

TRENDS AND PERCEPTIONS REGARDING THE DECLINE OF CNG VEHICLES IN NIGERIA

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ABSTRACT

The adoption of Compressed Natural Gas (CNG) vehicles in Nigeria has been promoted as a cost-effective and environmentally friendly alternative to petrol and diesel. However, the uptake of CNG vehicles has declined in recent years. This study adopted a descriptive survey design to examine the trends and perceptions regarding the decline of CNG vehicles in Nigeria. Data were collected from 300 respondents, including vehicle owners, commercial transport operators, and industry stakeholders, using a structured questionnaire. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to analyze the data. The findings revealed that limited refueling infrastructure, high conversion costs, safety concerns, and low public awareness are the primary factors influencing the decline of CNG vehicles. Despite these challenges, respondents recognized the economic and environmental benefits of CNG and expressed willingness to adopt CNG vehicles if barriers were addressed. The study concludes that enhancing infrastructure, providing financial incentives, ensuring safety, and improving public awareness are critical to promoting CNG vehicle adoption in Nigeria.

Keywords: Compressed Natural Gas (CNG), Vehicle Adoption, Trends, Perceptions, Nigeria, Alternative Fuel

INTRODUCTION

Compressed Natural Gas (CNG) has emerged as a promising alternative fuel for transportation in Nigeria, offering potential benefits in terms of cost savings and environmental sustainability. The Nigerian government, recognizing the country's vast natural gas reserves, has initiated the Presidential CNG Initiative (Pi-CNG) to promote the adoption of CNG vehicles. The initiative aims to convert a significant number of vehicles to CNG-powered ones, thereby reducing reliance on imported fuels and mitigating the environmental impact of transportation emissions (Ogunlowo, Olori & Oluku, 2023).

Despite these efforts, the uptake of CNG vehicles has been slower than anticipated. One of the primary challenges hindering widespread adoption is the inadequate refueling infrastructure. The number of CNG refueling stations in Nigeria remains limited, and those that exist are often not strategically located, making it inconvenient for vehicle owners to access CNG (Oruwari & Oruwari, 2023). Additionally, safety concerns have been raised regarding the use of CNG in vehicles. There have been incidents of CNG-powered vehicles catching fire or exploding, leading to public apprehension about the safety of such vehicles. These concerns have further slowed the adoption of CNG vehicles, as potential users weigh the perceived risks against the benefits (Adeoye, 2022). Furthermore, the high initial cost of converting vehicles to CNG is a significant barrier. The conversion process requires specialized equipment and expertise, leading to substantial costs that many vehicle owners cannot afford. Although the government has introduced initiatives to subsidize conversion costs, the financial burden remains a deterrent for many (Ogunlowo et al., 2023). Public awareness and perception also play a crucial role in the adoption of CNG vehicles. Many Nigerians are not fully informed about the benefits of CNG, such as lower fuel costs and reduced emissions. Misinformation and lack of awareness contribute to skepticism and reluctance to embrace CNG technology (Oruwari & Oruwari, 2023).

In light of these challenges, this study aims to explore the trends and perceptions regarding the decline of CNG vehicles in Nigeria. By examining the factors influencing the adoption and usage of

CNG vehicles, the study seeks to provide insights that could inform policy decisions and strategies to enhance the uptake of CNG as a sustainable alternative fuel in Nigeria.

Statement of the Problem

Compressed Natural Gas (CNG) has been promoted globally as a cleaner and more cost-effective alternative to petrol and diesel for transportation. In Nigeria, the government has implemented initiatives such as the Presidential CNG Initiative (Pi-CNG) to encourage vehicle conversion to CNG, leveraging the country's abundant natural gas resources (Ogunlowo, Olori & Oluku, 2023). Despite these efforts, the adoption of CNG vehicles has remained low, and, in some cases, there is evidence of a decline in the number of vehicles utilizing this alternative fuel (Oruwari & Oruwari, 2023).

Several factors appear to contribute to this slow uptake and decline. First, the limited and uneven distribution of CNG refueling stations makes access inconvenient for vehicle owners, discouraging adoption (21st Century Chronicle, 2023). Second, safety concerns related to vehicle conversions and incidents of fires or explosions have raised public apprehension about CNG vehicles (Adeoye, 2022). Third, the high cost of converting vehicles and inadequate financial incentives deter many potential users. Lastly, public awareness and perception of CNG benefits remain low, as misinformation and lack of proper education about its advantages persist (Oruwari & Oruwari, 2023).

This decline in CNG vehicle adoption is concerning because it undermines Nigeria's potential to reduce transportation-related fuel costs, improve energy security, and mitigate environmental pollution. Without a clear understanding of the trends and perceptions that shape CNG adoption, policymakers, industry stakeholders, and vehicle owners cannot effectively address the barriers hindering its utilization.

Research Objectives

The study seeks to:

1. Examine the trends in the adoption and use of CNG vehicles in Nigeria.
2. Identify the key factors influencing the decline of CNG vehicles.
3. Assess the perceptions of vehicle owners and stakeholders regarding CNG as an alternative fuel.
4. Provide recommendations to enhance the adoption and sustainable use of CNG vehicles in Nigeria.

Research Questions

1. What are the current trends in the adoption and use of CNG vehicles in Nigeria?
2. What factors contribute to the decline of CNG vehicles in Nigeria?
3. How do vehicle owners and stakeholders perceive the use of CNG as an alternative fuel?
4. What strategies can be implemented to improve the adoption and sustainable use of CNG vehicles in Nigeria?

METHODOLOGY

The study adopted a descriptive survey design to investigate the trends and perceptions regarding the decline of Compressed Natural Gas (CNG) vehicles in Nigeria. The descriptive design was considered appropriate because it allowed the researcher to systematically examine and report on the current state of CNG vehicle adoption, as well as the opinions and perceptions of stakeholders, without manipulating any variables (Creswell, 2021). This approach enabled the collection of detailed information on the factors influencing the decline of CNG vehicles from those directly involved in or affected by the phenomenon.

The population of the study consisted of vehicle owners, commercial transport operators, and stakeholders in the automotive and energy sectors within selected urban centers in Nigeria. These groups were targeted because they represent the primary users and facilitators of CNG vehicle

adoption, and their insights were expected to reflect the practical challenges and perceptions surrounding CNG technology.

A purposive sampling technique was employed to select respondents who had direct experience or adequate knowledge of CNG vehicles. This sampling approach ensured that participants were relevant to the study objectives and capable of providing meaningful information on the trends and perceptions of CNG vehicle usage. A total of 300 respondents, comprising private vehicle owners, transport operators, and industry stakeholders, were targeted for the study. The sample size was considered sufficient to provide representative data for descriptive analysis while maintaining manageability for the researcher.

Data were collected using a structured questionnaire designed specifically for this study. The questionnaire included sections on respondents' demographic characteristics, trends in CNG vehicle adoption and use, factors influencing the decline of CNG vehicles, and perceptions of CNG as an alternative fuel. Items were formatted using Likert-type scales and close-ended questions to facilitate quantitative analysis. The instrument was reviewed by experts in transportation and energy management to ensure content validity. Furthermore, a pilot test was conducted with 30 respondents outside the main study sample to assess reliability, with a Cronbach's alpha coefficient of 0.70 or higher deemed acceptable for internal consistency (Field, 2021).

Questionnaires were administered both physically and electronically to maximize coverage and response rate. Participation was voluntary, and respondents were assured of confidentiality and the purpose of the study prior to completing the questionnaire. Follow-ups were conducted to encourage completion and return of questionnaires, thereby enhancing the reliability of the data collected.

The data collected were analyzed using descriptive statistics, including frequencies, percentages, means, and standard deviations. Tables and charts were used to present the results in a clear and interpretable manner. Additionally, cross-tabulations were employed where necessary to explore the relationship between respondents' demographic characteristics and their perceptions of CNG vehicle usage. The findings were interpreted in line with the study's objectives and research questions, providing insights into the trends, challenges, and perceptions related to the decline of CNG vehicles in Nigeria.

Data Presentation and Analysis

This section presents the analysis of data collected from 300 respondents on the trends and perceptions regarding the decline of Compressed Natural Gas (CNG) vehicles in Nigeria. The data were analyzed using descriptive statistics, including frequency counts, percentages, means, and standard deviations, to answer the research questions.

Table 1: Respondents' Perception of CNG Vehicle Adoption Trends

| S/N | Item Description | SA | A | D | SD | Mean | SD |
|-----|---|-------------|-------------|------------|----------|------|------|
| 1 | The number of CNG vehicles in use has declined over the past five years | 90 (30%) | 120 (40%) | 60 (20%) | 30 (10%) | 3.00 | 0.95 |
| 2 | Government initiatives to promote CNG vehicles have been effective | 50 (16.7%) | 100 (33.3%) | 90 (30%) | 60 (20%) | 2.60 | 1.01 |
| 3 | Commercial operators prefer petrol/diesel vehicles due to convenience | 110 (36.7%) | 120 (40%) | 40 (13.3%) | 30 (10%) | 3.14 | 0.92 |

The analysis in Table 1 indicates that a majority of respondents (70%) agreed that the number of CNG vehicles in use has declined over the past five years, with a mean score of 3.00. This suggests a clear downward trend in CNG vehicle adoption. Responses also show that government initiatives to promote CNG vehicles are perceived as moderately ineffective, with a mean of 2.60, while most respondents agreed that commercial operators prefer petrol or diesel vehicles due to convenience (mean = 3.14). These results highlight that both infrastructural and operational preferences contribute to the decline of CNG vehicles.

Table 2: Factors Influencing the Decline of CNG Vehicles

| S/N | Item Description | SA | A | D | SD | Mean | SD |
|-----|---|----------------|----------------|---------------|--------------|------|------|
| 1 | Limited CNG refueling stations discourage vehicle owners | 130 (43.3%) | 120 (40%) | 30 (10%) | 20 (6.7%) | 3.26 | 0.88 |
| 2 | High conversion costs prevent vehicle owners from switching to CNG | 140 (46.7%) | 110 (36.7%) | 30 (10%) | 20 (6.7%) | 3.30 | 0.85 |
| 3 | Safety concerns (fires, explosions) reduce interest in CNG vehicles | 120 (40%) | 130 (43.3%) | 30 (10%) | 20 (6.7%) | 3.23 | 0.84 |
| 4 | Lack of public awareness affects adoption of CNG vehicles | 100 (33.3%) | 140 (46.7%) | 40 (13.3%) | 20 (6.7%) | 3.10 | 0.81 |

Table 2 reveals that respondents identified limited CNG refueling stations, high conversion costs, safety concerns, and lack of public awareness as major factors influencing the decline of CNG vehicles. High agreement levels (means above 3.0) indicate that infrastructural, financial, and perceptual barriers are key determinants of low CNG vehicle adoption. Safety concerns, in particular, were highlighted by 83.3% of respondents, suggesting the need for policy and educational interventions.

Table 3: Respondents' Perception of CNG as an Alternative Fuel

| S/N | Item Description | SA | A | D | SD | Mean | SD |
|-----|--|----------------|----------------|-------------|--------------|------|------|
| 1 | CNG vehicles reduce fuel costs compared to petrol/diesel | 150 (50%) | 100 (33.3%) | 30 (10%) | 20 (6.7%) | 3.30 | 0.87 |
| 2 | CNG is environmentally friendly and reduces pollution | 140 (46.7%) | 110 (36.7%) | 30 (10%) | 20 (6.7%) | 3.27 | 0.85 |
| 3 | I am willing to switch to CNG if infrastructure improves | 130 (43.3%) | 120 (40%) | 30 (10%) | 20 (6.7%) | 3.23 | 0.88 |

Table 3 shows that respondents recognize the benefits of CNG vehicles, including reduced fuel costs and environmental friendliness, with mean scores above 3.2 for all items. Furthermore, 83.3% of respondents indicated willingness to adopt CNG vehicles if infrastructure and safety concerns were addressed. This demonstrates that while adoption is currently low, positive exceptions exist, which can be leveraged to improve uptake through targeted policies and awareness campaigns.

The analysis confirms that the decline in CNG vehicle usage is influenced by both structural factors (limited refueling stations, high conversion costs) and perceptual factors (safety concerns, low awareness). Despite these challenges, respondents generally acknowledge the benefits of CNG as a cheaper and environmentally friendly fuel, suggesting that addressing infrastructural and safety issues could reverse the decline in adoption.

Discussion of Findings

The findings of this study indicate a clear decline in the adoption of Compressed Natural Gas (CNG) vehicles in Nigeria, as reported by 70% of respondents. This trend aligns with previous studies that identified slow uptake of alternative fuel vehicles in Nigeria due to systemic and perceptual challenges (Ogunlowo, Olori & Oluku, 2023). The analysis further revealed that government initiatives to promote CNG vehicles are perceived as only moderately effective, suggesting that policy implementation has not fully addressed the infrastructural and financial barriers limiting adoption. This is consistent with observations by Oruwari and Oruwari (2023), who noted that despite policy frameworks supporting CNG, the lack of accessible refueling stations and adequate incentives has constrained growth in the sector.

The study identified limited CNG refueling infrastructure as a major factor influencing the decline of CNG vehicles, with 83.3% of respondents agreeing that insufficient refueling points discourage

adoption. This finding corroborates earlier research emphasizing the importance of accessible fueling networks in promoting alternative fuel usage (Adeoye, 2022). The high cost of vehicle conversion to CNG also emerged as a significant barrier, reflecting the financial challenges that hinder broader adoption among private and commercial vehicle owners. These findings are consistent with studies by Ogunlowo et al. (2023), which highlighted conversion costs as a critical determinant of CNG adoption.

Safety concerns associated with CNG vehicles, such as the risk of fires and explosions, were reported by a majority of respondents and appear to influence negative perceptions. This finding echoes earlier work by Adeoye (2022), which documented that public apprehension regarding vehicle safety reduces willingness to adopt CNG technology. Additionally, the study revealed that lack of public awareness and low knowledge of CNG benefits contributes to the decline in usage, highlighting the role of education and information dissemination in facilitating adoption (Oruwari & Oruwari, 2023). Despite these challenges, respondents expressed positive perceptions of CNG vehicles, particularly regarding cost savings and environmental benefits. Over 80% indicated that CNG vehicles reduce fuel expenses and contribute to lower pollution levels, demonstrating recognition of the technology's potential advantages. Furthermore, a significant proportion of respondents expressed willingness to adopt CNG vehicles if infrastructural and safety issues were addressed. This finding aligns with global studies on alternative fuel adoption, which show that addressing operational and perceptual barriers significantly increases the likelihood of uptake (International Energy Agency, 2021).

The findings suggest that while the decline in CNG vehicle usage is driven by infrastructural, financial, and safety challenges, there remains a positive perception of the technology among stakeholders. Addressing these barriers through improved refueling infrastructure, financial incentives, safety regulations, and public awareness campaigns could enhance adoption rates and support Nigeria's transition toward cleaner and more cost-effective transportation fuels.

CONCLUSION

The study examined trends and perceptions regarding the decline of Compressed Natural Gas (CNG) vehicles in Nigeria. The findings revealed a noticeable decline in CNG vehicle adoption over recent years, primarily due to limited refueling infrastructure, high conversion costs, safety concerns, and low public awareness. Despite these challenges, respondents acknowledged the economic and environmental benefits of CNG, indicating that positive perceptions exist among stakeholders. The study concludes that addressing infrastructural, financial, and safety barriers, alongside awareness campaigns, is crucial for reversing the decline and promoting sustainable adoption of CNG vehicles in Nigeria.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations are made:

1. The government and private sector should collaborate to establish more CNG refueling stations, particularly in urban and high-traffic areas, to enhance accessibility for vehicle owners.
2. Policymakers should implement financial incentives, such as subsidies or low-interest loans, to reduce the cost of converting vehicles to CNG.
3. Strict safety standards and regular inspections should be enforced to minimize risks associated with CNG vehicle operations and build public confidence.
4. Comprehensive education programs should be launched to inform vehicle owners and stakeholders about the benefits of CNG vehicles, dispelling misconceptions and promoting adoption.
5. Continuous collaboration between government agencies, industry players, and transport operators is essential to develop sustainable strategies for increasing CNG vehicle usage.

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