

NATURAL GAS AS NIGERIA'S TRANSITION FUEL: ENERGY SECURITY AND DECARBONIZATION IN THE TRANSFORMING ENERGY SYSTEM

INTRODUCTION

Across the world, the attainment of sustainable development and economic growth is closely linked to the availability of reliable, affordable, and environmentally sustainable energy systems. Nations increasingly seek energy sources capable of supporting industrialization; [and] improving living standards while also addressing the growing concerns of climate change and environmental degradation. In the global transition toward cleaner energy systems, natural gas has emerged as a strategic transition fuel because of its relatively lower carbon emissions compared to coal and crude oil¹.

In Nigeria, energy insecurity remains a major developmental challenge despite the country's abundant natural resources². Frequent electricity shortages, inadequate energy infrastructure, dependence on imported refined petroleum products, and limited access to stable power supply continue to hinder economic growth and industrial development. As Africa's largest holder of proven natural gas reserves³ Nigeria increasingly views natural gas as a viable pathway for enhancing energy security, stimulating economic development, and supporting decarbonization efforts within the transforming global energy system. Natural gas is widely considered an important component of the global energy transition because it provides a cleaner alternative to more carbon-intensive fossil fuels. However, despite these perceived benefits, challenges such as gas flaring, environmental pollution, inadequate infrastructure, pipeline vandalism, and policy inconsistencies continue to complicate Nigeria's transition agenda, raising concerns about the extent to which natural gas can effectively contribute to both energy security and decarbonization in Nigeria's transforming energy system⁴. Therefore, the aim of this paper is to examine natural gas as Nigeria's transition fuel, with particular focus on its role in promoting energy security and decarbonization within the transforming energy system.

¹ J Smith, *Energy Transition and Sustainable Development in Africa* (Oxford University Press 2022).

² A Adeyemi and B Okafor, 'Natural Gas and Energy Transition in Nigeria: Prospects and Challenges' (2023) 15 *Journal of Energy Policy and Law* 45.

³ International Energy Agency, *World Energy Outlook 2024* (IEA 2024) <https://www.iea.org/reports/world-energy-outlook-2024> accessed 21st May 2026.

⁴ Federal Republic of Nigeria, *National Gas Policy* (Ministry of Petroleum Resources 2017).

NATURAL GAS AND NIGERIA'S ENERGY SECURITY

Nigeria continues to face a severe energy supply crisis despite being richly endowed with vast deposits of oil, natural gas, coal, and other energy resources. The country's inability to provide adequate and stable electricity supply to households and industries has remained a major obstacle to economic growth and national development. A significant proportion of Nigerians lack access to reliable electricity, while those connected to the national grid frequently experience persistent power outages, unstable voltage, and prolonged blackouts. These have led many houses and businesses to depend heavily on petrol and diesel generators as alternative sources of power supply.

The persistent failure of the electricity sector has negatively affected industrial productivity, agriculture, healthcare delivery, education, and small-scale businesses across the country. The transmission infrastructure remains weak and outdated, with frequent system collapses and inadequate maintenance further worsening the energy crisis. Although several reforms, including the privatization of the power sector and the establishment of regulatory agencies, have been introduced to improve electricity generation and distribution, however, the progress has remained relatively slow⁵.

For example, since President Bola Ahmed Tinubu assumed office in May 2023, Nigeria's national grid has experienced about 13–16 recorded collapses (around 3 in late 2023, about 9 in 2024, and at least 1 in 2025)⁶, reflecting persistent instability in the power sector caused mainly by weak transmission infrastructure, gas supply constraints, and system overload; this frequent collapse undermines the reliability of natural gas as a transition fuel and increases dependence on diesel and petrol generators, thereby worsening overall carbon emissions and weakening Nigeria's decarbonization efforts.

In response to these challenges, natural gas has increasingly been recognized as a strategic solution to Nigeria's energy insecurity. Thus, Nigeria possesses one of the largest proven natural

⁵ Chijioke Nwaobi, 'Energy Crisis and Economic Development in Nigeria' (2020) 8(2) Journal of Energy Studies 45

⁶ Nigerian Electricity Regulatory Commission, Third Quarter Report 2025 (2026)

https://nerc.gov.ng/wp-content/uploads/2026/01/2025_Q3-Report.pdf accessed 21st May, 2026.

gas reserves in Africa, making gas an accessible and relatively affordable energy resource for domestic utilization. Natural gas currently plays a significant role in electricity generation in Nigeria and is considered more environmentally friendly than other fossil fuels such as coal and oil because it emits lower levels of greenhouse gases⁷.

The growing reliance on natural gas is based on its potential to improve electricity generation, support industrialization, reduce dependence on imported petroleum products, and enhance economic productivity. Furthermore, natural gas is viewed as an important transition fuel capable of supporting Nigeria's movement toward cleaner⁸ and more sustainable energy systems while ensuring energy security for its rapidly growing population.

However, despite its enormous potential, the effective utilization of natural gas in Nigeria continues to face several challenges, including inadequate infrastructure, pipeline vandalism, gas flaring, poor policy implementation, and insufficient investment in the energy sector. These challenges have limited the country's ability to maximize its gas resources for sustainable energy development and long-term energy security.

NATURAL GAS AND DECARBONIZATION

The growing concern over climate change and environmental degradation has increased the global demand for cleaner and more sustainable energy systems⁹. Countries across the world are increasingly adopting decarbonization strategies aimed at reducing greenhouse gas emissions while maintaining economic growth and energy security. Thus, decarbonization refers to the gradual reduction of carbon emissions arising from energy production and consumption, particularly from fossil fuels such as coal and crude oil. In this global energy transition, natural gas has emerged as a relatively cleaner alternative because it produces lower carbon emissions compared to other conventional fossil fuels¹⁰.

⁷ Olasupo Shittu, 'Pipeline Vandalism and Energy Infrastructure in Nigeria' (2019) 6(3) Nigerian Journal of Public Policy 102

⁸ Sambo AS, 'Strategic Developments in Renewable Energy in Nigeria' (2009) 13 International Association for Energy Economics 15.

⁹Ibid.

¹⁰ Chijioke Nwaobi, 'Energy Crisis and Economic Development in Nigeria' (2020) 8(2) Journal of Energy Studies 45

Nigeria's energy sector remains heavily dependent on oil and natural gas for electricity generation and industrial activities. While these resources contribute significantly to economic development¹¹, they are also associated with environmental pollution and greenhouse gas emissions¹². The continued use of carbon-intensive fuels, coupled with practices such as gas flaring, oil spills, and inefficient energy infrastructure, has contributed to environmental challenges including air pollution, climate change, desertification, flooding, and ecosystem degradation. Consequently, the need for cleaner and more sustainable energy alternatives has become increasingly important.

Natural gas is widely regarded as an important transition fuel in the global decarbonization agenda because it emits less carbon dioxide than coal and oil during combustion¹³. Its utilization in electricity generation, industrial production, and domestic energy supply offers the potential to reduce carbon emissions while ensuring stable energy access. Furthermore, recent technological advancements and mitigation strategies aimed at reducing methane leakage, gas flaring, and emissions across the natural gas supply chain have strengthened arguments in favour of natural gas as a decarbonization strategy¹⁴.

Also, the integration of renewable natural gas, hydrogen blending, carbon capture and storage technologies, and cleaner gas production methods has further enhanced the environmental potential of natural gas within the transforming energy system. Studies have shown that combining multiple mitigation strategies throughout the natural gas value chain can significantly reduce methane emissions and improve environmental sustainability.

However, despite its relative environmental advantages, debates continue regarding the long-term sustainability of natural gas in achieving global climate objectives. Critics argue that methane leakages associated with natural gas production and transportation remain a major environmental concern because methane is a highly potent greenhouse gas. Others contend that

¹¹ Ibid.

¹² Adebayo Olukayode, 'Natural Gas Utilization and Energy Security in Nigeria' (2021) 12(1) African Journal of Energy Law 67

¹³ Olasupo Shittu, 'Pipeline Vandalism and Energy Infrastructure in Nigeria' (2019) 6(3) Nigerian Journal of Public Policy 102

¹⁴ Ibid.

excessive reliance on natural gas may delay investment in renewable energy technologies such as solar, wind, and hydroelectric power.

Nevertheless, for developing countries such as Nigeria, natural gas continues to be viewed as a practical transition fuel capable of balancing economic development, energy security, and environmental sustainability. It therefore remains an important component of Nigeria's broader strategy toward achieving decarbonization within the transforming global energy system.

CHALLENGES

1. INADEQUATE GAS INFRASTRUCTURE

Nigeria possesses about 206 trillion cubic feet (TCF) of proven natural gas reserves, yet limited pipelines, processing facilities, and storage systems restrict efficient utilization¹⁵. This infrastructural deficit leads to unreliable gas supply to power plants and industries, undermining efforts to improve electricity generation, energy security, and decarbonization¹⁶.

2. GAS FLARING AND ENVIRONMENTAL HARM

Nigeria continues to flare an estimated 300–400 million standard cubic feet of gas daily, releasing greenhouse gases such as carbon dioxide and methane into the atmosphere. This not only wastes valuable energy resources but also contributes to climate change, air pollution, and serious health risks in host communities¹⁷.

3. WEAK POLICY IMPLEMENTATION AND REGULATORY GAPS

Although Nigeria has developed key frameworks such as the Gas Master Plan and flare reduction initiatives, implementation remains inconsistent due to weak enforcement and frequent policy

¹⁵ Olasupo Shittu, 'Pipeline Vandalism and Energy Infrastructure in Nigeria' (2019) 6(3) Nigerian Journal of Public Policy 102

¹⁶ Osise O Okwilagwe and Olusanya E Olubusoye, 'Environmental Economic Impacts and Policy Pathways of Gas Flaring in Nigeria from 2002 to 2024' (2025) 3 Discover Environment 183.

¹⁷ The Guardian, 'Gas flaring created 389m tonnes of carbon pollution last year, report finds' (18 July 2025).

shifts. This regulatory instability discourages long-term investment and slows progress in the gas sector¹⁸.

4. LIMITED INVESTMENT AND HIGH CAPITAL REQUIREMENTS

The development of gas infrastructure is capital intensive, yet Nigeria continues to face difficulties attracting adequate investment due to perceived risks such as insecurity, policy inconsistency, and weak infrastructure. This limits expansion in gas-to-power projects and industrial gas utilization¹⁹.

5. OVERDEPENDENCE ON FOSSIL FUELS

Over 80% of Nigeria's electricity generation still depends on fossil fuels, particularly natural gas and oil, while renewable energy contribution remains relatively low. This heavy reliance increases carbon emissions and limits diversification into cleaner and more sustainable energy sources²⁰.

RECOMMENDATIONS

1. Nigeria should prioritize the expansion of gas pipelines, processing plants, and storage facilities to improve the effective transportation and utilization of gas for electricity generation and industrial development²¹.
2. The government should strengthen the enforcement of anti-gas flaring laws and promote gas capture technologies capable of converting flared gas into useful energy resources for domestic²² and industrial consumption.
3. Nigeria should ensure consistency in energy policies and strengthen regulatory institutions to improve policy implementation, transparency, and investor confidence within the gas sector.²³

¹⁸ Reuters, 'Nigeria issues permits for gas-flaring project, targets \$2 billion investment and 3 GW power potential' (12 December 2025).

¹⁹ Godwin O Aigbe, Lindsay C Stringer and Matthew Cotton, 'Gas Flaring in Nigeria: A Multi-level Governance and Policy Coherence Analysis' (2023) 2 *Anthropocene Science* 31–47.

²⁰ Ibid.

²¹ A A Oyedepo, 'Energy and Sustainable Development in Nigeria: The Role of Natural Gas' (2012) 5 *Energy, Sustainability and Society* 1

²² S A Adeyemi and T O Oluwasanmi, 'Gas Flaring and Environmental Regulation in Nigeria's Oil and Gas Sector' (2019) 11 *International Journal of Energy Economics and Policy* 112

²³ A C Nwoke, *Energy Law and Policy in Nigeria* (Princeton & Associates Publishing 2019)

4. Government should encourage both local and foreign investment in gas infrastructure through tax incentives, public-private partnerships, and improved security for energy facilities and investments²⁴.
5. Nigeria should diversify its energy mix by increasing investment in renewable energy sources such as solar, wind, and hydropower while utilizing natural gas as a cleaner transition fuel²⁵.

CONCLUSION

Natural gas plays a strategic role in Nigeria's energy transition, serving as a bridge between fossil fuel dependence and a cleaner, more sustainable energy future. With proven reserves of over 206 trillion cubic feet, it has strong potential to enhance energy security, drive industrial growth, and support economic development. However, this potential is limited by infrastructural gaps, insecurity, policy inconsistency, environmental concerns, and low investment, all of which hinder effective utilization. To fully benefit from natural gas as a transition fuel, Nigeria must address these challenges while integrating gas development with renewable energy expansion, improved governance, and sustainable environmental practices²⁶. Finally, natural gas should function as a transitional tool toward a diversified, low-carbon energy system that balances economic growth with climate responsibility.

²⁴ Ibid.

²⁵ S A Adeyemi and T O Oluwasanmi, 'Gas Flaring and Environmental Regulation in Nigeria's Oil and Gas Sector' (2019) 11 International Journal of Energy Economics and Policy 112

²⁶ A A Oyedepo, 'Energy and Sustainable Development in Nigeria: The Role of Natural Gas' (2012) 5 Energy, Sustainability and Society 1