

# GLOBAL ENERGY TRANSITION AND ITS IMPLICATIONS ON ENERGY SECURITY IN NIGERIA: A CRITICAL REVIEW

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## ABSTRACT

*This paper undertakes a critical review of the impact of the global energy transition on Nigeria's energy security, particularly considering the goal of the National Development Plan (NDP), which aims to achieve significant economic growth and lift millions of Nigerians out of poverty, and the government's energy transition plan (ETP), which aims to achieve net-zero carbon emissions by 2060. Achieving these goals, however, requires energy security, which poses a challenge for a country heavily dependent on fossil fuels as its primary energy source. The paper discusses the need for energy diversification for a plethora of renewable energy potential while emphasising the need for energy equity as the country improves the adoption of natural gas as its transition fuel. It also underscores the global trend to gradually phase out investments in new hydrocarbon projects that pose a significant risk to Nigeria's energy security. The paper concludes by emphasising the importance of energy security to Nigeria's economic growth and development and the need for the government to remain committed to sound policies and programs to adopt sustainable energy sources while staying in tune with global reality.*

**KEY WORD:** *Energy Transition, Energy Security, Sustainability, Economic growth, Energy Transition Plan*

## INTRODUCTION

Nigeria's National Development Plan (NDP) 2021-2025 is a medium-term economic plan that targets an average economic growth of 4.6 per cent. This plan's practical and efficient implementation will lift 35 million Nigerians out of poverty and create full-time jobs for 21 million people. It would also increase the government revenue-to-GDP ratio to 15 per cent and improve the health and education of the population (Federal Ministry of Finance, Budget and National Planning [FMFBNP], 2021). However, achieving the macroeconomic goals outlined in the NDP requires energy security, which can only be achieved using the country's abundant energy sources.

The global economy is experiencing an energy transition driven by the need to reduce greenhouse gas (GHG) emissions and mitigate the effects of climate change. The growth is towards clean, sustainable, and affordable energy, which involves a migration from traditional fossil fuels, such as coal, oil, and gas, to renewable energy sources, such as solar, wind, hydro, and geothermal, considering energy efficiency systems, smart grids, and energy storage solutions. As a sign of commitment to addressing the impact of climate change in the country, the Nigerian government launched the Nigerian Energy Transition Plan (ETP), which aims to achieve net zero carbon emissions by 2060.

Globally, several International Oil Companies (IOCs) have rebranded themselves as energy companies while divesting their stakes and reducing their financial exposure to new hydrocarbon projects. Companies such as Total rebranded to TotalEnergies to achieve net-zero carbon by 2050, British Petroleum (BP) rebranded to Beyond

Petroleum, and Statoil to Equinor, showing global trends and commitments towards a more sustainable energy future with phased divestment, energy diversification, and transition from oil and gas as the primary energy source. In addition, the war between Russia and Ukraine, which started in 2022, has dramatically affected the supply side of natural gas, which has seen a price spike, causing various governments to doubt the possibility of energy security while relying on fossil fuels because of the geopolitical complexities involved. This has accelerated the pace of energy transition and increased the demand for renewable energy and other non-fossil fuels for power plants and industries (BP p.l.c., 2022).

Although energy security is vital to every country's economic growth and development, its availability, accessibility, affordability, and reliability are essential to its industrial, transportation, and household needs. Like many developing countries, Nigeria faces significant energy security challenges because of its heavy reliance on fossil fuels and the impact of the global transition (decarbonisation), which will lead to an overall reduction in funding. This is evident in the recent fuel shortages following Nigeria's 2023 general election, which slowed economic activity and dampened inflation from FX instability.

Nigeria is the largest oil producer in Africa and the sixth largest in the Organisation of Petroleum Exporting Countries (OPEC, 2022) member country, with oil exports as the backbone of its economy since the 1970s; however, despite the country's rich oil and natural gas reserves, a significant portion of its population needs access to electricity, and those without access suffer from unreliable and expensive energy. The Nigerian government has recognised the importance of energy security. As a result, several policies and programs have been initiated to address this issue. This study assessed the impact of the global energy transition on Nigeria's energy security.

## **REVIEW OF RELATED LITERATURE**

Global energy transition has received significant attention in recent years due to climate change concerns and the finite nature of fossil fuel resources. The transition to renewable energy sources aims to reduce greenhouse gas (GHG) emissions and achieve sustainable economic growth. This literature review focuses on the impact of the global energy transition on Nigeria's energy security.

Aigheyisi and Oligbi (2020), in their study on energy poverty and economic development in Nigeria, used the ordinary least squares estimator to analyse annual time-series data spanning the period from 1990 to 2017. The study found that energy poverty negatively impacts a nation's economic development, implying that improved access to electricity promotes development. In addition, domestic investment and the labour force are crucial development factors in the country. However, FDI inflows, trade openness, and currency depreciation have been detrimental to the development of the country's economy, highlighting its (low) degree of preparedness for the vagaries of globalisation.

Osunmuyiwaa and Kalfagiannib (2016) examined the conditions and pathways of renewable energy adoption in Nigeria using three analytical lenses (niches, regimes, and landscapes). High-income countries are pioneers in the face of a regime with transition-supporting institutions and coalitions. In contrast, middle-/low-income countries are laggards due to regimes characterised by weak support from political actors. The authors concluded that the role of the government and political actors is central to the energy transition processes in Nigerian states.

On the other hand, Ademiloye et al. (2020), in their study on Nigerian renewable energy sources as a panacea for electricity shortages, using secondary data, postulated that electricity shortages in Nigeria would become history if the available renewable energy resources were fully utilised, which in turn provided the power supply for electricity consumers. Akpabio and Ebeleme (2019) examined Nigeria's socioeconomic benefits from renewable energy. The authors note that the country's heavy reliance on fossil fuels for power generation and economic development makes it vulnerable to price volatility and supply disruptions in the global oil and gas markets. They argue that shifting to renewable energy sources allows Nigeria to diversify its energy mix, increase its energy security, and achieve sustainable economic growth.

The Nigerian government recognised the importance of renewable energy for sustainable economic growth. The National Renewable Energy and Energy Efficiency Policy (Federal Ministry of Power [FMP], 2015) aim to increase the share of renewable energy in a country's energy mix and improve energy efficiency. The policy also seeks to create a favourable environment for investment in renewable energy, improve access to electricity, and reduce greenhouse gas emissions. Samuel's (2016) study examines the observed and expected impacts of climate change on energy security and points to the need for a policy framework to develop an integrated approach to energy security and climate change, with a stable investment climate favourable enough to generate investment returns and guarantee reasonable profits for investors in the renewable energy system.

The Nigerian Electricity Market Stabilization Facility is another initiative for improving energy security in the country. The program financially supports power generation companies to strengthen the country's operational efficiency, reliability, and transmission and distribution infrastructure. Ugwoke et al. (2020) highlight the challenges of energy access in Nigeria and its impact on socioeconomic development. The authors argued that access to electricity is a crucial driver of socioeconomic development. Access to electricity in Nigeria has hampered the country's progress toward Sustainable Development Goals (SDGs)

Yohanna et al. (2021), in their study on energy resource diversification and energy security in Nigeria, showed that regions with comparative advantages in natural endowment with small hydroelectric, wind, and solar energy potentials should be optimally utilised. Consequently, the prioritisation of energy distribution for industry, commerce, and households can be efficiently determined. In addition, the International Monetary Fund (IMF) has published several reports on energy transitions. For example, in a recent paper, the IMF (2020) argued that transitioning to renewable energy sources is crucial for sustainable recovery from the COVID-19 pandemic. In addition, the report finds that investments in renewable energy can create jobs and boost economic growth while reducing greenhouse gas emissions and improving energy security.

The World Bank has published several reports on energy transitions. For example, in another report, the World Bank (2019) argued that switching to renewable energy sources is essential for achieving SDGs and reducing poverty. In addition, the report found that renewable energy can improve access to electricity, reduce energy costs, and create jobs in the energy sector. The academic literature has also examined the economic impact of the energy transition. For example, Huang (2022) discussed the effects of natural resources and economic factors on the energy transition in China. The author noted that transitioning to renewable energy sources can increase economic growth and reduce greenhouse gas emissions, revealing “that natural resources (total natural resource rent and natural gas rent) and economic factors (energy imports, economic growth, and population growth) are positively related to China's energy transition.”

Other studies have addressed the challenges of financing energy transitions. For example, Ashaye and Helmi (2019) examined financing options and developments in renewable energy. The author argues that the impact on funding and costs, policy design that would encourage the adoption and implementation of renewable energy technologies, and the development of incentives that align with policy goals depending on the market, technical and financial constraints should be considered would be connected whereas Sarangi (2018) in his study of green energy finance in India argues that innovative financing mechanisms such as green bonds and crowdfunding can help address these challenges and accelerate the transition to renewable energy.

Geopolitical implications of energy transitions. For example, Höysniemi (2022) examined the global energy transition and its dependence on Russian energy. The author argued that shifting to renewable energy sources significantly challenged Russia's economy and geopolitical influence. Therefore, European countries face the challenge of reshaping their energy security after cutting ties with Russia.

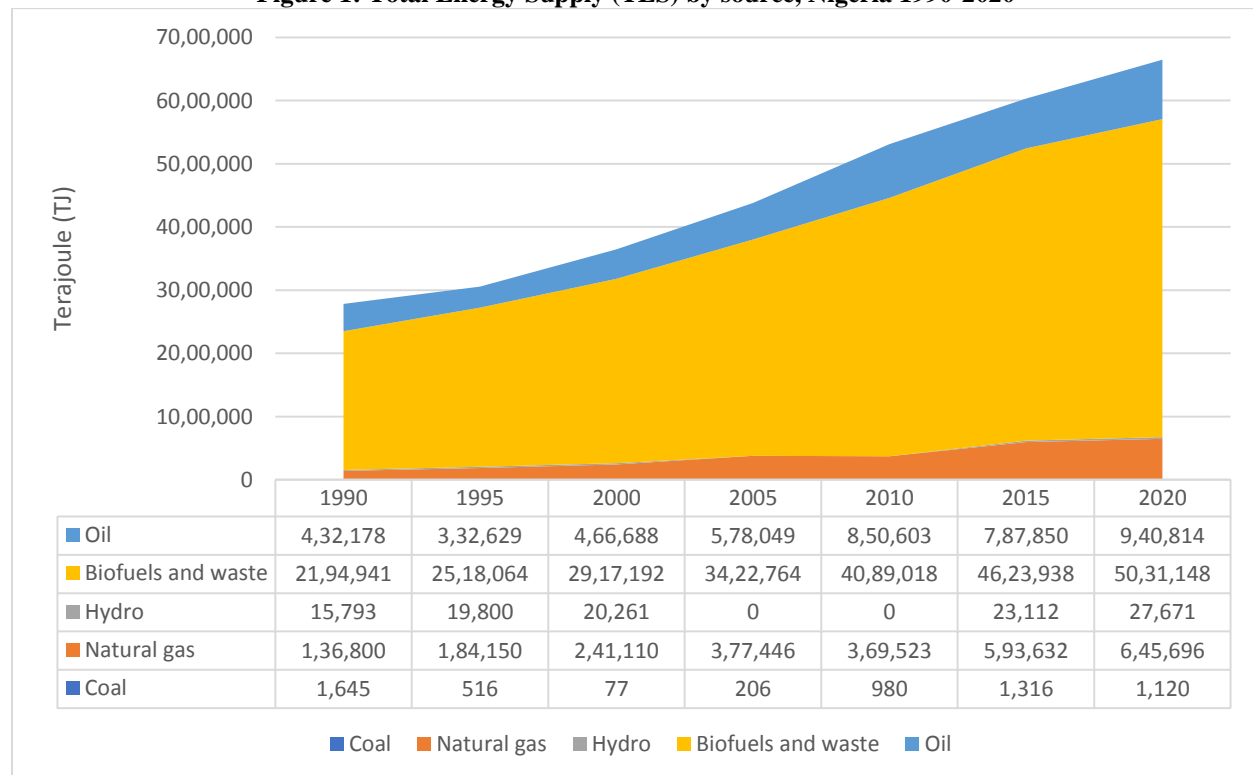
The Nigerian government continues to channel heavy public funds to fossil fuel production and consumption. In 2019, at least \$1.7 billion was provided in consumption subsidies for oil used primarily to power vehicles and generators. Nigerians expect cheap energy and see subsidies as one of the government's only benefits. Careful management of fossil fuel subsidy reform is crucial to prevent the further marginalisation of vulnerable populations

and avoid widening inequality. Channelling the necessary funding and promoting constructive engagement around subsidy reform and equity and social responsibility in the energy transition Overall, the literature on the global energy transition illuminates this complex and multifaceted issue. The transition to renewable energy sources offers opportunities and challenges to achieve sustainable economic growth and energy security. As such, policymakers and industry leaders must carefully weigh the economic, social, and geopolitical implications of this transition. Global energy transition poses challenges and opportunities for Nigeria's energy security.

### MAJOR ENERGY SOURCES IN NIGERIA

Energy security is essential for economic development and sustainable growth. Despite being a major oil-producing country, Nigeria struggles to provide citizens with adequate and stable energy. This is due to insufficient development and use of its energy resources. Hence, Nigeria must explore and utilise energy resources to improve its security. The significant energy sources in Nigeria can be harnessed to increase energy security in the country.

**Figure 1: Total Energy Supply (TES) by source, Nigeria 1990-2020**



**Source:** International Energy Agency (IEA) World Energy Balances 2022 <https://www.iea.org/data-and-statistics/data-product/world-energy-statistics-and-balances>

Figure 1 above, adapted from the IEA database, shows biofuel, an organic material such as agricultural, forestry, and municipal solid waste, as Nigeria's predominant energy source. This is attributed to massive agricultural waste, such as palm kernel shells, sawdust, and rice husks, which are converted into energy. Firewood, a major type of biofuel, accounts for over 50% of the country's total domestic primary energy consumption and is the dominant energy source in the household sector (FMP, 2022). Using biofuel for energy help in reducing GHG emission and provides energy to rural communities since there is mainly not connected to public electricity grids. The total energy supply for Nigeria by Biofuels is estimated to be around 5 million TJ.

Whereas crude oil is the primary energy source for the country, with an estimated reserve of over 37 billion barrels (bbl), the natural gas reserve is estimated to be 206 trillion cubic feet (tcf) (OPEC, 2022), both found predominantly

in the Niger Delta in southern Nigeria. Crude oil is primarily used to manufacture petroleum products for transportation, power generation, and other industrial applications. On the other hand, natural gas is used in power generation, cooking, and other industrial applications. The Nigerian government has encouraged using natural gas to reduce dependence on crude oil for power generation through the National Gas Expansion Programme (NGEP). As seen in figure 2, Crude oil and Natural Gas are Nigeria's primary energy source after biofuel.

However, the coal reserves in Nigeria are over 2 billion tons, primarily found in eastern Nigeria, particularly in Enugu. Coal is used in power generation and other industrial applications. However, the use of coal for power generation in Nigeria is massively declining owing to the country's dominance of crude oil and natural gas. In contrast, hydroelectric power generation has been considered a favourable source of power generation in Nigeria, mainly due to its sustainability.

The potential of the Nigerian rivers and waterfalls must be harnessed to increase energy security. Nigeria's largest hydroelectric power stations are Kainji, Shiroro, and Jebba, located in the country's northern parts (Niger and Kwara). The country has a substantial technically usable potential in hydroelectric power. The large-scale hydroelectric power plant alone can generate over 10,000 MW, producing a staggering 36,000 GWh of electricity each year. However, as of 2012, only 15% of this potential had been utilised.

Additionally, there is potential for small and medium-sized hydropower plants, which could produce over 3,500 MW of electricity. Unfortunately, by 2012, less than 2% of this potential had been harnessed (FMP, 2015). Over the years, the Nigerian government has desired to utilise the water bodies for power generation to solve its myriad issues of power crisis. However, this has been unattainable due to poor political will to undertake projects in this regard, the case of the failed Mambilla power project.

While Solar Energy can be harnessed in the tropics, especially since Nigeria has abundant sunlight year-round, the government has attempted to encourage the use of solar energy for off-grid power generation in rural areas. Due to the dwindling power supply, solar energy can be used for the growing needs of industrial, home, and business applications. As a result, there has been increasing momentum in deploying off-grid renewable energy technologies by the Rural Electrification Agency (REA) while capitalising on the potential of Solar energy, which has been implemented to take some institutions like the Ado Bayero University Kano and the Sabon Gari Market in Kano off-grid.

The country's potential for wind energy generation cannot be overemphasised, particularly in the north. The Nigerian government has identified several locations for wind-energy development, including Katsina, Sokoto, and Kano. Wind power can provide a country with a clean, renewable energy source and contribute to Nigeria's energy security. However, wind power generation in Nigeria is still in its infancy, as seen in figure 1. Moreover, its development has challenges, such as the high upfront cost of wind turbines and the need for significant infrastructure to support wind power generation.

Based on the IEA data, Nigeria has a wide range of energy resources that can be used to improve energy security and has the potential to become a significant clean energy centre if it can develop and utilise its renewable energy resources effectively. However, there are challenges in developing these resources, such as infrastructure development, financing, and political frameworks.

## ENERGY SECURITY AND SUSTAINABLE DEVELOPMENT

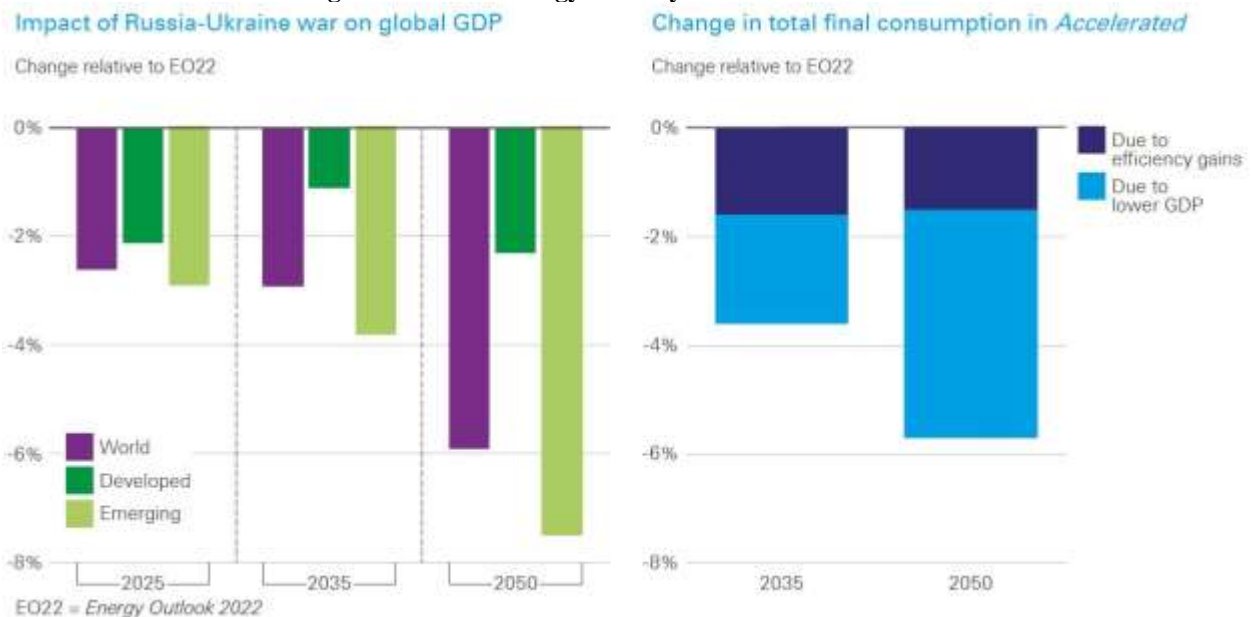
Energy security and economic growth are closely intertwined, with the availability of affordable, reliable and sustainable energy sources playing a crucial role in fostering economic development. Access to energy is crucial for economic growth as it is an essential input to the production process of goods and services. Without access to electricity, businesses and households could not operate efficiently, and economic activity would halt. Therefore, energy security is crucial to ensure a stable and predictable energy supply to meet economic growth demands. The availability of affordable energy sources is also vital for economic growth, as energy costs can be a significant part

of production costs. Higher energy costs can reduce the competitiveness of companies and limit economic growth. Conversely, access to affordable energy can help boost investment, job creation and economic development.

Reducing fossil fuel financing and investment will eventually lead to a decline in Nigeria's oil production and export. This will affect the country's economy, which relies heavily on oil revenue. The drop in oil revenue will result in a fall in government revenue, reducing public spending on social and economic development programs. The decline in public spending will also significantly affect Nigeria's energy availability and security.

In the study of Aigheyisi et al. (2020), economic development is a factor of energy security, as energy poverty negatively impacts growth, implying that improved access to electricity promotes growth and necessitates development. Therefore, the authors recommend rural and urban electrification expansion to meet domestic and commercial demand, reduction in electricity tariffs; proper design and implementation of policies and programs to encourage domestic investment to mitigate the adverse impacts of energy poverty.

**Figure 2: Global Energy Security and Economic Growth**

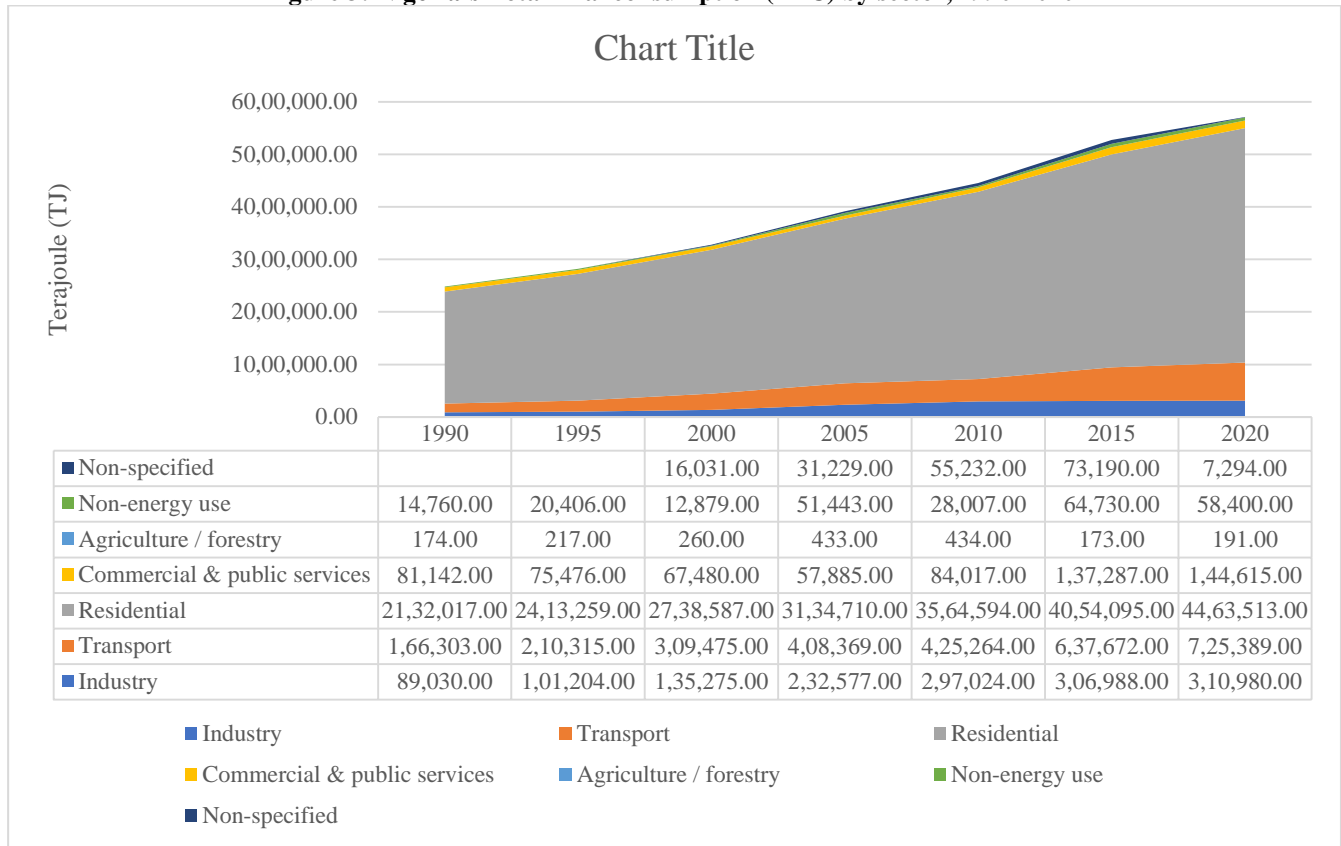


Source: Energy Outlook, BP, Plc.

Figure 2 reveals the impact of the Russian-Ukraine war on global economic growth, which saw a significant decline in world output. In addition, the conflict has created uncertainty for investors, particularly those exposed to Russia and Ukraine. This has led to a slowdown in investment and economic activity, particularly in the affected regions, due to supply and demand disruptions. The decline in economic activity is mainly driven by the commodity price shock associated with the Russia-Ukraine war. However, the direct impact of the commodity price shock largely fades by 2030.

Nigeria has a rapidly growing population of over 211 million, with 133 million people categorised as multidimensionally poor (National Bureau of Statistics [NBS], 2022). As the population grows, so does the energy demand arising from urbanisation and industrialisation. To achieve sustained economic growth and development in Nigeria, energy must be available, accessible, and affordable. While power grid failures have bedevilled the country over the years and hampered business sustainability, Nigeria needs to improve its electricity generation to at least 40,000MW by 2030 (FMP, 2022) to meet the continuous energy demand necessary for sustained economic activities.

Figure 3: Nigeria's Total final consumption (TFC) by sector, 1990-2020



**Source:** IEA World Energy Balances 2022 <https://www.iea.org/data-and-statistics/data-product/world-energy-statistics-and-balances>.

Figure 3 shows the overview of sectoral energy consumption in Nigeria. The residential or domestic sector accounts for 78% of the average energy consumption in Nigeria from 1990 to 2020, followed by the transportation sector, which accounts for 13% of the total energy consumption. The industries and commercial sector share of energy consumption is low.

The energy consumption of the industrial and commercial sectors, which accounts for only 8% on average over the 20 years, as depicted in figure 3 above, must increase. This is because increased production requires more energy. Therefore, a safe and reliable energy supply is essential for companies and industries. Sustainable energy sources such as renewable energy can provide a stable energy source that does not rely on fossil fuels and is subject to price fluctuations and supply disruptions. While 80% of electricity comes from gas, the remainder is from oil. Nigeria is the largest user of oil-fired emergency generators on the African continent (IEA, 2019) and the most significant source of power and energy for the industrial and commercial sectors.

In 2020, the Rural Electrification Agency estimated that nearly 90 million Nigerians do not have access to the electricity grid and that millions of those connected to the grid have less than 12 hours of electricity per day. As a result, economic decline, low living standards, citizen distress and many other adverse effects can be attributed to inadequate energy. Conversely, the supply of energy a constant and stable and is fundamental to the development of a nation.

Accessibility to energy is critical to reducing poverty, improving health outcomes through cleaner energy, and supporting education and economic opportunity. In addition, improving energy efficiency can reduce energy consumption and costs while reducing greenhouse gas emissions. This can be achieved through energy-efficient technologies and practices such as smart buildings, efficient transport systems, and industrial energy management. It is imperative to note that the country's over-reliance on subsidised oil and gas as primary energy sources has hampered its development of renewable energy sources (Gençsü et al., 2022). Therefore, a more comprehensive energy supply mix of different energy sources is required to ensure energy security. While demand for petroleum products in the country is increasing rapidly, the prices of fossil fuels such as natural gas, crude oil and diesel continue to rise; there will eventually be exhausted. Therefore, a national strategy relying on such sources is neither sustainable nor wise, which calls for a radical strategy for increasing the share of renewable energy in the Nigerian energy mix.

### **ENERGY JUSTICE AND THE GLOBAL TRANSITION**

However, much of Nigeria's rural population relies heavily on traditional energy sources, mainly biomass, used by inefficient appliances. These fuels account for over 50% of the country's total energy consumption (IEA, 2019). The disequilibrium between the supply and demand for firewood in some parts of the country threatens the energy security of rural communities. Therefore, improving energy efficiency can better meet the demand while reducing the consumption of scarce energy resources in rural communities.

The issue of energy justice is at the heart of the quest for cleaner and more sustainable energy. The concept of energy justice in the case of Nigeria and many other developing countries on the African continent envisions each country progressing towards net-zero carbon emissions at their own pace. This is based on the socio-economic conditions and the country's carbon footprint. Energy justice is critical to energy security in a fossil fuel-dominated economy. It calls for disseminating and distributing appropriate sustainable energy technologies (Aiken, 2011) to the energy poor in our rural communities who depend heavily on fuelwood. Moreover, they are causing severe environmental degradation through the ongoing desertification in the northern region and the loss of our rainforest in the south affecting forest conservation.

Rural electricity shortages deny nearly half of the nation access to necessities such as lighting and cooling. Therefore, special attention must be paid to diversifying the energy-supply mix in rural areas. An effective energy platform integrated with this diversification strategy will allow rural dwellers to enjoy a conservation culture as they become increasingly energy dependent.

Nigeria's current energy need is mainly powered by natural gas (transition fuel) and hydropower, despite abundant renewable energy sources such as solar, hydropower and wind power. However, despite the challenges posed by the global energy transition, opportunities exist to diversify its energy mix and promote renewable energy sources. Therefore, the government has also initiated policies and programs encouraging renewable energy development, such as the National Renewable Energy and Energy Efficiency Policy (NREEP) and Renewable Energy Master Plan (REMP). These policies and programs provide a framework for renewable energy development in Nigeria, which can help reduce the country's dependence on fossil fuels and promote energy security.

### **CONCLUSION**

Nigeria is confronted with challenges, including insecurity, a high unemployment rate, price instability, and many macroeconomic inefficiencies exacerbated by corruption which has affected the living conditions of the people. In addition, the global transition from fossil to renewable energy has equally threatened a significant source of its revenue with the potential of energy insecurity emanating from underinvestment in the oil and gas industry. Therefore, policymakers must implement effective strategies integrating renewable energy sources and energy efficiency in rural communities to ensure equitable energy distribution and access; improved power sector management and governance would help to reduce outages and transmission losses to steer industrial growth while addressing the underfunding through the creation of Energy banks to promote the inclusiveness in the global transition.



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