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A STUDY ON ECONOMIC IMPACT OF CNG IN PUBLIC TRANSPORTS WITH SPECIAL REFERENCE TO COIMBATORE DISTRICT

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ABSTRACT

The rising fuel prices and growing environmental concerns have urged many cities across India to explore cleaner and more economical alternatives for public transport. Compressed Natural Gas (CNG) has emerged as a promising substitute for conventional fuels like diesel and petrol due to its cost-effectiveness and reduced carbon emissions. This study aims to analyze the economic impact of CNG adoption in public transport, focusing specifically on the Coimbatore district. The research explores various aspects such as fuel cost savings, maintenance expenses, operational efficiency, and the environmental benefits of using CNG- powered vehicles. Data was collected through structured questionnaires distributed among transport operators, bus drivers, and relevant government officials. The study also highlights the challenges faced in transitioning to CNG, including infrastructure limitations and initial conversion costs.

KEY WORDS

CNG public transport, Economic impact, Government incentives, Cost efficiency, Environmental concerns.

INTRODUCTION

Public transportation plays a crucial role in urban mobility, economic development, and environmental sustainability. It is the backbone of urban mobility, providing an affordable and efficient mode of transport for millions of people. In recent years, cities worldwide have been exploring alternative fuels to reduce dependency on conventional fossil fuels like diesel and petrol. Compressed natural gas (CNG) is one of the alternative fuels

that many cities have adopted to lower pollution and operating costs as a result of rising fuel prices and growing environmental concerns. Compared to traditional petrol and diesel, CNG has become a cleaner and more affordable fuel.

Coimbatore, known as the Manchester of South India, is a major industrial and commercial hub, experiencing rapid urbanization and population growth. This has led to an increasing demand for efficient public transportation. Auto-rickshaws, private buses, and state-run transport services form the core of Coimbatore's public transport network. The Coimbatore district is the primary subject of this study, which looks at the financial effects of CNG adoption in public transportation. Increasing urbanization and vehicle growth have resulted in increased fuel consumption and environmental issues in Coimbatore, a fast expanding industrial and commercial hub in Tamil Nadu. Considerable economic ramifications are anticipated from the implementation of CNG in public transportation, including cost reductions for transport operators, modifications to fare structures, government subsidies, and effects on employment and company prospects.

The study intends to evaluate the effects of the switch to CNG on public transportation operations, its financial sustainability, and its overall influence on the Coimbatore local economy. This study offers insights into the long-term economic viability of CNG in public transportation by examining cost-benefit factors, environmental benefits, and policy frameworks.

OBJECTIVES OF THE STUDY

- To analyze the cost efficiency and financial impact
- To examine government policies and incentives
- To evaluate the environmental benefits.

RESEARCH TECHNIQUES

Creating the research project's design involves defining the research problems. Coimbatore city were chosen to gather data. A practical sample technique is used in this investigation. The researcher chose the sample of respondents based on convenience. A variety of data collection techniques are employed for the investigation. Here, two primary categories of data collection techniques are employed. There are two types of data: primary and secondary. This is the first collection of primary data. Primary data for this study are gathered by a survey using a carefully thought-out questionnaire. Books, journals and the Internet are the sources of secondary data. A total of 50 samples were taken from the CNG public transport operators in Coimbatore. Simple percentage, Chi-square, ANOVA and T-Test tools are used.

REVIEW OF LITERATURE

- **Fattah, Istiaqe, Biswas, Rahman, Morshed, & Chakraborty, (2023**). Environmental and economic benefits of CNG conversion on three-wheelers in a developing city, Khulna, Bangladesh. This study examines the environmental and economic impacts of converting three-wheelers to CNG in Khulna City. Using a top-down approach, it estimates emissions and costs from 2019 to 2022. CNG conversion reduced CO_2, SO_2, NMVOC, and PM10 emissions while lowering vehicle operation costs and increasing travel distances. However, CO, CH_4, and NO_2 emissions rose. The shift led to a daily reduction in pollutant emission costs by BDT 1.12 million (USD 4.8 million/year). Diesel three-wheelers were found to be the noisiest. The study highlights CNG's co-benefits for air quality and climate change mitigation.
- **Fabianová & Janeková (2022).** Economic assessment of investment in electric buses and CNG buses–a case study of a public transport company. The article deals with green investment focused on urban public transport. This work presents a holistic approach to evaluating investments in electric and CNG buses, i.e., the economic efficiency assessment, including the risk aspect. The investment project is assessed in terms of the source of funding and risk factors affecting the profitability of the project. A non-repayable subsidy from the European Social Fund in the amount of 0%, 25%, 50% and 90% of investment costs is considered. Economic efficiency is assessed in terms of profitability through the financial criterion Net Present Value (NPV) and risk using mean NPV and standard deviation. The result of the evaluation of the variants of the investment project is that the investment project without the support of non-repayable resources is loss-making. With a low level of financial support, it is more economical to procure CNG buses. With a higher level of financial support, investments in electric buses are more profitable, due to lower operating costs.

DATA ANALYSIS AND INTERPRETATION

TABLE - 1

TABLE SHOWING WHETHER CNG VEHICLES ARE MORE PROFITABLE COMPARED TO DIESEL/PETROL

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	14	28.0	28.0	28.0
	No	13	26.0	26.0	54.0
	The same	10	20.0	20.0	74.0
	Not sure	13	26.0	26.0	100.0
	Total	50	100.0	100.0	

Source: Primary data

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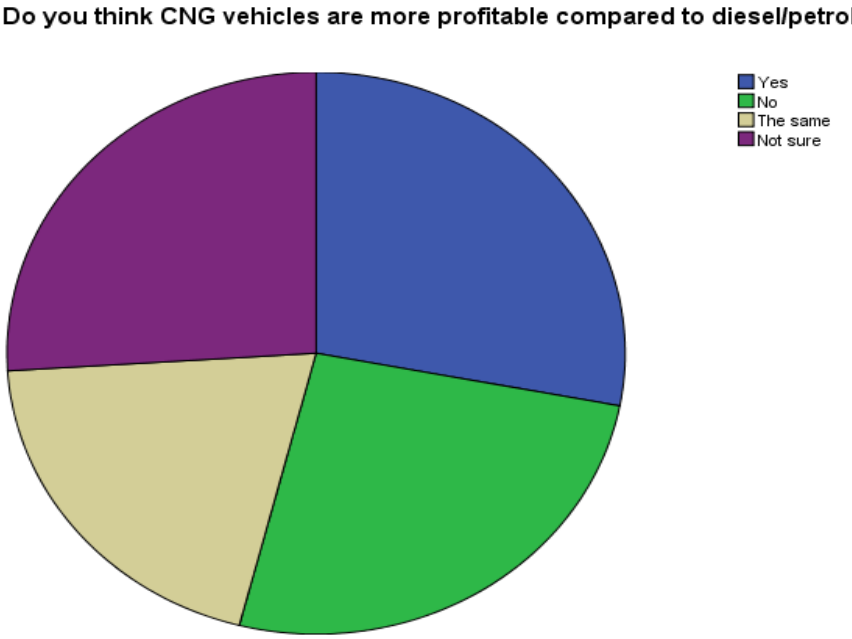
CHART – 1: SHOWING WHETHER CNG VEHICLES ARE MORE PROFITABLE COMPARED TO DIESEL/PETROL



INTERPRETATION

The above table represents respondents' majority opinion is divided, with **28%** responding "Yes" and **26%** saying "No." Another **26%** are "Not sure," indicating uncertainty or lack of awareness, while **20%** feel the situation remains "The same." The cumulative percentage shows that **74%** of respondents have a definitive stance, while the remaining **26%** are unsure. This distribution suggests mixed perceptions, highlighting the need for further exploration into factors influencing these opinions.

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TABLE - 2

TABLE SHOWING CHI-SQUARE VALUE–RELATIONSHIP OF AGE OF THE RESPONDENTS WITH ANY GOVERNMENT SUBSIDY OR FINANCIAL SUPPORT RECEIVED FOR USING CNG VEHICLES

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Age* Have you received any government subsidy or financial support for using CNG	50	100.0%	0	.0%	50	100.0%

Age * Have you received any government subsidy or financial support for using CNG Crosstabulation

Count

		Have you received any government subsidy or financial support for using CNG				
		Yes	No	Aware but not received	Not aware of any	Total
Age	26-35years	3	5	3	1	12
	36-45years	4	9	10	6	29
	Above 45 Years	2	3	2	2	9
Total		9	17	15	9	50

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Chi-Square Test

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.289[a]	6	.891
Likelihood Ratio	2.421	6	.877
Linear-by-Linear Association	.574	1	.448
No of Valid Cases	50		

a. 8 cells(66.7%) have expected countless than 5. The minimum expected count is 1.62.

INTERPRETATION

From the above table, the results indicate no significant relationship between age and receiving government subsidies or financial support for using CNG ($\chi^2 = 2.289$, $p = 0.891$). Across all age groups, most respondents have not received subsidies, while some are aware but have not benefited. This suggests that access to financial support is not influenced by age.

TABLE - 3

ANOVA RESULTS FOR AVERAGE MONTHLY CNG EXPENDITURE

On average, how much do you spend on CNG per month?

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	.908	2	.454	.713	.495
With in Groups	29.912	47	.636		
Total	30.820	49			

Source: Primary data

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Multiple Comparisons

On average, how much do you spend on CNG per month?

Tukey HSD

(I)Age	(J)Age	Mean Difference(I- J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
26-35years	36-45years	-.27011	.27383	.589	-.9328	.3926
	Above 45 Years	-.38889	.35178	.515	-1.2402	.4625
36-45years	26-35years	.27011	.27383	.589	-.3926	.9328
	Above 45 Years	-.11877	.30440	.920	-.8555	.6179
Above 45 Years	26-35years	.38889	.35178	.515	-.4625	1.2402
	36-45years	.11877	.30440	.920	-.6179	.8555

INTERPRETATION

From the above table, the **ANOVA test** results show **no significant difference** in the **average monthly CNG expenditure** across different groups (**F = 0.713, p = 0.495 > 0.05**). The **low between-groups variance (0.908)** compared to the **higher within-groups variance (29.912)** suggests that spending variations exist more within groups rather than between them. Since **p > 0.05**, we conclude that **monthly CNG expenses remain fairly consistent across different groups, with no major variations.**

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TABLE - 4

GROUP STATISTICS FOR AVERAGE PRICE PAID FOR CNG PER KILOGRAM IN COIMBATORE BY GENDER

Group Statistics

Gender	N	Mean	Std. Deviation	Std. Error Mean
What is the average price you pay for CNG per kg Coimbatore — Male	24	2.5000	1.25109	.25538
What is the average price you pay for CNG per kg Coimbatore — Female	26	2.4231	1.02657	.20133

Source: Primary data

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
What is the average price you pay for CNG per Kilogram Coimbatore	Equal variances assumed	2.383	.129	.238	48	.813	.07692	.32261	-.57173	.72557
	Equal variances not assumed			.237	44.618	.814	.07692	.32519	-.57820	.73205

INTERPRETATION

The above table shows that the **average price paid for CNG per kilogram in Coimbatore** is slightly higher for **males (Mean = 2.5000, SD = 1.25109)** compared to **females (Mean = 2.4231, SD = 1.02657).**

RESULTS AND FINDINGS

- The majority of the respondents (74%) thinks CNG vehicles are more profitable compared to other fuels while 26% are of the respondents are unsure.
- The Chi-square test examined the relationship between age and receiving government subsidies or financial support for using CNG. A p-value of 0.891 indicates no statistically significant association at the conventional alpha level of 0.05. Across all age groups, most respondents have not received subsidies, while some are aware but have not benefited, suggesting that access to financial support is not influenced by age.
- The ANOVA test analyzed differences in average monthly CNG expenditure across different groups. The results ($F = 0.713, p = 0.495$) indicate no statistically significant difference, as the p-value is greater than 0.05. The low between-groups variance (0.908) compared to the higher within-groups variance (29.912) suggests that variations in spending occur more within groups than between them. Since the p- value is not significant, we conclude that monthly CNG expenses remain fairly consistent across different groups, with no major variation.
- The Group Statistics table indicates that the average price paid for CNG per kilogram in Coimbatore is slightly higher for males (Mean = 2.5000, SD = 1.25109) compared to females (Mean = 2.4231, SD = 1.02657). However, the difference is minimal, suggesting that both genders experience similar CNG pricing.

SUGGESTIONS

Based on the findings of this study, several measures can be suggested to enhance the adoption and economic benefits of CNG in public transport within Coimbatore district. First, the availability of CNG refueling stations needs to be expanded, as limited infrastructure remains a key challenge for vehicle operators. Additionally, the government should focus on providing better financial support, including subsidies and incentives, to reduce the high initial conversion costs that discourage many from switching to CNG. Awareness campaigns highlighting the cost-effectiveness and environmental benefits of CNG should also be conducted to address misconceptions and encourage adoption. Furthermore, improvements in vehicle maintenance support and technological advancements can enhance the performance of CNG vehicles, making them a more viable alternative to diesel and petrol. Lastly, policy interventions, such as tax rebates and regulatory support, can accelerate the shift toward CNG-based public transport, ultimately contributing to economic savings and environmental sustainability.

CONCLUSION

The study on the economic impact of CNG in public transport, with a special focus on Coimbatore district, highlights both the benefits and challenges associated with CNG adoption. While many transport operators acknowledge the cost savings of CNG, concerns such as limited refueling stations, high conversion costs, and maintenance issues continue to hinder widespread adoption. The findings indicate that while fuel cost is a primary factor influencing CNG adoption, government incentives and better infrastructure can further encourage its usage. Additionally, perceptions of CNG profitability and performance vary across different age groups and genders, emphasizing the need for targeted awareness campaigns. To ensure a smooth transition to CNG-based transport, policymakers must address these challenges through infrastructure development, financial incentives, and regulatory support. A well-implemented CNG adoption strategy can lead to significant economic and environmental benefits, making public transport more sustainable and cost- effective in the long run.

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