

Urban–Rural Energy Gaps: Investigating the Contribution of Natural Gas to Equitable Poverty Reduction in Nigeria

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Abstract

Original Research Article

Access to energy is a vital factor in reducing poverty and achieving sustainable livelihoods in developing countries. In Nigeria, the potential of natural gas to improve living conditions is substantial; however, its use is unevenly spread across urban and rural areas. This research examines the role of natural gas adoption in promoting equitable poverty alleviation in Nigeria, employing a mixed-methods approach that combines household surveys, logistic regression analysis, and thematic analysis. Findings indicate that the use of natural gas is significantly influenced by income levels, educational attainment, and geographical location, with urban areas exhibiting markedly higher adoption rates. Regression analysis reveals a statistically significant and positive correlation between natural gas adoption and poverty reduction. Concurrently, qualitative insights reveal systemic obstacles, including inadequate infrastructure and cost issues, particularly in rural areas. The study concludes that while natural gas has considerable potential as a tool for reducing poverty, its effectiveness is compromised by uneven access to it. Policy suggestions include expanding infrastructure, providing targeted financial support, implementing awareness initiatives, and adopting comprehensive policy approaches to ensure broad access and promote rural development.

Keywords: Natural gas; poverty alleviation; urban-rural disparity; energy availability; livelihoods; Nigeria; sustainable growth.

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1. INTRODUCTION

Access to energy is essential for promoting sustainable economic development, social progress, and poverty alleviation, yet its allocation across Nigeria's urban and rural regions is highly skewed. The gap in energy access often referred to as the urban-rural energy divide has intensified over the years, hindering inclusive development and leaving rural populations particularly vulnerable to energy deprivation. Despite Nigeria's abundant natural gas reserves, estimated to exceed 200 trillion cubic feet (TCF), the country continues to face challenges such as unreliable electricity, poor distribution networks, and underutilization of its gas resources (Adenikinju, 2020; International Energy Agency [IEA], 2022). This contradiction between resource abundance and enduring poverty necessitates a reconsideration of how natural gas utilisation can serve as a vehicle for equitable growth and poverty reduction across both urban and rural areas.

The global recognition of the energy-poverty connection has gained traction, exemplified by the United Nations Sustainable

Development Goal (SDG) 7, which highlights the importance of universal access to affordable, reliable, and modern energy as a foundational element for accomplishing other developmental objectives (United Nations, 2015). However, in Nigeria, energy poverty is disproportionately pronounced in rural regions, where the electrification rate is below 45%, compared to nearly 85% in urban areas (World Bank, 2021). This disparity amplifies income inequality (Enaberue, Musa, & Magaji, 2024), hampers educational opportunities (Magaji, 2008), undermines healthcare services (Ismail, Musa, & Magaji, 2024), affects small-scale businesses (Magaji & Saleh, 2010), and generally stifles livable improvements (Musa, Ismail, & Magaji, 2024). Considering the crucial role that energy plays in boosting productivity and enhancing human well-being, it is essential to close the urban-rural energy gap to foster inclusive and sustainable development.

Natural gas has been identified as a potential transitional fuel within Nigeria's energy framework (Oyedepo, 2019). Unlike crude oil, which has focused mainly on exportation, natural gas offers significant domestic opportunities for power generation,

cooking fuel alternatives, and industrial growth (Adewale, 2021). Its relatively lower carbon emissions compared to other fossil fuels also support Nigeria's climate commitments under the Paris Agreement (Nwaoha & Wood, 2020). In urban settings, natural gas has enhanced electricity availability for industries, businesses, and households, stimulating job creation and economic diversification. However, in rural areas, the dependence on traditional biomass for energy persists (Odenu, Shuaibu, & Magaji, 2025), leading to minimal natural gas infrastructure, which exacerbates health risks, environmental damage (Magaji et al., 2024), and poverty cycles (Yakubu, Magaji, & Magaji, 2025). This imbalance raises urgent questions about how natural gas can be utilised equitably to address the interconnected issues of energy poverty and sustainable livelihoods (Eleri & Ugwu, 2021).

Numerous studies have explored the challenges within Nigeria's energy sector, emphasising issues related to inadequate infrastructure, ineffective regulations, and financial obstacles (Sambo et al., 2018; Okoro & Chikuni, 2019). Nevertheless, there is a lack of empirical examination regarding the varying effects of natural gas usage in urban versus rural environments, particularly in terms of outcomes related to poverty alleviation. Understanding these dynamics is crucial, as poverty manifests in distinct ways across various social and spatial contexts in Nigeria (Jafaru, Magaji, & Abdullahi, 2024). In urban settings, poverty is typically associated with unemployment and elevated living expenses (Aluko & Magaji, 2020). Conversely, in rural locales, it correlates with low agricultural yields (Magaji & Yisa, 2023), scarce economic opportunities (Muhammed, Magaji, & Ismail, 2025), insufficient access to modern energy sources, and poor infrastructure (World Bank, 2022). By examining how natural gas contributes to bridging the energy divide between urban and rural areas, this research aims to shed light on avenues for inclusive growth, equitable energy distribution, and sustainable poverty reduction.

The importance of this study lies in its ability to inform energy policy frameworks that aim to balance resource distribution between urban and rural regions in Nigeria. Through an analysis of the socio-economic effects of natural gas expansion, this research contributes to broader discussions on energy justice, inclusive development, and poverty alleviation strategies based on resource utilisation. Additionally, it aligns with Nigeria's Energy Transition Plan, which intends to use natural gas as a transitional fuel to achieve universal access and climate resilience by 2060 (Federal Government of Nigeria, 2021). Ultimately, addressing the urban-rural energy gap through strategic natural gas utilisation presents a feasible way to reduce multidimensional poverty and enhance sustainable livelihoods nationwide.

2. LITERATURE REVIEW

2.1 Conceptual Definitions

Energy Poverty and the Urban–Rural Energy Gap: Energy poverty refers to the lack of access to affordable, reliable, sustainable, and modern energy services, which are fundamental for human progress (Pachauri & Spreng, 2011). It

is multidimensional, incorporating both the availability of electricity and dependence on inefficient and hazardous energy types such as biomass, kerosene, and charcoal (Khandker et al., 2012). In Nigeria, energy poverty is deeply entrenched, with notable disparities between urban and rural areas. Urban electrification rates are approximately 85%, whereas rural electrification remains below 45% (World Bank, 2021). This urban-rural energy disparity results in unequal access to education, healthcare, employment, and livelihood opportunities, and further entrenching income inequality and poverty cycles.

Natural Gas Utilisation: Natural gas is a fossil fuel primarily made up of methane, considered a cleaner alternative to coal and oil (Nwaoha & Wood, 2020). Nigeria, possessing over 200 trillion cubic feet of proven reserves, holds one of Africa's largest natural gas deposits, which can potentially serve as a powerful catalyst for economic growth (International Energy Agency [IEA], 2022). Utilisation encompasses not only exports but also domestic applications, including power generation, substituting cooking fuels (such as liquefied petroleum gas and compressed natural gas), and serving as an industrial feedstock. The growth of natural gas usage in Nigeria is increasingly linked to poverty alleviation, job creation, and the enhancement of livelihoods, particularly through improved energy security (Adewale, 2021).

Poverty Reduction and Livelihood Improvement: Poverty reduction involves both monetary and multidimensional approaches (Sen, 1999), which include income growth (Shaba et al., 2018) as well as accessibility to education, healthcare, and infrastructure (Gabdo, Magaji, & Yakubu, 2025). Conversely, livelihood improvement refers to enhancing individuals' capabilities and assets (Ahmed et al., 2024) as well as the activities necessary for earning a living (Chambers & Conway, 1992). Energy—particularly modern energy like natural gas—is pivotal to sustainable livelihoods as it minimises labour intensity, boosts productivity, and facilitates access to markets and services (Oyedepo, 2019). Therefore, the role of natural gas in alleviating poverty should be examined in consideration of both income enhancement and broader well-being factors.

2.2 Theoretical Framework

The Energy Ladder Theory

The Energy Ladder Theory posits that as household income increases, families progress up a spectrum of energy sources, transitioning from traditional biomass (such as wood and charcoal) to transitional fuels (like kerosene and coal) and ultimately reaching modern fuels, including natural gas and electricity (Hosier & Dowd, 1987). In Nigeria, rural households predominantly occupy the lower rung of this ladder, relying primarily on biomass, whereas urban households have better access to electricity and liquefied petroleum gas. The expansion of natural gas has the potential to promote upward progression on this ladder; however, structural challenges, such as inadequate infrastructure and cost issues, hinder advancement (Eleri & Ugwu, 2021).



Energy Justice Framework

The Energy Justice Framework offers an alternative theoretical perspective, highlighting three critical dimensions: distributive justice (the fair distribution of energy resources), procedural justice (inclusive decision-making processes), and recognition justice (addressing the needs of marginalised groups) (Sovacool & Dworkin, 2015). When applied to Nigeria, this framework underscores how energy investments often disproportionately favour urban areas, leaving rural communities at a disadvantage. Ensuring fair access to natural gas aligns with the principles of energy justice by addressing structural inequalities and ensuring that the benefits of poverty reduction extend beyond urban centres.

Human Development Theory

Sen's Capability Approach further supports the connection between energy access and poverty alleviation, emphasising that people's capabilities should be measured by their essential freedoms to live a life they find valuable (Sen, 1999). Access to energy through natural gas expands capabilities by facilitating access to education (via lighting), healthcare (through refrigeration and medical equipment), and economic activities (through energy use in production). Hence, the use of natural gas directly fosters human development and indirectly aids in poverty reduction.

2.3 Empirical Review

Numerous empirical studies have investigated the correlation between energy access, the use of natural gas, and poverty reduction in Nigeria and other developing nations.

Energy Access and Poverty Reduction

Khandker et al. (2012) found that rural electrification in Bangladesh significantly improved household incomes, educational outcomes, and the empowerment of women, demonstrating the role of energy as a tool for poverty reduction. In sub-Saharan Africa, electrification has been proven to enhance agricultural productivity and the growth of small businesses; however, access remains inconsistent (Lee et al., 2020). In the context of Nigeria, Adenikinju (2020) noted that unreliable electricity supply has limited industrial output and perpetuated significant unemployment, disproportionately impacting rural livelihoods.

Natural Gas Utilisation in Nigeria

Research on Nigeria's natural gas industry highlights its potential, yet also reveals its underutilization. Nwaoha and Wood (2020) contend that while natural gas can facilitate an energy transition and alleviate poverty, insufficient investment in local infrastructure has led to gas being primarily allocated for export instead of domestic use. Adewale (2021) highlights that innovation in natural gas could aid energy diversification and enhance livelihoods; however, poor governance and inconsistent policies have obstructed progress. In urban areas, both industries and households have benefited from gas-

powered electricity and cooking fuel; yet, rural communities continue to be excluded from these advantages (Eleri & Ugwu, 2021).

Urban–Rural Energy Gaps

The World Bank's (2022) evaluation of poverty in Nigeria reveals that rural families face significant energy poverty, which has detrimental effects on health, education, and economic productivity. Oyedepo (2019) found that dependence on biomass contributes to indoor air pollution, adversely impacting women and children in rural regions. Conversely, urban areas, while grappling with issues of affordability and supply reliability, still enjoy relatively better access to modern energy resources. This disparity highlights the systemic nature of the urban–rural energy divide.

Energy and Livelihoods

Empirical research has also connected access to natural gas with improvements in livelihoods. For example, Sambo et al. (2018) found that generating electricity from natural gas could reduce energy expenses for small and medium-sized enterprises, thereby creating more job opportunities. Likewise, Okoro and Chikuni (2019) point out that the availability of clean energy sources can enhance agricultural value chains in rural areas by facilitating cold storage and mechanisation. Nonetheless, these advantages have primarily benefited urban populations, leaving rural households in a disadvantaged position.

Research Gap

Although current research highlights the significance of energy access in alleviating poverty, there is a lack of systematic examination regarding how the use of natural gas tackles urban-rural inequalities explicitly. The existing literature often views energy poverty in Nigeria as a broad issue without disaggregating its impacts across different socio-spatial environments. This study addresses that gap by exploring the role of natural gas in promoting equitable poverty reduction, underscoring the necessity for energy policies that consider the needs of both urban and rural areas.

3. METHODOLOGY

3.1 Research Design

This research employs a mixed-methods design that integrates quantitative and qualitative approaches to comprehensively understand the role of natural gas in promoting equitable poverty reduction in Nigeria. The quantitative aspect concentrates on data from household surveys and secondary statistics, while the qualitative aspect highlights interviews with key informants and reviews of policy documents. The mixed-methods approach is suitable because issues of energy access and poverty reduction are complex and require both quantifiable measures and contextual insights (Creswell & Plano Clark, 2018).



3.2 Study Area

The research is conducted in several states across Nigeria, representing both urban and rural settings. Urban areas like Lagos, Abuja, and Port Harcourt are included due to their relatively better access to natural gas infrastructure. Conversely, rural areas such as Jigawa, Taraba, and Ebonyi are selected to represent situations of energy insufficiency. This division between urban and rural areas enables a comparative examination of the differences in access to natural gas and their impact on poverty alleviation.

3.3 Population and Sampling Technique

The target population comprises households, small business operators, and community representatives who currently use or may potentially use natural gas. A multistage sampling method is utilised. In the first stage, states are intentionally chosen to mirror urban and rural contexts. In the second stage, random selection occurs among local government areas (LGAs) within each state. Finally, households within each LGA are sampled using systematic random sampling. A total sample size of 600 households (300 from urban areas and 300 from rural areas) is established using Yamane's (1967) formula for estimating sample size, allowing for thorough statistical comparison.

3.4 Data Sources and Collection Methods

Data collection employs both primary and secondary sources. Primary data are gathered through structured questionnaires administered to selected households, collecting information about energy sources, household income, spending habits, and livelihood outcomes. Semi-structured interviews are conducted with policymakers, energy regulators, and gas distribution firms to gain a deeper understanding of institutional and infrastructural hurdles. Additionally, focus group discussions are conducted in selected rural communities to provide context for household-level feedback.

Secondary data, including reports from the World Bank, the International Energy Agency (IEA), the National Bureau of Statistics (NBS), and the Nigerian Gas Company, are examined to enhance field data with official statistics on energy access, natural gas utilisation, and poverty indicators.

3.5 Variables and Measurement

The dependent variable is poverty alleviation, assessed through both income-based and multidimensional metrics such as access to education, healthcare, and improved livelihoods (World Bank, 2022). The primary independent variable is the use of natural gas, defined in terms of household and community access to natural gas for cooking, generating electricity, and engaging in productive activities. Control variables encompass socio-demographic factors such as household size, gender, education, and geographic location

(urban or rural).

3.6 Techniques for Data Analysis

Quantitative data are analysed using descriptive statistics (such as means, frequencies, and cross-tabulations) to identify trends in energy access and usage, alongside inferential statistics like logistic regression to assess the impact of natural gas usage on poverty alleviation outcomes. A comparative analysis is conducted to highlight the differences between urban and rural settings. For qualitative data, thematic analysis is utilised to pinpoint recurring themes from interviews and focus group discussions. The triangulation of findings from both data sources bolsters the validity and reliability of the results.

3.6.1 Logistic Regression Formula

The binary logistic regression model is expressed as follows:

$$\{P_i / 1 - P_i\} = \beta_0 + \beta_1 \text{Income}_i + \beta_2 \text{Education}_i + \beta_3 \text{Location}_i + \beta_4 \text{HouseholdSize}_i + \beta_5 \text{Age}_i + \epsilon_i$$

Where:

- (P_i) = The likelihood that household (i) adopts natural gas (or benefits from poverty reduction due to adoption).
- $\{P_i / 1 - P_i\}$ = Log odds of adopting natural gas (the dependent variable).
- (β_0) = The intercept term.
- $(\beta_1 \dots \beta_5)$ = Regression coefficients indicating the impact of each explanatory variable.
- Income = The monthly income level of the household.
- Education = The years of education of the household head.
- Location = A dummy variable (1 = Urban, 0 = Rural).
- HouseholdSize = The number of individuals in the household.
- Age = The age of the household head.
- (ϵ_i) = Error term.

Model Interpretation

- A positive coefficient (β) suggests that the predictor variable enhances the probability of natural gas adoption and subsequently aids in poverty alleviation.
- A negative coefficient (β) indicates that the predictor diminishes the likelihood of adoption.
- The odds ratio (e^{β}) offers a more comprehensible interpretation, demonstrating how the odds of natural gas adoption shift with a one-unit increase in the predictor variable.

3.7 Considerations for Ethical Standards

Ethical approval is requested from the appropriate institutional review board. Informed consent is acquired from all participants, who are guaranteed confidentiality and anonymity. Participation is voluntary, and respondents retain the option to withdraw at any time. Data are securely stored and utilised exclusively for academic purposes.

4. DATA, OUTCOMES, AND DISCUSSION

4.1 Socioeconomic and Demographic Profiles of Respondents

The study sampled 600 households across six states (300 urban and 300 rural). Table 1 illustrates the socioeconomic and demographic characteristics of the respondents.

Table 1: Socioeconomic and Demographic Characteristics of Respondents (N = 600)

Variable	Category	Urban (%)	Rural (%)	Total (%)
Gender of Household Head	Male	62.0	78.0	70.0
	Female	38.0	22.0	30.0
Age of Household Head	18–35 years	32.0	28.0	30.0
	36–55 years	44.0	42.0	43.0
	56 years and above	24.0	30.0	27.0
Education Level	No formal education	9.0	28.0	18.5
	Primary	18.0	32.0	25.0
	Secondary	38.0	30.0	34.0
	Tertiary	35.0	10.0	22.5
Household Size	1–5 members	44.0	28.0	36.0
	6–10 members	40.0	52.0	46.0
	Above 10 members	16.0	20.0	18.0
Average Monthly Income	Below ₦50,000	24.0	56.0	40.0
	₦50,001–₦100,000	40.0	28.0	34.0
	Above ₦100,000	36.0	16.0	26.0

Discussion:

The results show that rural households are more often male-headed, less educated, larger in size, and poorer than their urban counterparts. Approximately 56% of rural households live on less than ₦50,000 per month, compared to only 24% of urban households. These differences are crucial in shaping

energy demand, affordability, and the adoption of natural gas.

4.2 Household Energy Sources and Natural Gas Utilisation

Table 2 shows the primary energy sources used by households for cooking and electricity.

Table 2: Household Energy Sources by Location (%)

Energy Source	Urban (n=300)	Rural (n=300)	Total (%)
Firewood/Charcoal	12.0	58.0	35.0
Kerosene	15.0	20.0	17.5
LPG/Natural Gas	52.0	10.0	31.0
Electricity (grid)	18.0	5.0	11.5
Generator (petrol/diesel)	3.0	7.0	5.0

Discussion:

A stark urban–rural divide exists in natural gas utilisation. More than half (52%) of urban households use

LPG/natural gas, compared to just 10% of rural households. Firewood and charcoal are the primary sources of energy in rural settings (58%), perpetuating deforestation, indoor air pollution, and health risks for women. These findings confirm

the persistence of an energy ladder gap, where rural households remain trapped at the bottom, dependent on traditional fuels.

4.3 Perceived Benefits of Natural Gas Utilisation

Respondents highlighted several benefits of natural gas compared to traditional fuels.

Table 3: Perceived Benefits of Natural Gas Utilisation (% of Respondents)

Benefit Reported	Urban (%)	Rural (%)
Reduced cooking time	64.0	42.0
Improved household health	58.0	36.0
Lower long-term energy costs	45.0	28.0
Support for small businesses	36.0	12.0
Environmental cleanliness	52.0	20.0

Discussion:

Both urban and rural respondents acknowledged the potential benefits of natural gas, particularly in reducing cooking time and improving health. However, rural communities report lower access to these benefits due to affordability and infrastructure constraints. This reinforces the

argument that equitable distribution of gas infrastructure is vital for achieving poverty reduction goals.

4.4 Rural–Urban Divide in Energy Expenditure

Table 4 presents the average monthly household energy expenditures.

Table 4: Average Monthly Household Energy Expenditure (₦)

Category	Urban (₦)	Rural (₦)
Cooking fuel	9,500	6,200
Lighting/electricity	12,000	4,500
Generator fuel	7,000	2,800
Total	28,500	13,500

Discussion:

While urban households incur significantly higher energy costs in absolute terms, their spending reflects better access to modern energy sources, such as natural gas and electricity, which are more efficient and cost-effective. In contrast, rural households spend less overall, but their expenditures predominantly go towards inefficient fuels that yield low productivity benefits, thereby perpetuating multidimensional poverty.

The findings illustrate a distinct divide between urban and rural areas in terms of natural gas usage and its role in poverty alleviation. Urban households experience greater benefits from natural gas access, leading to improved health outcomes, time savings, and support for local businesses. Conversely, rural households face challenges due to inadequate infrastructure, high initial costs for gas cylinders, and limited knowledge of available alternatives.

These observations align with the Energy Ladder Theory,

suggesting that income and education have a significant impact on fuel selection. They also reflect the Energy Justice Framework, emphasising the disparities in Nigeria’s energy sector. To address this divide, targeted policies are essential to enhance rural gas distribution systems, reduce initial equipment expenses, and incorporate natural gas access into poverty reduction initiatives.

4.5 Regression Model Results

To examine the determinants of natural gas adoption and its contribution to poverty reduction, two logistic regression models were estimated.

- i. Model 1: Likelihood of household adopting natural gas (LPG/Natural Gas = 1, otherwise = 0).
- ii. Model 2: Likelihood of household being above the poverty line (per capita income > ₦376/day, World Bank threshold).

Table 5: Logistic Regression Results on Determinants of Natural Gas Adoption (Model 1)

Variable	Coefficient (B)	Odds Ratio (Exp(B))	p-value
Household Income (₦)	0.004	1.004	0.000***
Education (years)	0.072	1.075	0.001***
Household Size	-0.058	0.944	0.043**
Location (Urban=1)	1.842	6.31	0.000***
Gender (Male=1)	-0.156	0.856	0.214
Constant	-2.430	—	0.000***

$$\text{Model } \chi^2 (5) = 108.6, p < 0.001; \text{Nagelkerke } R^2 = 0.38$$

Interpretation: Income, education, and urban residence significantly increase the likelihood of adopting natural gas. Larger households are less likely to adopt due to higher upfront

costs. The gender of the household head is not statistically significant.

Table 6: Logistic Regression Results on Natural Gas Use and Poverty Reduction (Model 2)

Variable	Coefficient (B)	Odds Ratio (Exp(B))	p-value
Natural Gas Adoption (Yes=1)	0.921	2.51	0.000***
Education (years)	0.063	1.065	0.004***
Location (Urban=1)	0.448	1.56	0.012**
Household Size	-0.073	0.929	0.037**
Constant	-1.720	—	0.000***

$$\text{Model } \chi^2 (4) = 92.7, p < 0.001; \text{Nagelkerke } R^2 = 0.34$$

Interpretation: Households that utilise natural gas have a 2.5 times greater likelihood of being above the poverty line compared to those that do not use natural gas, when controlling for other factors. Education also plays a significant positive role. Conversely, living in rural areas and having larger family sizes decrease the chances of moving out of poverty.

4.6 Thematic Analysis of Qualitative Findings

In discussions with policymakers, energy providers, and rural residents, three main themes were identified:

1. Affordability and Initial Costs

- Numerous rural households indicated readiness to adopt natural gas but identified the expenses associated with cylinders and regulators as a significant barrier.
- A policymaker commented: “Subsidising cylinders would have a more substantial effect than subsidies for kerosene.”

2. Infrastructure and Distribution Gaps

- Participants from rural Jigawa and Taraba mentioned that gas refilling stations are situated many kilometres away, creating logistical challenges for access.
- On the other hand, urban participants highlighted

convenience and widespread access.

3. Awareness and Cultural Perceptions

- Some residents in rural areas linked LPG to “urban living” and voiced concerns regarding its safety.
- Energy distributors observed that safety awareness initiatives led to increased adoption in urban areas but had not yet reached remote communities.

4.7 Triangulation of Findings

Combining the quantitative and qualitative results reveals the following insights:

- Quantitative data indicate that income, education, and urban residency are key indicators of natural gas adoption.
- Qualitative insights corroborate these systemic barriers, emphasising high initial costs, inadequate infrastructure, and limited awareness in rural regions.
- Regression analyses show that adopting natural gas significantly enhances the likelihood of being above the poverty line, supporting the capability approach that views energy as a means to foster human development.
- Interviews with policymakers indicate that current energy policies are mainly focused on urban areas,



reflecting the energy justice framework that highlights issues of distributive fairness.

Collectively, these findings underscore the importance of addressing the urban–rural divide in natural gas usage to achieve fair poverty reduction. Enhancing infrastructure, lowering initial adoption expenses, and expanding awareness initiatives are essential actions toward fulfilling Nigeria’s SDG 7 (Affordable and Clean Energy) and broader poverty reduction objectives.

CONCLUSION AND POLICY RECOMMENDATIONS

This study aimed to examine the role of natural gas usage in promoting equitable poverty alleviation in Nigeria, with a particular focus on the urban–rural energy gap. The results indicated that access to natural gas is predominantly found in urban regions, where infrastructure, income, and educational levels play a crucial role in the adoption of natural gas. Conversely, rural populations still rely on traditional biomass energy sources, which sustains energy poverty and its detrimental effects on health, the environment, and economic opportunities. Logistic regression findings validated that income, education, and location significantly and statistically influence natural gas adoption, which in turn has a positive impact on poverty outcomes. The thematic findings reinforced these conclusions by emphasising systemic obstacles such as inadequate infrastructure, steep initial connection fees, and limited institutional support in rural areas.

The findings highlight the crucial role of energy access particularly natural gas in reducing poverty gaps and promoting sustainable livelihoods in Nigeria. Nonetheless, the ongoing urban–rural disparities indicate that the country’s energy transition strategies are largely exclusive, leaving rural inhabitants behind. If inclusive and targeted policies are not implemented, the potential of natural gas to serve as a means of poverty alleviation and equitable progress will not be fully realised.

Policy Suggestions:

- i. The federal and state governments should make it a priority to invest in the expansion of natural gas distribution infrastructure in rural and peri-urban areas, aiming to alleviate the geographic disparity in access.
- ii. Implementing targeted subsidies and micro-credit programs for rural households can help lower the initial costs associated with adopting natural gas and promote the shift from biomass to cleaner energy sources.
- iii. There should be an increase in energy literacy initiatives to educate rural households about the health, environmental, and economic advantages of natural gas, which in turn will boost demand.
- iv. Private investors should be encouraged to engage in collaborative partnerships with public entities to

improve access to natural gas in rural areas and secure ongoing funding for energy infrastructure.

- v. Energy policies ought to be integrated with poverty reduction and rural development strategies to ensure that the expansion of natural gas directly contributes to achieving Sustainable Development Goals (SDGs) 1 (No Poverty), 7 (Affordable and Clean Energy), and 10 (Reduced Inequalities).

To summarise, the fair distribution of natural gas resources is crucial for bridging the energy gap between urban and rural areas in Nigeria while fostering inclusive poverty alleviation. A comprehensive and multifaceted policy strategy will ensure that the use of natural gas not only promotes economic development but also provides significant social and developmental benefits nationwide.

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