

## TRANSITIONING TRANSPORTATION TO COMPRESSED NATURAL GAS (CNG): A STRATEGY FOR SUSTAINABLE EDUCATIONAL DEVELOPMENT IN NIGERIA

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### **Abstract**

This study investigated “Transitioning Transportation to Compressed Natural Gas (CNG): A Sustainable Educational Development Strategy for Nigeria.” It is a theoretical research work. The target population includes staffers and members of Nigeria Tertiary Institutions as well as educational stakeholders at both federal to state levels. Data were collected from both primary and secondary sources including anecdotal evidence, which was compared with reviewed literatures. The findings reveal that twelve (12) countries around the world have adopted CNG powered vehicles in significant numbers for transportation. In contrast, only three (3) cities in the world are currently in the use of CNG-powered buses for public transport. The study also finds that, natural gas is abundantly available in Nigeria, with reserves measured in trillions of cubic feet (TCF). However, only a small portion of this resource has been explored and compressed and there is currently zero percent net exportation of natural gas. Another finding is that CNG is significantly cheaper to Premium Motor Spirit (PMS) when comparing cost efficiency and distance coverage. For instance, 9kg of CNG costing ₦2,070 can cover approximately 150-160 kilometers, whereas 12.5 litres of PMS (# 870 per litres = ₦10,875 covers less than 50kilometers. Furthermore, the study finds that CNG is environmentally friendly due to its clean-burning properties and reduced emissions. The paper recommended that, educational stakeholders in Nigeria should cooperate together to ensure the attainment of the aims and objectives of sustainable educational development by all positive means.

**Keywords:** Development, Transitioning, Transportation, Sustainable

### **Introduction**

Nigeria is abundantly blessed with a wide range of natural resources, including human resources—individuals who are being equipped with skills and knowledge that enable them to compete effectively with their global counterparts in the international talent market. Despite these human and non-human resources, which, if properly utilized, could transform the lives of Nigerians and even benefit neighboring countries, the nation continues to face sustainability challenges across key sectors of national development. One major area affected is educational development. The country struggles to sustain consistent progress in its education sector due to recurring crises. In tertiary institutions, students frequently skip lectures, which often leads to unrest, while academic and non-academic staff members frequently embark on industrial actions in the form of strikes. This situation has become increasingly widespread, with other labor unions in the country also joining in sympathy strikes.

It is common knowledge among Nigerian workers and leaders that even the shortest industrial action in any tertiary institution lasts at least 72 hours. The root causes of these disruptions include poor working conditions, chronic underfunding of education, the commercialization of the sector, inadequate remuneration for workers, lack of government support for transportation of workers to and from work, and insufficient provision of essential learning equipment, among others. Unless these issues are effectively addressed, the goals of sustainable development in the education sector will continue to be questioned and undermined. However, there is potential for change. Nigeria possesses the necessary resources to support sustainable tertiary education—one of which is **Compressed Natural Gas (CNG)**. Leveraging this abundant and cost-effective energy source aligns with the focus of this study and could serve as a viable strategy for promoting sustainability in the education sector.

### Statement of the Problem

Transportation is a major sector in the development of nation's economy likewise, education serves as the engine room of every sector for National Development. But it is obvious recently that both human and non-human resources in education sector stand-still, suffering and appear less effective, less productive and idle due to the collapse of transportation system which eventually disturb moving and carrying every needed resource to where it can be effectively utilized on time due to high-cost fueling with premium motor spirit (pms) that has become unaffordable for the staffers and administrators of educational sectors. Several researches have been carried out on the impacts of transportation in educational development and many on the profits and benefits of Compressed Natural Gas (CNG) to business, economy, technology and even internet communication but few scholars' attentions were drowned to carryout study on the sustainability of education and national development through converting all educational and administrative vehicles to CNG powered vehicles to CNG powered vehicles. This research work is therefore aiming at closing the gap of non-sustaining transportation of educational materials towards sustainable educational development by carrying out research work on Transitioning Educational Transportation to Compressed Natural Gas (CNG) as: A sustainable educational development strategy for Nigeria.

The aim of this study is to investigate the Transitioning Educational Transportation vehicles: A sustainable educational development strategy for Nigeria.

The objectives of this study are for:

- i. Expose the National Educational stakeholders to the cost benefits of CNG over PMS.
- ii. Create awareness of diverting attention of the Nation's educational stakeholders to powering educational vehicles with CNG.
- iii. Sustain the holistic development of Nigeria through sustainable education.
- iv. Establish CNG powered stations into all the Nations tertiary institutions.
- v. Import CNG-powered vehicles into Nigeria educational sectors.
- vi. Make use of the money saved from PMS to funding educational industries.

### Research Questions

Based on the stated objectives, the following research questions were raised and answered in this study:

- i. What could cause shifting from powering vehicle with PMS to CNG powering?
- ii. What are the impacts of the cost of PMS and CNG on the running of educational transportation vehicles?
- iii. How can CNG serves as a strategy towards sustainable educational development?
- iv. To what extent is CNG available in Nigeria for educational industries vehicular use?
- v. Is there any country in the world that mainly or partly operate on CNG powered vehicles for transportation system?

By the way, what is sustainability? It literally implies a long-term improvement, blue print method or action-plan toward a programme or section. Daniel (2023) view sustainability as the ability to maintain or support economic environmental or social processes overtime without depleting natural resources. In another expression, it is the ability to maintain a process for a longer-time. This indicates that sustainability is an ever-relevance, useful and functional system. While Educational Development is clearly described by Alice (2014) as the practice of helping those who are teaching others to be better at what they do, through resources, workshops, one-one assistance and other logical means.

The contribution of Edutinker (2022) is also in line with others, when it narrates educational development as a rapid expanding and lively area in assisting Colleges and Universities in their efforts to function successfully as teaching and learning community. It is a sub-field of higher education study and practice, specifically concerned with assisting and strengthening the design and development of high-quality student learning experiences, developing the scholarship of teaching and learning, management system and incorporating findings from research into the goals and practices of higher education. This implies that development in education will produce quality research findings that will be the basis for holistic development of communities.

Therefore, sustainable educational development requires support, collaboration, assistance and strategy as explained by Matua (2019) that the contribution from innovation and statistical science in sustainable management education can ensure the managerial skills up graduation, technical acquisition, skilled employment, direct link to productive industries advanced technological knowledge and discovering various field of environmental scenario.

In the perception of Lan Macmillan (2025) sustainability signals benefits of an activity lasting after its end for performance to outlast activity in any factors need to be in first place. These has to be performance in the first

place for the activity has to cause some change of value. In addition to overcome the pressure of competing alternatives such factors include: Strong stakeholder commitment, incentives and accountability system, supportive process and structures, people with the right skills and attitudes and affordable programme that given the future fiscal context.

Sustainable educational development show must take the following sustainability scoring into cognizance; leaderships, constituency, mandate, strategy, peoples, skills and attitudes, financial and other resources, processes, structures, institutionalization with insensitive and accountability mechanisms. Notwithstanding, a little closeness that the above influential factors for sustainable educational development have with what constitutes a capacity can never be underrated. Capacity to deliver education sustainably requires three major factors, which are: institutional, organizational and individual factors, those three factors just mentioned collaborate together to produce improved delivery of services which will penetrate into long-term sustained service improvement.

In an attempt to achieve a sustainable educational development for Nigeria these came about the thought of Compressed National Gas (CNG) with the aim of solving transportation problems for the tertiary institution staffers and management after the removal of fund subsidy in the year 2023. The concept tagged "Compressed National Gas (CHNG) stands as an important and feasible gaseous fuel that is relatively very cheap, environmentally friendly safe to handle and has abundant available energy resources.

Taking availability and infrastructure facility into consideration, CNG appear to be a prominent option fuel for diesel enquire applications, because it can stand well below conventional fuel for the consideration of permanence aspects, but the emissions aspects might give a strong driving force for its commercialization in the automobile sectors. Interestingly, the widened availability and excellent storage infrastructure are the dominant factors that pave the way for its selection of one of the best alternative fuels at the moment (Ashok, 2019).

Cng.co (2020) described CNG as a natural gas under pressure which remains clear, odourless and non-corrosive, it is cheaper, greener and more efficient alternative to the traditional petrol and diesel fuels for vehicles. GLNG (2024) also corroborated this obvious fact by further describing CGN as a fossil fuel comprised of 87 to 92 percent of methane and is one of the cleanest burning fuel, it natural gas that has been compressed at 200 to 250 bar pressure, which remains clear and non-corrosive. It is alternative fuel to diesel, petrol and black oil. Against diesel, CNG is 45 to 60% cheaper (depending on customer location). CNG on wheels act as a virtual pipeline for the consumers.

Another research organization that key into the above empirical fact is Fuel Program (2025) who narrated Compressed National Gas (CNG) as gasoline and diesel fuel alternative consisting primarily of methane. The gas is associated with other fossil fuels (coal or oil) and is created by methanogenic organisms in land-fills. The gas is extraction from the source and compressed to a high pressure where it can be stored in a vehicle fuel tank. That informed Iskal (2024) to advanced reasons that the continuous price in the cost of fuel has facilitated the need for an optional means of pouring the transportation sector in Nigeria. In the past it months, the price of fuel has increased twice and more than 400%, it was compared that eighteen (18) months ago, fuel was sold for N190 and N240 per litre but today (2024), the prices have skyrocketed to between N950 and N1,200 of which it was assumed that, that selling price may increase at any price. Such persistence increase always has negative effects as it aids to public anger for Nigerians who are already struggling with inflation of 55.5 percent that has driven up transport costs and caused a cost-of-living crisis in many homes. Oluwabukola (2024) too aligned with this fact as he challenges and opportunities in Nigerians adoption of CNG that as Nigeria seeks to transition to Compressed National Gas (CNG) as alternative to premium motor spirit (PSMS) always known as petrol, critical stakeholders have highlighted significant challenges could impede this change-over. The urgency of this transition has greton as petrol prices have surged following the Federal Government's removal of the subsidy regime, in a recent move, the Federal Government of Nigeria directed marketers to install CNG dispensing pumps to promote the growth of CNG adoption programme. The initiative was welcome by the indigenous gas stakeholders who viewed it as a promising step towards reshaping transportation, stimulating economic growth and enhancing environmental sustainability.

Dentos (2025) also confirm the above opinion as Dentos (2025) clearly analysed that "as the world increasingly priotizes sustainable energy solution, Nigeria home to one of Africa largest natural gas reserves a ranked eight globally aim to leverage its abundant natural gas resources to drive some adoption of Compressed Natural Gas (CNG). "The removal of petroleum subsidies in May, 2023 among other factors has led to a rise in premium motor spirit (PMS) prices, positioning CNG as a cleaner and more affordable alternative. The adoption of CNG has gained attention of the highest levels of government in Nigeria, particularly after president Bola Ahmed Tinubu (The president approved the presidential Compressed Natural Gas initiative in December 2023 to reduce energy cost and promote clearer fuel option. Additionally, the Federal Government of Nigeria FGN through the Nigerian

National Petroleum Company limited inaugurated a 6.2 million standard cubic feet per day (minsefd) CNG plant in Lagos which explores the key drivers of CNG adoption in Nigeria and the policies that could support its implementation.

Usman (2025) convincingly corroborates the above assertion that ‘transportation challenges had strong positive lineal relationship with residence with biological presents, sex and parents, occupation. Little Wonders why Uimpress (2025) pointed out its opinion on the hike on fuel price that as relevant as you cannot talk about a rise in the cost of transportation without talking about one of the major excuses transport workers give when student complain about the high price of transportation. The removal of the fuel subsidy has significantly raised the cost of living for student of the University of Ibadan. It has also increased the cost of goods and services, the cost of food, study materials and housing has risen putting additional financial stream on student as transportation cost have nearly tripped. Forcing students to devote a significant shere of their limited resources to commuting. Attempted to this is Najeem (2024) as the said recommends that Government should ensure that fuel, subsidy is not allowed to deprive education, of its fair share of government spending, given that, current spending on the sector (Education) has been established to implications for the sectors growth in the future years.

Going with the above scholars’ contributions and opinions, it is obvious that, there are negative consequences on the high cost of pins to the running of educational transportation globally.

The following research question on this study asked that how can CNG serves as a strategy towards sustainable educational development got the attention of Ahmad (2024) as he quoted president Bola Ahmed Tinubu who said “His administration intends to develop sustainable power to boost research in the nation’s universities through Compressed Natural Gas (CNG) being that CNG is a natural gas that remain clear odourless and non-corrosive, serving as an alternative to petrol. It is compressed to the point where it is lighter than air-usually approximately one percent of its original volume. The president said his administration is committed to prmoting education and sustainable development in the country, and working towards revamping vocational centres. The aforementioned commitment of the president strengthened Abdulbasit (3024) to carryout research titled “Evaluating Regulatory Frameworks for Sustainable Transport (CNG) Adoption in Nigeria. After evaluated the qualitative components analyses successful CNG programmes in Iran, China and Argentina selected for their significant achievements in CNG adoption, His findings go thus: strong government commitment, comprehensive regulatory measures, phased implementation and public awareness campaign are the key factors in promoting CNH adoption the study contributes to the theoretical understanding of how regulatory framework interact with technological innovations and sustainable development in developing countries. It offers valuable suggestions for policy makers and industry stakeholders in Nigeria by providing evidence-based policy recommendations for policy makes and industry stakeholders in Nigeria by providing evidence-based policy recommendations for designing and implementing effective regulatory framework to accelerate CNG adoption, stimulate investment in CNG infrastructure and create a sustainable market for CNG vehicles.

The opinion of Ahmed (2024) is in consonant with the current transportation challenges that face Nigeria tertiary institutions as he expresses that “the slow populace embraces and inability of Nigeria’s tertiary institutions to hit the ground running on the much-desired vehicular conversion to Compressed Natural Gas signaled policy framework missteps that need to be readdressed.

Adegoke (2024) also attested to this view in his findings that CNG innovative technology is negatively impacted by challenges confronting its adoption, but positively infelunced economic security due to its availability, cost effectiveness and foreign exchange savings to the Federal Government. Based on the findings from his study, he recommends amongst others that all tier of government including tertiary institution shows further amplify through a whole society approach the economic benefit, professional retrofitting standards of CNG as alterative to fossils fuel patronage in general endeavours.

### **Level of Availability of Natural Gas in Nigeria**

The statistical data on the availability of natural gas in Nigeria is based on the World Ranking System of 2015 and 2017 as reported by Worldometer 2025 which gave the the summary table of gas reserve, history of gas reserves, gas consumption, gas production and gas export in Nigeria as follows:

- i. Gas Reseraves is 180,490,000 in 2025 while it stands at 187 trillion cubit feet (TCF) in 2017 as Nigeria be at 44<sup>th</sup> positioning in the global rank.
- ii. Gas production in Nigeria is 3,000.650 with 12<sup>th</sup> positioning global rank.
- iii. Gas consumption is of 664.628 with 93<sup>th</sup> position global rank even with 2017 repay of 609,290 trillion cubic feet year (MCF B/z/r).
- iv. Gas deport is at 929.844 with 2020 “o” position global ranking.

Simply put, a brief study of the following summary table Nigeria Natural Gas will shield more illumination into the full knowledge of the level of availability of Natural Gas in Nigeria as made available by Worldometer (2025).

### Summary Table of Nigeria Gas

	Natural Gas in Nigeria	Million Feet/MCF	Cubic	Global Rank	Year 2015
i.	Gas reserves	180,490.000		44 <sup>th</sup>	2015
ii.	Gas production	3,009,650		12 <sup>th</sup>	2015
iii.	Gas consumption	664,628		93 <sup>th</sup>	2025
iv.	Gas import	0		-	-
v.	Gas export	929.844		-	-

	Natural Gas in Nigeria	Million Feet/MCF	Cubic	Global Rank	Year 2017
i.	Gas reserves	187 trillion (TCF)		44 <sup>th</sup>	2017
ii.	Gas production	3,009,650 (mcf)		12 <sup>th</sup>	2017
iii.	Gas consumption	609,290 (mcf)		93 <sup>th</sup>	2027

Worldometer, 2025

The above statistical data report is substantiated by Statista (2024) that Nigeria is a key contributor to the Africa but also worldwide. In the area of gas production, Nigeria ranked 17<sup>th</sup> position in the global natural gas production, as of 2023, the country measured close to 44 billion cubic meters in the natural gas output, placing it above countries such as Oman, Argentina and Mexico. On the African continent, Nigeria ranked 3<sup>rd</sup> after Algeria and Egypt inspite of the existing and emerging factors that slowdown production of the chemical in Nigeria, the country is still relentless in its contribution, to the global threshold.

Nigeria has made significant efforts in increasing its proved natural gas reserves since 1960. Additionally, expanding the capacity of its liquid factors plants which is also expected to boost developments in the industry indeed, several operational gas trains in the country accounted for these. However, the domestic consumption of natural gas in Nigeria declined by around 6.4 percent in 2022, compared to the preceding years. Similarly, the per capital use of the fossil fuel dropped in 2022 after a carbnous increase in 2022. These refers to the amount of gas consumed locally without considering exports, nonetheless, natural gas is the main source of electricity generation in Nigeria, accounting for nearly 80 percent of the sources. More so, demands for gas in Nigeria soared by 44 percent in 2023.

Having gone through the above statistical reports, it can be inferred that that Nigeria is blessed with abundant Natural Gas Reserves in Trillion Cubic feet while production of natural gas stands at 3,009,650 million cubic feet (compare, trillion to million cubic feet) which is for below the reserves and the level of it consumption which stands at 664,625 mcf in 2015 and 609,290 mcf in 2017, while it is amazing that over 929 million are been exported as world ranked Nigeria as 17<sup>th</sup> in the global natural gas production, 2023.

Now, the certainty of the shortfall has been showcased by Kolapo (2024) where he affirmed that CNG is abundant in Nigeria with vast reserves spend across the country. This indicates that, transitioning to CNG could reduce Nigeria's dependence on imported fuels stabilizing energy prices and boost the local economy on sustainable for educational development.

### Countries in the Globe with CNG Powered Vehicle Fleets

There are some countries in the world that are operating on CGN powered vehicles for their national development in all sectors.

Cngport (2025) shows the table that display some countries and fleet of vehicles of CNG powered.

S/N	Countries	No of CNG powered Vehicle Fleet
1.	Iran	4.0 million Vehicles
2.	China	4.0 million Vehicles
3.	Pakistan	3.7 million Vehicles
4.	Argentina	2.5 million Vehicles
5.	Brazil	1.8 million Vehicles
6.	India	1.8 million Vehicles
7.	Italy	900 thousand Vehicles

8.	Columbia	500 thousand Vehicles
9.	Uzbekistan	450 thousand Vehicles
10.	Thailand	462 thousand Vehicles
11.	Ukraine	388 thousand Vehicles
12.	Armenia	244 thousand Vehicles

While Barcelona, Ostrava and Lille happen to be few examples of cities in the world that have adopted CNG buses to transport their citizens (EGi-Gas Nature, 2020).

Estimated Cost of CNG per Kilogram and Its Corresponding Mileage

Some fundamental question we need to ask and have answer for are;

What is likely cost of CNG per Kg?

What is likely kilometer a 10 Kg CNG can cover?

What is the current cost of PMS per liter?

What is likely equivalent of the monetary cost of a 10Kg of CNG to PMS?

Damola (2024) responded to these questions that the Administration of president Bola Ahmed Tinubu has enabled Compressed Natural Gas (CNG) to be available for vehicles of N230 per kilogram. This message delivered by the chief executive and programme officer presidential CNG initiative, Micheal Oluwagbemi who further expressed that the initiative will provide a cheaper and cleaner alternative to petrol selling for over N900 per liter. Interestingly, IOAGPC (2025) provides that A Cylinder with a 50-liter water carrying capacity is capable of carrying approximately 9Kg of CNG. This is equivalent to 12.5 litre of pins and that will allow a tun of about 150 - 160 Kms

Going by the above comprehensive responses to the to the question raised earlier. It could be suggested that: if 1kg of CNG is N230 per kg, then multiply N230 by 9kg approximate of a cylinder with 50 litre water carrying capacity will give us N2,070.00 only which is equivalent to 12.5 litres of pay. Meanwhile, the cost of a of PMS as at the time of conducting this research work is N900 per litre, if we multiply N900 by 12.5 litre of PMS the result is N11,250. The difference of the cost advantage between CNG and PMS is hereby obvious from N2,070 to N11,250 which is N9,180.

Another difference that serves as benefit is the kilometer which CNG can cover with the same equivalent PMS cost from less than 50km on PMS to 150 – 160km on CNG. Other benefits that make difference are abound like CNGs cleanness, odourless and the likes. It is now clearer to the nook and crannies that, it will be a reasonable strategy for the Nigeria government to shift from pms to CNG powered vehicle for transportation of educational materials towards sustainable educational development of which if it adopted and bomefricated into education sector, the cost saving achieved on CNG adoption will be used to fund another educational need in our institutions.

### Recommendations

Based on the findings of the study, the following recommendation were suggested:

1. Educational stakeholders in Nigeria should cooperate together to ensure the attainment of the aims and objectives of sustainable educational development by all positive means.
2. Government should take the lead by encourage citizenry shifting from PMS powered vehicles to CNG powering vehicles.

### Conclusion

The conclusion drawn from the study are as follows: It has become obvious that members and staffers Nigeria tertiary Institution are taking trekking, asking for lift, waiting for colleagues to get to their respectful offices and working stations which is caused by sudden removal of fuel subsidy in May 29, 2023 without pre-provision of better alternative to such effect. This has significantly affected sustainable educational development as students skip lecture room and staffer eject late to their work. Even, it is becoming costlier to mobilize both human and non-human resources to sites.

Whatever, this research work discovers the best, cheapest and environmentally friendly alternative, which is CGN as alternative to PMS. Therefore, this paper is advocating for the adoption of CGN use in all Nigeria Education Industries with the aims of serving all the members in the educational industry. If this strategy is well applied, there will be Sustainable Educational Development in Nigeria.

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