Forum For Economic Studies and Research Journal
Volume: 10/ N°: 01 (2026), p 275 - 295

The Use of Natural Gas as a Transport Fuel: Global Dynamics, the Algerian Trajectory, and Competitiveness Challenges vis-à-vis LPG

MOUSLI Abdenadir
LED Laboratory, A-Mira University of Bejaia, Algeria, abdenadir.mousli@univ-bejaia.dz

Received: 20/01/2026 **Accepted: 14/05/2026**

Abstract:
The energy transition in the transport sector has positioned natural gas, in its compressed (CNG) and liquefied (LNG) forms, as well as LPG, among the main alternatives to conventional fuels. This paper analyzes global trends in the use of natural gas as a transport fuel and examines the Algerian trajectory, characterized by a sharp contrast between the successful diffusion of LPG and the stagnation of CNG. The results show that this divergence is driven less by technological factors than by economic, institutional, and regulatory determinants. A comparative assessment highlights the complementary rather than substitutable nature of LPG and CNG, with LPG being better suited to light-duty vehicles and private users, while CNG is more appropriate for captive fleets and public transport. The paper concludes that a gradual and integrated strategy is required to develop gas-based mobility in Algeria while ensuring both energy transition and fiscal sustainability.

Key Words: *Natural gas as fuel, CNG, LPG, Energy transition, Transport policy.*
Key Words 1, Key Words 2, Key Words 3, Key Words 4, Key Words 5.
JEL Classification: *Q42 ،Q48.*

1. Introduction

The energy transition of the transport sector has emerged as one of the main levers for reducing greenhouse gas emissions, improving air quality, and curbing the consumption of conventional fuels. At the global level, the persistent dependence on gasoline and diesel, combined with the rapid growth of road mobility, exerts increasing pressure on countries' energy balances, public finances, and environmental sustainability (Intergovernmental Panel on Climate Change [IPCC], 2022). In this context, many countries have, over recent decades, implemented energy diversification policies based on the introduction of alternative fuels, notably natural gas in its compressed (CNG) and liquefied (LNG) forms, as well as liquefied petroleum gas used as a transport fuel (LPG).

The expansion of natural gas as a substitute transport fuel is driven by several key factors. On the one hand, it is an abundant, competitive resource widely available on international markets. On the other hand, its use in road transport is associated with significantly lower environmental and health impacts than those of conventional fuels, particularly in terms of carbon dioxide emissions, nitrogen oxides, particulate matter, and noise pollution. These advantages have supported the rapid development of CNG and LNG in many countries, including non-hydrocarbon-producing states such as Italy and Turkey, thereby demonstrating that local resource availability is neither a sufficient nor a necessary condition for the success of such policies (Gas Exporting Countries Forum [GECF], 2020).

The most recent international statistics confirm this trend. The global fleet of natural gas vehicles exceeded 28 million units in 2020, with a strong concentration in a limited number of leading countries, mainly in Asia and Latin America (World LPG Association and Liquid Gas Europe, 2023). This large-scale deployment has been made possible by the high technological maturity of CNG and LNG solutions, which have reached advanced development stages corresponding to the final levels of the Technology Readiness Levels (TRL) scale. In practice, a TRL of 8–9 indicates that technologies are fully validated under real operating conditions, industrialized, and commercially available, enabling both the reliable conversion of existing vehicles and the manufacture of vehicles specifically designed to run on natural gas. At the same time, these countries have implemented coherent public policies combining financial incentives, appropriate regulatory frameworks, and the large-scale development of refueling infrastructure.

At the African level, despite considerable natural gas potential, the use of natural gas as a transport fuel remains marginal. In 2019, the continent had only a limited number of CNG vehicles and refueling stations, with a strong concentration in Egypt. Nevertheless, projections by the Gas Exporting Countries Forum indicate sustained growth in natural gas demand over the coming decades, opening new prospects for its use in the transport sector, alongside electrical and industrial applications (GECF, 2022)

Within this contrasted global context, Algeria occupies a distinctive position. As a major producer and exporter of natural gas, the country has significant potential for the development of CNG and LPG, two fuels regarded as strategic for reducing domestic gasoline and diesel consumption and combating fuel smuggling. Their promotion forms part of the national policy framework on energy efficiency and energy transition, supported by public authorities and coordinated by institutions such as the Renewable Energy and Energy Efficiency Commission (CEREFE).

The Algerian experience nonetheless reveals a markedly differentiated trajectory between the two fuels. While LPG, introduced in 1983, experienced rapid expansion from 2015 onward reaching a national vehicle fleet of one million units by 2025 and increasing consumption more than sixfold within less than a decade CNG has remained largely confined to an experimental stage. Pilot projects launched since the late 1990s, particularly in urban transport and public fleets, have failed to achieve large-scale deployment due to persistent structural constraints along the value chain, including an incomplete regulatory framework, weak pricing mechanisms, institutional shortcomings, and limited coordination among public actors.

Moreover, evidence suggests that LPG's rapid diffusion has been driven primarily by gradual increases in gasoline and diesel prices rather than by direct subsidies for vehicle conversion kits. This raises critical questions regarding the effectiveness and transferability of policy instruments to CNG, whose infrastructure and conversion costs are significantly higher.

Against this background, the central research question addressed in this article is: **Why has large-scale CNG deployment failed to materialize in Algeria despite favorable resource endowments and explicit policy support, while LPG has achieved rapid and sustained diffusion?**

This question is explored through two complementary inquiries: **(**i) to what extent have fuel pricing policies and market-based incentives been more decisive than direct subsidies in driving LPG adoption; and (ii) under what economic, institutional, and regulatory conditions could the mechanisms behind LPG's success be adapted to enable a viable and sustainable development of CNG?

To address these issues, the article adopts an analytical approach aimed at informing strategic choices related to clean mobility in Algeria. It first reviews global trends in the use of natural gas as a transport fuel, highlighting key success factors and constraints, before examining Algeria's CNG trajectory through an analysis of pilot projects, financial support schemes, and the regulatory framework. Finally, it provides a comparative assessment of the competitiveness of CNG relative to LPG, with the objective of identifying the economic, institutional, and technical conditions conducive to a gradual transition toward sustainable gas-based mobility, consistent with national energy transition and fiscal sustainability objectives.

2. State of Development of CNG at the Global Level

2.1 CNG as an Alternative Fuel: Characteristics and Technological Maturity

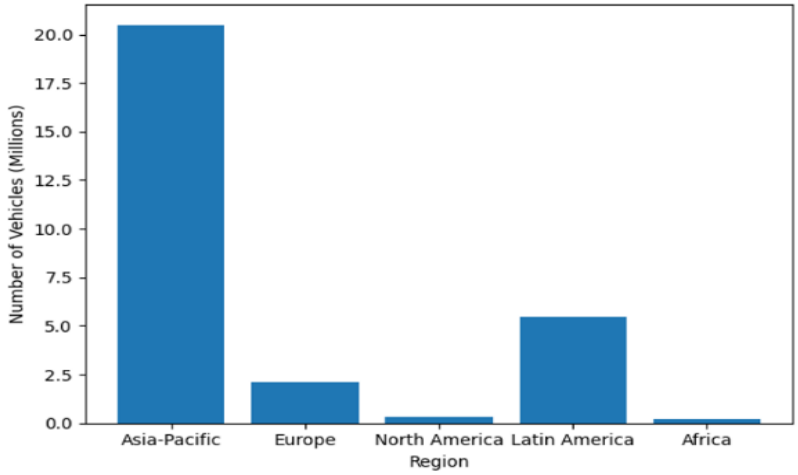
Over recent decades, natural gas has emerged as a credible alternative fuel for road transport due to its lower carbon footprint, reduced pollutant emissions, and noise levels. Its structurally lower cost compared with gasoline and diesel further enhances its economic appeal for private users, captive fleets, and public transport, making it a viable option for partially substituting conventional fuels.

Technically, natural gas is used in vehicles in two main forms: compressed natural gas (CNG) and liquefied natural gas (LNG). CNG, stored under high pressure, is well suited to light-duty and commercial vehicles, while LNG, stored at cryogenic temperatures, offers higher volumetric energy density and extended driving range, making it more appropriate for heavy-duty and long-distance transport. The complementarity of these two forms allows natural gas to address a broad spectrum of urban and interurban mobility needs.

Beyond its environmental and economic benefits, natural gas stands out for its high level of technological maturity. Extensive operational experience and empirical studies across different vehicle categories demonstrate the technical reliability, safety, and operational viability of CNG technologies, including under intensive fleet operating conditions (Yaïci & Ribberink, 2021). As a result, technical constraints no longer constitute a major barrier to large-scale deployment, which clearly distinguishes natural gas from other alternative solutions that are still in demonstration or pre-commercial phases.

This advanced technological maturity has been accompanied by a significant global rollout of natural gas vehicles. According to international statistics, the worldwide fleet of CNG and LNG vehicles has expanded steadily over the past two decades, with particularly strong penetration in Asia-Pacific and Latin America. These regions now account for the majority of natural gas vehicles globally, reflecting proactive public policies combining economic incentives, regulatory support, and sustained investment in refueling infrastructure (NGV Global , 2023).

Fig.1. Global distribution of natural gas vehicles by region in 2019



Source: Adapted from Yaïci & Ribberink (2021).

Data published by the international association NGV-Global confirm the scale of this deployment. In 2020, the total number of natural gas vehicles worldwide reached 28,540,819 units, indicating that their use is now well established at the international level. However, this global dynamic largely relies on the efforts of a limited number of countries. As shown in Table 1, five countries alone account for nearly 65% of the global natural gas vehicle fleet: China, Iran, India, Pakistan, and Italy.

Table 1. Leading countries in the deployment of natural gas vehicles (2019)

Country	Number of natural gas vehicles
China	6,760,000
Iran	4,502,000
India	3,150,138
Pakistan	3,000,000
Italy	1,004,982

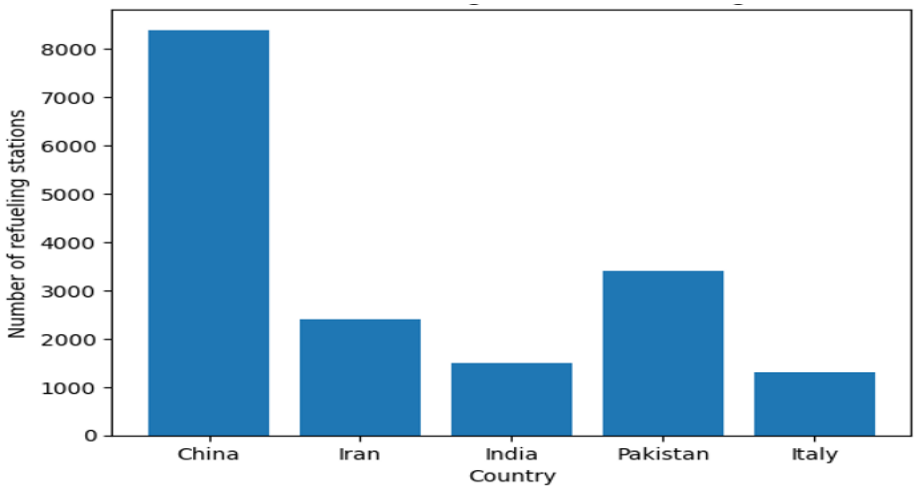
Source: NGV Global (2020), *Global NGV Statistics*, available from NGV Global database.

It is particularly noteworthy that some of these leading countries, notably India and Italy, are not among the world's major producers of natural gas. This observation highlights the fact

that the successful deployment of CNG does not depend solely on the domestic availability of natural gas resources, but rather on the coherence of public policies, the stability of the regulatory framework, and substantial investment in refueling infrastructure.

Indeed, the large-scale development of natural gas vehicles would not have been possible without a simultaneous expansion of dedicated refueling stations. Figure 2 highlights a strong correlation between the number of natural gas vehicles and the density of refueling infrastructure in leading countries, confirming the central role of these facilities in structuring the market.

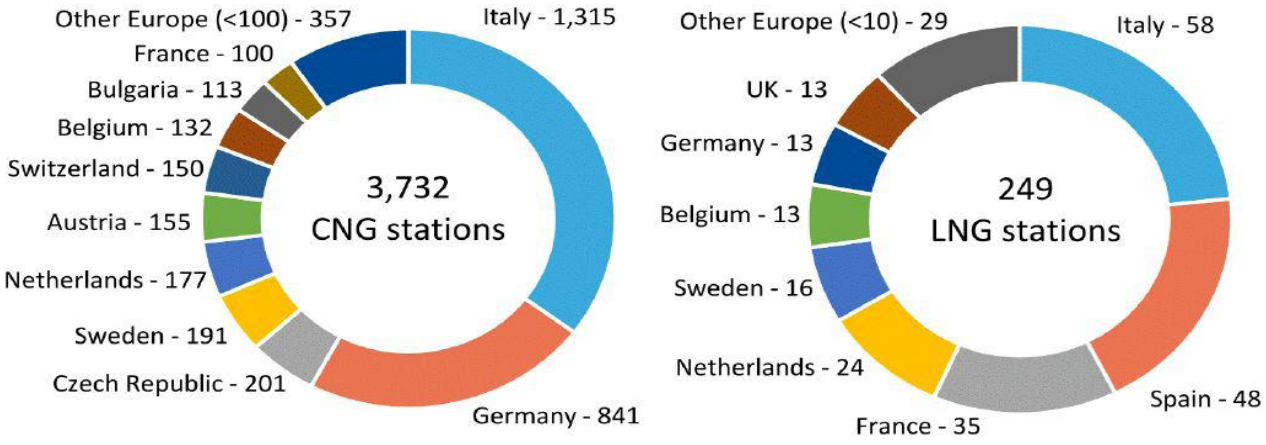
Fig.2.Development status of natural gas refueling infrastructure in leading countries, 2019.



Source: Adapted from NGV Global (2020), *Global Natural Gas Vehicle Statistics*.

At the European level, Italy holds a pioneering position in the use of natural gas in the transport sector. Despite growing interest from other European countries, particularly Germany, which views CNG as a transitional fuel toward biomethane, Italy remains the country with the densest network of natural gas refueling stations in Europe, as illustrated in Figure 3. This lead can be explained by an early and coherent strategy based on a comprehensive set of incentive measures implemented since the early 2000s.

Fig.3. Distribution of CNG and LNG refueling stations in Europe, 2019



Source: adapted from Yaïci and Ribberink (2021).

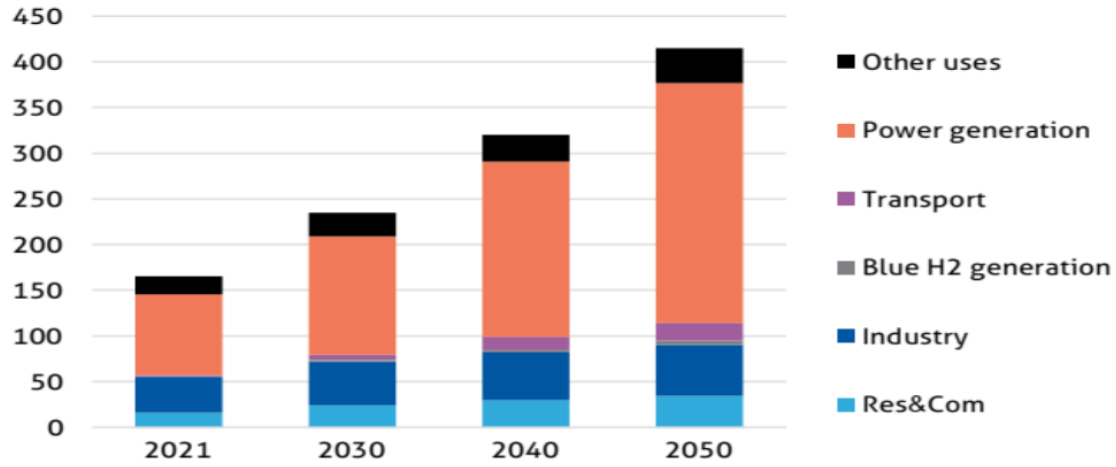
These measures notably include subsidies for the purchase of natural gas vehicles, tax reductions on new vehicle sales, and exemptions from road taxes, parking fees, and urban tolls. The effectiveness of these instruments has helped create a favorable environment for the

adoption of CNG by households and professionals, thereby contributing to the long-term sustainability of the market.

In contrast, the African continent shows a significant lag in the use of natural gas as a fuel for road transport, despite its considerable natural gas potential. By the end of 2019, Africa had only 295,349 natural gas vehicles and 210 refueling stations, with a strong concentration in Egypt, which alone accounted for 63% of the African fleet, or approximately 185,000 vehicles. This situation reflects the presence of structural, institutional, and economic constraints that hinder the diffusion of CNG across the region.

Nevertheless, future prospects remain favorable. According to projections by the Gas Exporting Countries Forum (GECF), African demand for natural gas is expected to experience sustained growth in the coming years. Although this growth will be primarily driven by power generation, the use of CNG in road transport is also expected to increase significantly, as illustrated in Figure 4. These outlooks confirm that natural gas has genuine potential to play an expanded role in the energy transition of the transport sector, including in African gas-producing countries.

Fig.4. Scenario for the evolution of Africa's natural gas demand by sector (billion m³), established in 2022



Source: GECF Secretariat, based on data from the GECF GGM.

2.2 Regional Diffusion Dynamics of CNG and Explanatory Factors

The global development of natural gas as a fuel for road transport displays pronounced regional heterogeneity, reflecting significant differences in public policies, energy structures, institutional capacities, and environmental priorities. An analysis of regional diffusion dynamics highlights the decisive role of national strategies in the adoption of CNG, sometimes independently of the level of domestic natural gas production.

2.2.1 Asia-Pacific and Latin America: Driving Forces of Global Diffusion

The Asia-Pacific and Latin American regions currently constitute the main centers of global CNG diffusion, accounting for the largest share of the worldwide natural gas vehicle fleet. This predominance reflects the combined influence of economic, environmental, energy security, and institutional factors that have positioned CNG as a key instrument in transport system transformation across many emerging economies.

In the Asia-Pacific region, large-scale CNG adoption in countries such as China, India, Iran, and Pakistan has primarily been driven by the need to address severe urban air pollution

and associated public health concerns. The widespread use of CNG in public transport and commercial fleets has resulted in substantial reductions in local pollutant emissions and noise, while also mitigating exposure to volatile oil prices and strengthening energy security. These trends have been reinforced by ambitious national strategies, particularly in China and India, where large-scale infrastructure development plans have integrated CNG as a core component of broader energy policies, profoundly reshaping urban mobility.

In Latin America, CNG diffusion has followed a distinct yet equally structuring trajectory. Countries such as Argentina and Brazil have capitalized on extensive gas infrastructure and supportive public policies to promote large-scale vehicle conversion, initially as a response to macroeconomic and fiscal constraints. More recently, the exploitation of unconventional gas resources especially in Argentina has further enhanced CNG's price competitiveness, while regional initiatives such as cross-border "blue corridors" have supported long-distance freight transport and regional market integration.

Overall, the experiences of Asia-Pacific and Latin America illustrate that CNG has evolved beyond a transitional role to become a strategic pillar of energy sovereignty and industrial policy. Their trajectories highlight that successful deployment depends less on resource endowment alone than on coherent public policies, infrastructure planning, and the integration of CNG within a comprehensive economic and environmental development strategy.

2.2.2 Europe: A More Targeted and Transition-Oriented Diffusion

In Europe, the diffusion of compressed natural gas has followed a more selective and differentiated pathway than in Asian and Latin American regions, reflecting strategic priorities focused on decarbonization, security of supply, and the gradual integration of renewable energies. The European CNG landscape is thus increasingly shaped by a structural transition toward bio-CNG derived from biomethane, which is progressively replacing fossil-based CNG (ADEME, 2014).

Italy represents a notable exception and remains the historical leader in CNG deployment in Europe, particularly in the light-duty vehicle segment. As illustrated in Figure 3, the country has the densest network of CNG and LNG refueling stations on the continent, the result of an early and continuous rollout initiated in the 1990s. This success is underpinned by a coherent public strategy combining financial incentives for vehicle purchases, tax advantages, exemptions from usage-related charges, and strong involvement by local authorities (Rapaport, 2002).

In other European countries, notably France and Germany, CNG diffusion follows a more targeted approach, focusing on transport segments with high potential for emissions reduction. Natural gas is primarily deployed for captive fleets, urban services (such as waste collection and municipal transport), and increasingly for heavy-duty freight vehicles. This orientation is strongly influenced by the European Union's Green Deal, which imposes increasingly stringent CO_2 emission standards and actively promotes the use of low-carbon alternative fuels (Kim & Mason, 2023).

Within this framework, the development of biomethane plays a central role. Local production of renewable gas mainly through agricultural anaerobic digestion and organic waste treatment enables European transport operators to pursue carbon neutrality objectives while retaining the operational advantages of gas-powered vehicles, including extended driving range

and refueling times that are significantly shorter than those of electric vehicles. Bio-CNG thus emerges as a key vector for decarbonizing heavy and medium-duty road transport, offering an immediately deployable solution that is fully compatible with existing infrastructure (Ellison, Greaves, S. P., & Hensher, D. A., 2013).

Consequently, at the European level, CNG is no longer regarded as a long-term substitute for petroleum-based fuels, but rather as an evolving transition fuel, gradually integrating into a broader renewable energy value chain. This trajectory contrasts with those observed in Asia and Latin America and highlights the decisive role of strategic and regulatory frameworks in shaping technological and energy choices within the transport sector (Amundsen & Sundvor, I., 2018).

2.2.3 Africa: High Potential, Still Limited Deployment

At the continental level, the integration of natural gas into the transport energy mix represents a major strategic challenge for Africa, although its deployment remains uneven. Historically, natural gas has been considered a marginal resource for mobility compared to its role in exports and power generation. Recent developments, however, point to a notable acceleration in its use as a transport fuel (African Energy Chamber, 2024).

Egypt has consolidated its position as the continental leader through an ambitious large-scale vehicle conversion policy. By the 2025/2026 fiscal year, the country aims to convert an additional 165,000 vehicles to compressed natural gas (CNG), with the overall objective of exceeding one million NGV-powered cars by the end of 2026 (Egypt Oil & Gas, 2025). This national program, supported by financial incentives and a substantial expansion of the refueling station network, seeks to reduce diesel consumption by 50% and cut CO_2 emissions by approximately 1.5 million tonnes per year.

Nigeria has emerged as the second major driver of this transition with the launch of the Presidential CNG Initiative (Pi-CNG). The program targets the conversion of one million vehicles by 2027, relying on a network of conversion centers across 19 states and investments exceeding USD 450 million by the end of 2024 (Presidential CNG Initiative[Pi-CNG], 2025). In 2025, the Nigerian government intensified efforts to attract USD 1 billion in annual investments for CNG infrastructure, facilitating the deployment of gas-powered buses and motorized tricycles to mitigate public transport costs.

Despite these localized successes, Africa continues to face persistent structural challenges, notably weak cross-border distribution infrastructure and regulatory frameworks that remain underdeveloped in many gas-producing countries. Nevertheless, the Gas Exporting Countries Forum projects a 4% increase in natural gas consumption across the continent in 2025, driven by industrialization and major projects such as the Trans-Saharan Gas Pipeline linking Nigeria to Algeria (Gas Exporting Countries Forum [GECF], 2020). Such large-scale infrastructure projects are widely viewed as fundamental levers for interconnecting domestic markets and fostering the emergence of an independent African gas transport corridor.

2.2.4 Key Factors Driving or Constraining the Development of CNG

A global and comparative analysis of national compressed natural gas (CNG) trajectories reveals highly contrasted dynamics, whose determinants extend well beyond purely technological considerations. Despite a high level of technological maturity (TRL 8–9), CNG development remains strongly conditioned by a set of economic, institutional, infrastructural,

and public health factors. The interaction of these elements largely explains the successful deployment observed in some regions and the persistent barriers encountered in others.

a) Fuel Price Gap

Economic factors constitute the central determinant of CNG adoption. The success of conversion policies is closely correlated with the existence of a clear and durable price differential between natural gas and conventional fuels, particularly diesel. Countries that have implemented either targeted subsidies for CNG/Bio-CNG or high carbon taxes on diesel report the highest conversion rates, especially among professional and captive fleets. Conversely, where fuel prices are administratively regulated or weakly differentiated, the economic advantage of CNG is eroded, significantly reducing incentives for initial investment.

b) Maturity of Gas Distribution Infrastructure

The availability of pre-existing gas infrastructure represents a decisive structural factor. The presence of natural gas transmission and distribution networks (pipelines and urban grids) substantially lowers the marginal costs associated with installing CNG compression and refueling stations. Countries with dense gas networks therefore enjoy a strong comparative advantage, enabling rapid and economically viable CNG deployment. By contrast, in countries where gas infrastructure is limited or absent, infrastructure costs constitute a major entry barrier, delaying market creation.

c) Institutional and Regulatory Support

Public policies play a structuring role throughout all phases of CNG development. Fiscal incentives for vehicle purchases, fuel tax exemptions, and regulatory instruments such as low-emission zones (LEZs) have proven to be essential levers in shaping fleet operators' choices. In Europe in particular, the regulatory framework stemming from the Green Deal enhances the attractiveness of CNG and Bio-CNG as transition solutions by progressively internalizing the environmental costs of conventional fossil fuels.

d) Public Health and Air Quality Imperatives

In emerging economies and large metropolitan areas, the fight against air pollution often constitutes the primary political driver behind the shift to CNG. Faced with severe smog episodes and high concentrations of fine particulate matter, public authorities tend to favor solutions capable of delivering immediate improvements in air quality. In this context, CNG emerges as a pragmatic alternative, significantly reducing local emissions of NO_x and particulate matter, even as electric mobility gradually gains prominence at the global level.

e) Constraining Factors and Structural Limitations

Conversely, the absence of a clear strategic vision, regulatory uncertainty, and high upfront costs related to infrastructure development and vehicle conversion represent major constraints on CNG deployment, particularly in developing countries. These barriers are often exacerbated by inconsistent or unstable energy policies, which undermine investor and consumer confidence. These key determinants can be summarized in a comparative framework, as presented in Table 2.

Table 2. Key Determinants of CNG Development: Comparative Overview

Key factor	Impact on CNG development	Examples of favorable contexts
Fuel price differential	Direct economic incentive for conversion	Countries with high carbon taxes or targeted subsidies
Existing gas infrastructure	Reduction in investment costs	Western Europe, Italy, Germany
Institutional and regulatory support	Investment security, market creation	LEZs, fiscal incentives, CO_2 standards
Public health imperatives	Political acceleration of adoption	Asian and Latin American megacities
High upfront costs and uncertainty	Structural barrier	Countries with limited gas networks

Source: Author's elaboration

3. Development of CNG Use in Algeria: Current Status, Institutional Framework, and Structural Constraints

In light of the international experiences previously examined, the Algerian case presents a notable paradox. The country possesses substantial natural gas resources, long-standing industrial expertise in the gas sector, and a relatively developed gas network. Yet, the use of natural gas as a fuel for road transport remains marginal and largely confined to pilot projects, without reaching a structured commercial deployment phase. This situation is particularly striking given that CNG could play a strategic role in reducing diesel import expenditures and improving air quality, especially in large urban agglomerations (Ministère de la Transition Énergétique et des Énergies Renouvelables, 2022).

The history of CNG development in Algeria dates back to 1998, with the launch of the first pilot initiative involving the construction of two natural gas compression stations by Sonelgaz, located in Hussein Dey and Gué de Constantine. This pioneering initiative aimed to promote CNG use and test the conversion of existing vehicles. In 2002, Sonelgaz converted 85 light-duty vehicles to CNG, marking the first concrete steps toward the adoption of this fuel.

In 2004, experimentation was extended to public transport with the deployment of ten CNG-powered buses in the Wilaya of Algiers, jointly operated by Sonelgaz and ETUSA. These pilot actions made it possible to test the technology under real operating conditions and assess its integration into urban fleet operations. Building on these experiences, the National Company for Industrial Vehicles (SNVI) launched the development of a first prototype of a CNG-adapted bus, finalized in 2016. However, the suspension of Naftal's pilot refueling station in Rouiba due to unresolved pricing and regulatory issues led to the withdrawal of CNG buses from service in 2017, revealing major governance and coordination failures (Naftal, 2022).

Despite these initiatives and sustained efforts to promote CNG, its development in Algeria has never progressed beyond the experimental stage. In 2014, Naftal inaugurated its first pilot refueling station open to the general public in Issane, Rouiba. However, operations were suspended three years later due to a dispute with Sonelgaz over the CNG concession price, which had not been defined by the regulatory framework. This interruption led to the withdrawal of

eleven prototype buses from service in 2017 owing to a complete lack of CNG supply, highlighting the fragility of the system when key links in the value chain fail to function.

Thus, unlike LPG/C, whose use has experienced rapid and sustained growth since the mid-2010s, CNG in Algeria remains limited to pilot experiments. Several factors explain this stagnation, including structural bottlenecks, regulatory shortcomings, the absence of clear pricing and distribution mechanisms, as well as insufficient infrastructure and supply continuity. These experiences demonstrate that, despite the availability of resources and technical expertise, the successful deployment of CNG requires a systemic approach integrating regulation, financing, infrastructure development, institutional support, and human capacity building.

3.1 State Financial Support for the Acquisition of CNG-Powered Vehicles

Financial support from the Algerian state for the use of CNG as a transport fuel forms part of broader public policies aimed at energy efficiency and energy transition, seeking to reduce dependence on petroleum fuels and mitigate the environmental impacts of the transport sector. As of the 2023 fiscal year, this support has been formalized through annual budgetary allocations recorded in the budget of the Ministry of Energy and Mines under "transfer expenditures," Program No. 04, *Energy Efficiency and Renewable Energies Connected to the National Power Grid*.

The support mechanism primarily targets public collective transport, especially the acquisition of CNG-powered buses. The state has opted for full coverage (100%) of acquisition costs**,** reflecting the high upfront investment associated with CNG technologies. According to official assessments, this policy aims to eliminate the main economic barrier faced by public transport operators

Within this framework, the state support rate has been set at 100% of the acquisition cost of CNG-powered buses. In 2018, this cost was estimated at approximately 10 million Algerian dinars per bus, a figure that has since proven to be substantially below current market prices due to rising costs of equipment, dedicated engines, and gas storage systems. Despite these cost increases, the principle of full state coverage has been maintained in order to remove the primary economic barrier to the adoption of this technology by transport operators.

In 2023, a dedicated budget envelope was mobilized to finance the acquisition of CNG buses. Nevertheless, experience shows that financial support alone has proven insufficient. The lack of operational refueling infrastructure, supply continuity issues, and weak institutional coordination have significantly reduced the effectiveness of public spending, leading to the immobilization of several CNG vehicles (Schulin, T. Köhler & J., 2022).

However, accumulated experience shows that this financial support, although substantial, has not been sufficient to ensure effective and sustainable diffusion of CNG. The lack of continuity in fuel supply, the shortage of operational refueling infrastructure, and organizational and institutional deficiencies have led to the immobilization of several acquired or converted vehicles, significantly reducing the economic efficiency of public funds invested. This situation highlights the limitations of an approach primarily focused on investment subsidies, in the absence of a fully structured and coherent CNG ecosystem integrating infrastructure, regulation, value-chain governance, and coordination mechanisms among stakeholders.

3.2 Regulatory Framework Governing the Development of CNG Use

From a regulatory standpoint, Algeria initiated a proactive approach in the early 2000s to regulate and promote the use of compressed natural gas (CNG) as an automotive fuel. Starting in 2003, this approach materialized through a series of decrees and interministerial orders under the authority of the Ministry of Energy and Mines, aiming to create a secure legal environment that would enable the launch of initial pilot projects and the technical structuring of this emerging sector (Naftal, 2023).

The regulatory framework established covers several essential aspects of the CNG value chain. Decree No. 03-473 of December 2, 2003 serves as the foundational text, defining the conditions for conducting CNG distribution activities and the rules for installing conversion kits on motor vehicles. This was supplemented by Decree No. 05-313 of September 10, 2005, which specifies the retail distribution margin and the sale price of CNG fuel, reflecting the authorities' intent to economically regulate an activity still in its infancy.

Additionally, several interministerial orders adopted between January and June 2005 clarified operational implementation procedures for CNG, particularly regarding usage authorization, vehicle signage, infrastructure safety, and technical conditions for installing conversion kits. Table 3 summarizes these regulatory texts governing the use of natural gas as fuel in Algeria.

Table 3. Regulatory texts governing the use of natural gas as fuel

No.	Regulatory Text	Scope of Application
01	Decree No. 03-473, December 2, 2003	Establishes conditions for conducting CNG distribution activities and installing vehicle conversion kits
02	Decree No. 05-313, September 10, 2005	Sets the retail distribution margin and sale price of CNG fuel
03	Interministerial Order, January 23, 2005	Defines procedures for granting authorization to use CNG in vehicles
04	Interministerial Order, February 12, 2005	Specifies characteristics and dimensions of vehicle CNG signage
05	Interministerial Order, April 10, 2005	Establishes safety rules for the installation, layout, and operation of CNG distribution infrastructure
06	Interministerial Order, June 8, 2005	Defines conditions for installing vehicle conversion kits for operation on CNG

Source: Author's compilation based on Algerian official regulatory texts (2003–2005).

This body of regulations reflects an early and relatively comprehensive effort on technical and safety aspects, placing Algeria among the pioneering African countries in establishing a legal framework for CNG fuel. However, despite this initially favorable framework, the Algerian experience has revealed operational limitations and its inadequacy for large-scale commercial deployment (Ministère de la Transition Énergétique et des Énergies Renouvelables, 2022).

Several strategic links in the value chain remain insufficiently covered or poorly defined. First, the absence of a clear, stable, and enforceable pricing mechanism for supplying natural gas to public CNG stations constitutes a major bottleneck. The dispute between Naftal and Sonelgaz over the Rouiba CNG station supply exemplifies how such a gap can block project viability. Second, the existing regulations have not allowed effective entry of private operators

into the CNG distribution sector, unlike the successful model applied for LPG. This restriction limits investment capacity, slows the expansion of the station network, and prevents the emergence of competition that could improve service quality and reduce costs.

Furthermore, the regulatory framework does not provide sufficiently detailed rules for the homologation of CNG vehicles, whether converted or manufacturer-built. This regulatory uncertainty represents a significant barrier for manufacturers, importers, and transport operators due to the lack of legal and technical visibility. Finally, the absence of detailed standards for the qualification of conversion kits and CNG storage cylinders remains a major weakness, even though these elements are essential to ensure the safety of installations, the reliability of equipment, and user confidence.

Overall, while the Algerian regulatory framework enabled pilot projects and laid the legal foundations for CNG use as fuel, its partial and insufficiently integrated nature has hindered scaling up. Consolidating and updating this framework through a systemic approach covering the entire value chain and incorporating lessons from successful international experiences appears as a necessary but not sufficient condition for the sustainable revival and widespread adoption of CNG in Algeria.

3.3 Lessons from Pilot Experiences and Observed Limitations

The pilot experiences conducted in Algeria in the field of compressed natural gas (CNG) as an automotive fuel, although limited in number and scope, provide particularly valuable insights into the conditions for success or failure of this sector. Launched mainly in the late 1990s and early 2000s, these projects primarily targeted urban public transport and public vehicle fleets, with the objective of testing the technical, economic, and organizational feasibility of CNG within the national context.

The near-total discontinuation of these programs emblematically illustrated by the prolonged immobilization of the eleven CNG buses operated by SNVI and ETUSA highlights the structural fragility of these initiatives. Despite significant initial investments and the existence of a formal regulatory framework, the lack of continuity in fuel supply, institutional dysfunctions among the stakeholders involved, and the absence of clarity regarding their respective responsibilities quickly led to the paralysis of the system.

These experiences reveal a characteristic domino effect inherent to integrated energy value chains: the failure of a single link whether gas supply, compression station operation, vehicle maintenance, or price-setting mechanisms is sufficient to undermine the entire system. In the Algerian case, the absence of a robust operational framework ensuring durable coordination among gas producers, distributors, station operators, and transport service providers transformed technically viable projects into aborted experiments.

Beyond technical considerations, these shortcomings also expose the limitations of an approach largely based on one-off investments or vehicle purchase subsidies. The Algerian experience demonstrates that CNG development cannot be conceived as a simple technological substitution for conventional fuels. It requires a systemic approach that coherently integrates regulatory, economic, institutional, and organizational dimensions, supported by clear governance arrangements capable of ensuring effective coordination among public stakeholders.

Moreover, the absence of ex post evaluation mechanisms for pilot projects and the lack of institutional learning and capitalization on feedback have contributed to the repeated emergence of the same constraints over time. Unlike experiences observed in certain emerging or European countries where pilot phases served as stepping stones toward gradual market scaling the Algerian projects remained confined to an experimental status, with no clear pathway toward generalization (Mousli A. , 2025).

These findings underscore that pilot projects are not an end in themselves, but rather a critical stage in the market creation process. When they are not embedded within a comprehensive deployment strategy featuring clear objectives, realistic timelines, and effective monitoring mechanisms they risk producing the opposite of the intended effect, reinforcing perceptions of CNG as an unreliable or economically unviable fuel (Mousli A. , 2019).

From this perspective, analyzing the limitations observed in Algerian pilot experiences provides an essential analytical framework for formulating realistic and actionable policy recommendations. It helps identify the institutional, economic, and technical conditions required to move from an experimental phase to a gradual and sustainable nationwide deployment of CNG, which is the focus of the following subsection.

3.4 Recommendations for the Large-Scale Adoption of CNG in Algeria: A Phased and Progressive Approach

Despite several initiatives to promote compressed natural gas as an automotive fuel, outcomes in Algeria remain well below initial expectations. The premature termination of the program, before the effective completion of the pilot phase, points to structural dysfunctions affecting the entire CNG value chain. The immobilization of eleven CNG buses mainly due to irregular fuel supply and weak institutional coordination led to significant investment losses for national companies such as SNVI and ETUSA, underscoring the limitations of fragmented and isolated initiatives.

These findings indicate that CNG development cannot rely on sporadic or sector-specific actions. Instead, it requires an integrated, coherent, and progressive strategy capable of sustainably structuring an enabling ecosystem for its deployment, particularly in passenger and freight transport. In the medium term, this strategy should also extend to other energy-intensive segments, such as maritime transport and fishing, as partial substitutes for diesel.

Accordingly, a phased approach is proposed, structured around three complementary stages: a pilot and demonstration phase, a market creation phase, and a large-scale deployment phase. This framework aims to mitigate technical and economic risks, gradually consolidate the sector, and facilitate the sustainable adoption of CNG by economic actors and end users.

A. Pilot and Demonstration Phase

Objective: To relaunch the CNG program on solid foundations by testing, in a controlled manner, technical, economic, and institutional solutions, while capitalizing on lessons learned from previous experiences.

This phase represents a fundamental step aimed at correcting the regulatory, organizational, and operational shortcomings that led to the suspension of earlier initiatives. It should be based on a limited number of targeted projects, concentrated in urban areas with high densities of public transport and logistics activities, where the potential for diesel substitution is greatest.

The priority actions to be implemented during this phase include:

- Strengthening and operationalizing the existing regulatory framework in order to remove identified bottlenecks, particularly with regard to CNG pricing mechanisms, vehicle homologation, equipment certification, and infrastructure safety standards;
- Reactivating or launching integrated pilot projects involving limited fleets of CNG-powered buses, trucks, or taxis, combined with reliable and operational refueling infrastructure;
- Systematic involvement of research centers, universities, and vocational training institutes in the monitoring, techno-economic evaluation, and continuous improvement of pilot projects.

This phase should be conceived as a collective learning process aimed at strengthening national capacities and training the human resources required for the subsequent large-scale deployment of CNG, notably technicians, installers, mechanics, station operators, and fleet managers.

B. Market Creation Phase

Objective: To establish the economic, institutional, and social conditions required for the emergence of a structured and viable CNG market, based on the voluntary participation of economic actors and consumers, and supported by a gradual investment dynamic.

During this intermediate phase, public action should play a catalytic role in lowering entry barriers, correcting market failures, and improving the competitiveness of CNG relative to diesel. The objective is no longer merely to experiment, but to create an environment conducive to private investment and the progressive diffusion of the technology. The main measures to be implemented during this phase include:

- Conducting comparative studies and ex ante and ex post impact assessments to evaluate the economic, fiscal, social, and environmental effects of CNG deployment, and to provide an evidence-based foundation for public policy trade-offs;
- Establishing targeted support mechanisms for investors willing to develop CNG refueling stations, including temporary tax incentives, investment subsidies, and guarantee schemes aimed at mitigating financial risks;
- Strengthening financial support for the acquisition of CNG-powered heavy vehicles, particularly buses and trucks, within clean and sustainable transport policies, with priority given to public transport operators and freight companies with high annual mileage;
- Introducing financial, fiscal, and parafiscal incentives for the conversion of existing vehicles especially diesel-powered ones and supporting the emergence of specialized operators in conversion and maintenance activities;
- Maintaining a favorable price differential between CNG and diesel at the pump, a key condition for the economic attractiveness of CNG, whose effectiveness has already been demonstrated in the case of LPG (GPL/c) in Algeria;
- Deploying structured vocational training programs to ensure the availability of qualified local skills and to strengthen user confidence in the reliability and safety of the CNG sector.

This phase aims to initiate a self-sustaining market dynamic, in which the role of the State gradually evolves from direct support toward regulation and facilitation.

Table 4. Key Levers for CNG Market Creation

Key Stage	Main Actors	Type of Incentive	Objective
CNG stations	Sonelgaz, private investors	Subsidie, guarantees	Infrastructure deployment
Buses and trucks	Transport companies	Targeted public financing	Initiation of market diffusion
Vehicle conversion	SMEs, public fleets	Financial and technical support	Expansion of the CNG fleet
Awareness-raising	Public authorities	Information and training	Voluntary adoption

Source: Author's own elaboration.

C. Large-Scale Deployment Phase

Objective: To ensure the nationwide rollout of CNG by integrating all segments of road transport and sustainably consolidating the value chain, within a framework of energy transition and fiscal sustainability.

This phase marks the transition of CNG to an industrial and commercial scale. It is predicated on the prior existence of a functional market, adequate infrastructure, and a stabilized regulatory framework. Public intervention becomes more selective and normative, aimed at supporting the large-scale adoption of CNG while ensuring safety, service quality, and the economic viability of the system. In particular, this phase involves:

- Expanding the number of vehicle conversion centers, with a broad yet regulated opening of the activity to the private sector, in order to foster competition, innovation, and cost reduction;
- Developing efficient after-sales services to ensure maintenance, safety, and long-term reliability of CNG-powered vehicles, which is a key prerequisite for user confidence;
- Generalizing the deployment of CNG refueling stations across the national territory, in line with the strengthening and expansion of the natural gas distribution network operated by Sonelgaz;
- Increasing the availability of new factory-built CNG vehicles on the domestic market, particularly for commercial vehicles and those exceeding 1.5 tonnes, through industrial partnerships and local content policies;
- Gradually introducing mandatory conversion or acquisition requirements for CNG vehicles in certain strategic segments, such as urban buses and public and semi-public fleets, especially for models manufactured locally by SNVI or its partners;
- Extending the use of natural gas as a fuel to maritime transport and fishing vessels, in order to maximize the economic, environmental, and fiscal gains associated with the substitution of diesel.

4. Competitiveness of LPG/C Compared with CNG

The choice between LPG/C and CNG as alternatives to conventional fuels depends on several interrelated parameters, including economic costs, infrastructure requirements, ease of supply, environmental performance, and technical feasibility. A comparative analysis of these two fuels helps to inform both public and private decision-making in the context of Algeria's transport energy transition.

4.1 Technical and Logistical Characteristics

From a technical perspective, LPG/C and CNG differ fundamentally in their storage methods and associated logistical constraints. LPG/C is stored in liquid form under relatively low pressure, which facilitates transportation, storage, and refueling operations. By contrast, CNG is stored in gaseous form at very high pressure (200–250 bar), requiring larger and more expensive tanks, as well as dedicated compression equipment.

Refueling infrastructure is a key determinant of the relative competitiveness of the two fuels. LPG/C stations involve investment and operating costs comparable to those of conventional fuels, which has enabled their rapid deployment and widespread diffusion across the national territory. In contrast, CNG stations require significantly higher investments, due to the need for gas compression, enhanced safety systems, and, in some cases, direct connection to the natural gas transmission or distribution network.

With regard to vehicle conversion, LPG/C kits are relatively easy to install, with costs generally ranging from USD 400 to USD 4,000 depending on vehicle type, technology, and local market conditions. Conversely, conversion to CNG is more complex and costly, particularly for heavy-duty vehicles, owing to the size and cost of high-pressure storage cylinders and the technical adaptations required.

Overall, from a technical and logistical standpoint, LPG/C offers immediate accessibility and greater flexibility, whereas CNG entails more stringent constraints but remains well suited to specific use cases, notably captive fleets and heavy vehicles operating on regular routes (European LPG Association, 2016).

4.2 Economic Performance

Economic analysis is a central criterion in assessing the competitiveness of LPG/C and CNG. The retail price of LPG/C is generally indexed to international LPG prices, which are themselves correlated with oil prices. However, owing to public support mechanisms, LPG/C prices typically remain lower than those of gasoline and diesel. This translates into an attractive cost per kilometer for both private users and small- and medium-sized fleets.

By contrast, the price of CNG mainly depends on the cost of bulk natural gas delivered to major consumption centers, as well as on compression and distribution costs. Although natural gas is an abundant resource in Algeria, the high investment required for infrastructure and vehicle conversion increases upfront costs and lengthens payback periods, particularly for private operators.

In terms of subsidies and taxation, LPG/C benefits from broad-based support, including regulated retail prices and tax incentives, which largely explains its widespread adoption among households. Conversely, support for CNG remains more targeted, primarily focused on buses and certain public fleets, thereby limiting its current attractiveness for private users and small businesses.

From this perspective, LPG/C appears to be the most economically competitive option in the short term for rapid diffusion, whereas CNG becomes more relevant within targeted public policies aimed at heavy-duty fleets and public transport, provided that appropriate support mechanisms are in place.

4.3 Environmental Aspects

From an environmental standpoint, CNG offers more pronounced advantages than LPG/C. The use of CNG allows for a significant reduction in carbon dioxide emissions up to 25–30% compared with diesel as well as a substantial decrease in NO_x and particulate matter emissions, making it particularly well suited to densely trafficked urban areas.

LPG/C, while providing a moderate reduction in emissions relative to conventional fuels, remains less effective than CNG in terms of decarbonization. Nevertheless, it contributes to improved local air quality and reduced nuisances, particularly noise pollution.

Moreover, CNG has a higher long-term decarbonization potential, as it is compatible with the gradual integration of biomethane and, more broadly, renewable gases. This characteristic gives CNG a strategic role in medium- and long-term energy transition scenarios (Mousli A. , 2025).

4.4 Market Outlook and Adoption in Algeria

In Algeria, LPG/C has achieved a clear lead in market penetration and user acceptance. By 2023, the LPG/C vehicle fleet exceeded one million units, supported by a relatively dense refueling network and a stable policy framework established over several decades. Owing to its technical characteristics, ease of storage and distribution, and high driving range, LPG/C is particularly well suited to light-duty vehicles and individual mobility, especially in areas lacking heavy gas infrastructure.

By contrast, CNG remains at an early stage of development, with a limited vehicle fleet and insufficient refueling infrastructure. Despite comparable technological maturity, constraints related to high storage pressure, tank weight, and stricter safety requirements hinder its adoption by private users. Its deployment is more appropriate for organized professional uses such as captive fleets, urban buses, and industrial vehicles where these constraints can be more effectively managed.

From this perspective, a strategy based on the complementarity between LPG/C and CNG appears the most efficient from economic, technical, and organizational standpoints. LPG/C would retain a central role in individual and light-duty transport, while CNG would be primarily targeted at public transport and professional fleets, and potentially heavy-duty vehicles in the longer term (through LNG). The co-location of LPG/C and CNG refueling infrastructure could serve as a key lever to optimize investment, reduce unit costs, and accelerate the transport sector’s energy transition.

The technical and operational differences between LPG/C and CNG, summarized in Table 5, thus support a differentiated yet complementary deployment strategy aligned with market segments and energy policy objectives.

Table 5. Technical and Functional Comparison between LPG/C and CNG

Criteria	LPG/C	CNG
Physical state	Liquid under moderate pressure	Compressed gas
Storage pressure	5–10 bar	200–250 bar
Volumetric energy density	Medium	Low
Vehicle range	High	More limited

Tank weight	Moderate	High
Safety constraints	Well controlled	More stringent
Technological maturity	Very high	Very high
Main use segments	Light-duty vehicles, private users	Captive fleets, buses, heavy-duty vehicles

Source: Author's own elaboration.

5. Conclusion

The analysis conducted in this article highlights that the use of natural gas as a transport fuel represents a relevant lever for energy transition in the transport sector, provided that it is embedded within a coherent, gradual, and context-specific strategy adapted to national economic and institutional realities. At the international level, successful experiences demonstrate that the development of CNG and LNG relies less on the mere availability of gas resources than on the establishment of a comprehensive ecosystem combining a stable regulatory framework, targeted incentive mechanisms, adequate refueling infrastructure, and effective coordination between public and private stakeholders.

In the Algerian case, the contrast observed between the success of LPG/C and the stagnation of CNG clearly illustrates the importance of structural determinants in the diffusion of alternative fuels. While LPG/C has benefited from a favorable combination of price signals, accessible infrastructure, and manageable conversion costs, CNG has remained confined to pilot projects, insufficiently supported by an integrated strategic vision and by the effective structuring of the entire value chain. Past experiences, marked by vehicle immobilization and the premature termination of otherwise promising programs, underscore the limitations of an approach largely focused on upfront investment without ensuring operational continuity.

The comparative analysis of the competitiveness of LPG/C and CNG also highlights their non-substitutable yet complementary roles in the Algerian context. LPG/C emerges as an immediately deployable, economically attractive, and socially acceptable solution for light-duty vehicles and private users, particularly in an environment characterized by high sensitivity to fuel prices. By contrast, CNG offers more pronounced environmental benefits and a higher decarbonization potential in the medium and long term, especially for captive fleets, urban public transport, and heavy-duty vehicles, provided that appropriate and sustainable support mechanisms are put in place.

The findings of this study suggest that the revival of CNG in Algeria should not be envisaged as an immediate alternative to LPG/C, but rather as a complementary strategic axis, to be pursued through a phased and progressive approach. Such an approach would help reduce investment risks, capitalize on both international and national feedback, and gradually prepare operators and users for the adoption of natural gas as a transport fuel. This implies, in particular, strengthening the regulatory framework, securing fuel supply, coordinating infrastructure development, and integrating training, maintenance, and institutional governance dimensions.

Finally, beyond the technological choice itself, the development of CNG and LPG/C is part of a broader issue of budgetary sustainability and public policy effectiveness. In a context of increasing fiscal constraints, optimizing state intervention instruments by prioritizing targeted,

temporary, and evaluable incentives appears essential to reconcile environmental objectives, subsidy rationalization, and social acceptability. From this perspective, gas-based mobility, when conceived as an integrated system rather than a collection of isolated projects, can constitute a credible pillar of Algeria's energy transition and a sustainable pathway for the valorization of national gas resources.

5. *Bibliography List*:

1. ADEME. (2014). *Les zones à faibles émissions en Europe : déploiement, retours d'expériences, évaluation d'impacts et efficacité du système.* Agence de l'environnement et de la maîtrise de l'énergie.
2. African Energy Chamber. (2024). *The State of African Energy 2024 Outlook Report.* African Energy Chamber. Récupéré sur https://www.africanenergychamber.org/report-2024
3. Amundsen, A. H., & Sundvor, I. (2018). *Low emission zones in Europe: Requirements, enforcement and air quality.*
4. Egypt Oil & Gas. (2025, February). *Egypt aims to convert 165,000 additional vehicles to run on CNG for FY 2025/26*. (E. O. Gas, Éditeur) Récupéré sur https://www.egyptoilgas.com/article-cng-conversion-fy25-26
5. Ellison, R. B., Greaves, S. P., & Hensher, D. A. (2013). Five years of London's low emission zone: Effects on vehicle fleet composition and air quality. *Transportation Research Part D, 23*, pp. 25-33.
6. European LPG Association. (2016). *LPG vehicles in underground parking.* European LPG Association. Récupéré sur https://www.worldliquidgas.org/publications/
7. Gas Exporting Countries Forum [GECF]. (2020). *The future of natural gas in road transport and its role for a decarbonised mobility agenda in Europe.* Récupéré sur https://www.gecf.org/_resources/files/events/gecf-expert-commentary---future-of-ngvs-focus-on-europe.pdf
8. Gas Exporting Countries Forum. (2025). *GECF annual gas market report 2025.* Récupéré sur https://www.gecf.org/_resources/files/pages/gecf-annual-gas-market-report-2025.pdf
9. GECF. (2022). *Global gas outlook 2050: Synopsis.* Gas Exporting Countries Forum. Récupéré sur https://www.gecf.org/_resources/files/pages/gecf-global-gas-outlook-2050/gecf-gas-outlook-2022.pdf
10. Intergovernmental Panel on Climate Change [IPCC]. (2022). *Mitigation of climate change.* Cambridge University Press. Récupéré sur https://www.ipcc.ch/report/sixth-assessment-report-working-group-3/
11. Intergovernmental Panel on Climate Change [IPCC]. (2022). *Mitigation of climate change.* https://www.ipcc.ch/report/sixth-assessment-report-working-group-3/: Cambridge University Press.
12. Kim, Y., & Mason, J. (2023). *The opportunity of low emission zones: A taming traffic deep dive report.* Institute for Transportation and Development Policy (ITDP).
13. Ministère de la Transition Énergétique et des Énergies Renouvelables (MTEER). (2022). *Rapport sur la situation des opérations de conversions de véhicules au GPL/c et au GNC.* Alger: MTEER.

14. Ministère de la Transition Énergétique et des Énergies Renouvelables. (2022). *Rapport sur la situation des opérations de conversion des véhicules au GPL/C et au GNC.* MTEER.
15. Mousli, A. (2019). L'impact des subventions des produits énergétiques sur le budget de l'État algérien : Cas des carburants routiers. *Thèse de doctorat*. Béjaïa, Algérie.
16. Mousli, A. (2025). LPG/C in Algeria: A Strategic Lever for Sustainable Mobility? *Majallat Al Manhal Al Iqtisadi (Economic Menhal Journal), 8*(1), pp. 1175–1194. doi:10.XXXX/majmanhal.v8i1.269446
17. Naftal. (2022). *Rapport sur l'activité GPL/C en Algérie.* Naftal.
18. Naftal. (2023). *GPL/C et GNC*. Récupéré sur Naftal: https://www.naftal.dz/fr/index.php/gplc-gnc
19. NGV Global . (2023). *NGV statistics*. Récupéré sur https://www.ngvglobal.org/ngv-statistics/
20. Presidential CNG Initiative[Pi-CNG]. (2025). *Impact Report and National Deployment Plan 2025: Transitioning Nigeria's Transport Sector.* Pi-CNG Nigeria. Récupéré sur https://www.pi-cng-nigeria.org/impact-report-2025
21. Rapaport, E. (2002). The Stockholm environmental zone, a method to curb air pollution from bus and truck traffic. *Transportation Research Part D, 7*, pp. 213–224.
22. Schulin, T. Köhler & J. (2022). *Sécurité des installations de gaz de pétrole liquéfiés (GPL)* (éd. 2e édition, novembre 2022). (A. I. (AISS), Éd.)
23. World LPG Association and Liquid Gas Europe. (2023). *Autogas incentive policies 2023: A country-by-country analysis of why and how governments encourage Autogas and what works.* World LPG Association (WLPGA). Récupéré sur https://www.wlpga.org/publication
24. Yaïci, W., & Ribberink, H. (2021). Feasibility study of medium- and heavy-duty compressed renewable/natural gas vehicles in Canada. *Journal of Energy Resources Technology, 143*, p. 090902. Récupéré sur https://doi.org/10.1115/1.4049455.