocates that energy consumption should be monitored in order to realize the best from domestic investment and domestic production.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the findings. It outlines the conclusions and recommendations premised on the results of the study. The main contributions to the knowledge as well as the limitations of the study together with the suggestions for future research were also discussed.

5.2 Summary of the findings

The result of this study summarised as follows

1. Hypothesis one investigated the impact of economic growth on energy consumption in Nigeria from 1970 -2019. It employs descriptive and econometric methodology.
2. Hypothesis two investigated the impact of energy consumption on economic growth in Nigeria using descriptive and econometric methodology. The studies suggest that energy consumption should be monitored in order to realize the best from domestic investment and domestic production.
3. Hypothesis three reveals that energy consumption has a direct impact on economic growth in Nigeria using descriptive and econometric methodology
4. The fourth hypothesis tested the causal relationship between energy consumption and economic growth in Nigeria.

5.3 Conclusion of the study

In specific, the study concludes that energy consumption has a positive and significant impact on domestic output in Nigeria, while the long run relationship is significant at 5 percent level of significance. Given that all variables were stationary at different orders, this conclusion allowed us to go with the use of ARDL Bound co integration test instead of Johansen Co integration test which could have been employed if the variables were stationary after first difference. The ARDL Bound test however, revealed that there exists long run relationship among all the variables of interest. Following the revelation that there exist a strong long run relationship among the variables and all the variables are integrated at different orders the Ordinary Least Square method was employed to estimate the short run and long run relationship

5.4 Recommendations of the study

Based on the empirical results, the study recommends the following that government should provide a friendly macro-economic indicators to boost the real economic growth within the study

period and government should consider other macro-economic driver policies, especially domestic polices to ascertain the real economic growth of Nigeria both in the short and long run.

5.5 limitations of the study

The study was limited due to the scope of the study between 1970 and 2019, the use of a single country study, use of OLS model, financial and time constraint.

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APPENDICES

Descriptive Statistics

	GDP	CO	EC	FFEC	GFCF_CURRENT_LCU_
Mean	175040.9	0.369400	700.1126	17.77620	3195.100
Median	106189.5	0.335000	696.0850	18.88000	1694.500
Maximum	568499.0	0.650000	798.6300	22.84000	9897.000
Minimum	23922.00	0.230000	585.4200	5.970000	1028.000
Std. Dev.	150705.5	0.117202	55.61228	4.213178	2810.316
Skewness	1.078996	0.723316	-0.378681	-1.617892	1.277770
Kurtosis	2.926501	2.525549	2.337149	4.800348	3.115190
Jarque-Bera	9.713183	4.828851	2.110349	28.56572	13.63345
Probability	0.007777	0.089419	0.348132	0.000001	0.001095
Sum	8752045.	18.47000	35005.63	888.8100	159755.0
Sum Sq. Dev.	1.11E+12	0.673082	151543.6	869.7924	3.87E+08
Observations	50	50	50	50	50

Cointegration Test

	GDP	CO	EC	FFEC	GFCF
GDP	1				
CO	-0.2445	1			
EC	0.7266	-0.26227	1	0.7	
FFEC	0.2401	0.162485	0.7084	1	
GFCF	0.18958	0.0244	0.351	0.2652	1

Unit Root Test

Null Hypothesis: GDP has a unit root

Exogenous: Constant

Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-0.606329	0.8559
Test critical values:	1% level	-3.646342	
	5% level	-2.954021	
	10% level	-2.615817	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	1.47E+09
HAC corrected variance (Bartlett kernel)	2.17E+09

Null Hypothesis: D(GDP) has a unit root

Exogenous: Constant

Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.356167	0.0017
Test critical values:	1% level	-3.653730	
	5% level	-2.957110	
	10% level	-2.617434	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	1.38E+09
HAC corrected variance (Bartlett kernel)	1.34E+09

Null Hypothesis: CO2E has a unit root

Exogenous: Constant

Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.399304	0.0182
Test critical values:	1% level	-3.646342	
	5% level	-2.954021	
	10% level	-2.615817	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.003380
HAC corrected variance (Bartlett kernel)	0.003558

Null Hypothesis: D(CO2E) has a unit root

Exogenous: Constant

Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-6.065506	0.0000
Test critical values:	1% level	-3.653730	
	5% level	-2.957110	
	10% level	-2.617434	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.004248
HAC corrected variance (Bartlett kernel)	0.004119

Null Hypothesis: EU has a unit root

Exogenous: Constant

Bandwidth: 10 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.388787	0.5757
Test critical values:	1% level	-3.646342	
	5% level	-2.954021	
	10% level	-2.615817	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	191.8628
HAC corrected variance (Bartlett kernel)	119.6131

Null Hypothesis: D(EU) has a unit root

Exogenous: Constant

Bandwidth: 23 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.167726	0.0000
Test critical values:	1% level	-3.653730	
	5% level	-2.957110	
	10% level	-2.617434	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	211.3264
HAC corrected variance (Bartlett kernel)	29.49904

Null Hypothesis: FFEC has a unit root

Exogenous: Constant

Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.760878	0.0749
Test critical values:	1% level	-3.646342	
	5% level	-2.954021	
	10% level	-2.615817	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	1.367710
HAC corrected variance (Bartlett kernel)	1.598769

Null Hypothesis: D(FFEC) has a unit root

Exogenous: Constant

Bandwidth: 8 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-6.550092	0.0000
Test critical values:	1% level	-3.653730	
	5% level	-2.957110	

	10% level	-2.617434

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	1.700607
HAC corrected variance (Bartlett kernel)	0.532023

Null Hypothesis: GFCF_CURRENT_LCU_ has a unit root

Exogenous: Constant

Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.406951	0.1476
Test critical values:	1% level	-3.646342	
	5% level	-2.954021	
	10% level	-2.615817	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	3626672.
HAC corrected variance (Bartlett kernel)	3909619.

Null Hypothesis: D(GFCF_CURRENT_LCU_,2) has a unit root

Exogenous: Constant

Bandwidth: 20 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-28.86415	0.0001
Test critical values:	1% level	-3.577723	
	5% level	-2.925169	
	10% level	-2.600658	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	1032979
HAC corrected variance (Bartlett kernel)	3 596938.5

ARDL Bound cointegration

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	9.287952	10%	2.2	3.09
k	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37
			Finite Sample: n=30	
Actual Sample Size	30			
		10%	2.525	3.56
		5%	3.058	4.223
		1%	4.28	5.84

Dependent Variable: LNGDP

Method: Least Squares

Date: 11/06/20 Time: 05:46

Sample: 1970 2019

Included observations: 50

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CO	2.485222	0.773037	3.214880	0.0024
EC	0.018543	0.002353	7.880317	0.0000
FFEC	-0.101799	0.029152	-3.492016	0.0011
GFCF_CURRENT_L CU_	-4.36E-06	2.86E-05	-0.152185	0.8797
C	-0.363597	1.429112	-0.254422	0.8003

R-squared	0.668218	Mean dependent var	11.71306
Adjusted R-squared	0.638727	S.D. dependent var	0.865916
S.E. of regression	0.520467	Akaike info criterion	1.626460
Sum squared resid	12.18988	Schwarz criterion	1.817662
Log likelihood	-35.66150	Hannan-Quinn criter.	1.699271
F-statistic	22.65785	Durbin-Watson stat	0.316764
Prob(F-statistic)	0.000000		

Pairwise Granger Causality Tests

Date: 11/04/20 Time: 23:28

Sample: 1986 2019

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
CO2E does not Granger Cause GDP	32	0.39783	0.6757
GDP does not Granger Cause CO2E		0.76959	0.4731
EU does not Granger Cause GDP	32	2.14178	0.1370
GDP does not Granger Cause EU		0.77691	0.4698
FFEC does not Granger Cause GDP	32	1.09265	0.3497
GDP does not Granger Cause FFEC		1.17251	0.3249
GFCF_CURRENT_LCU_ does not Granger Cause GDP	32	3.71877	0.0375
GDP does not Granger Cause GFCF_CURRENT_LCU_		0.49150	0.6171
EU does not Granger Cause CO2E	32	0.70097	0.5049
CO2E does not Granger Cause EU		0.01628	0.9839