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Assessment of the effects of fuel subsidy removal on direct cost components of building in Abuja, Nigeria

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Abstract

This study critically assesses the effects of fuel subsidy removal on the direct cost components of building projects in Abuja, Nigeria, with specific focus on materials (cement, reinforcement steel, and aggregates), labour, and plant costs between 2020 and 2025. A quantitative research design was adopted using market survey data analyzed through Pearson correlation and linear regression techniques using Jamovi software. Hypothesis testing was conducted to determine the significance of the relationship between fuel price fluctuations and direct construction cost components. The results indicate a very strong positive and statistically significant relationship between fuel prices and direct cost components of building, leading to the rejection of the null hypothesis. Cement prices increased by 45.8%, reinforcement steel by 44.4%, and aggregates by 32% in the post-subsidy removal period. Significant increases were also observed in mason and helper wages, rising by 25% and 37.5%, respectively. Furthermore, hypothesis testing confirmed a significant relationship between fuel price increases and plant operating costs, as higher fuel prices substantially increased equipment running expenses. Overall, the findings validate that fuel price deregulation exerts a cost-push inflationary effect on direct construction inputs, thereby increasing building production costs in Abuja. The study highlights the need for strategic policy interventions to mitigate energy-induced cost shocks within the housing sector in Nigeria..

Introduction

Fuel subsidy removal in Nigeria has far-reaching implications for the economy, particularly for energy-dependent industries such as construction. As the country's largest oil producer, Nigeria's economy has been heavily reliant on oil revenue, which funds a substantial portion of government expenditure (Sasu, 2024). The government introduced fuel subsidies in the 1970s to stabilize domestic fuel prices amid fluctuating global oil prices, aiming to reduce the financial burden on citizens and industries (Aniemeke, 2024). However, the fiscal burden of sustaining these subsidies became unsustainable over time, with expenditures on subsidies reaching ₦4 trillion by 2022, representing a significant portion of the national budget (Ozili & Obiora, 2023).

In 2023, President Bola Tinubu announced the complete removal of the fuel subsidy, arguing that the policy disproportionately benefited wealthier households and drained public funds (Olugbenga, 2023). The immediate aftermath of the subsidy removal saw petrol prices double, significantly raising the cost of living and directly influencing the prices of goods and services, including construction materials, labour, and machinery (Punch, 2024). The removal of the fuel subsidy has led to inflationary pressure across various sectors, with the construction industry particularly affected due to its reliance on fuel for transportation, equipment operation, and material production (Shittu, Idiake & Akanmu, 2022).

2.0 Literature Review

A. Fuel Subsidy and the Nigerian Construction Sector

The construction industry plays a critical role in Nigeria's economic development, providing essential infrastructure and housing. Construction costs are influenced by various factors, particularly materials, labour, and plant costs. As noted by Nnaemeka, Akintola, & Nnamani (2022), the cost of construction materials, especially cement and reinforcement steel, is highly dependent on fuel prices. Cement production is an energy-intensive process, requiring significant fuel input for both manufacturing and transportation (Akindele, 2024). Therefore, any fluctuation in fuel prices translates directly into changes in material costs, which in turn affects overall construction costs.

In addition to material costs, labour costs in the construction industry are also influenced by fuel prices. Increases in fuel prices lead to higher transportation costs, which directly impact workers' daily commute costs. This, in turn, leads to demands for higher wages as workers attempt to maintain their purchasing power amid rising living costs (Alintah-Abel, Okeke & Enebe, 2025). The removal of fuel subsidies thus exacerbates cost-push inflation, where rising input costs drive up the prices of final products and services, including housing. The impact of fuel fluctuations on construction costs is not only felt in urban centres like Abuja but also in rural areas where the cost of transporting materials over long distances becomes more burdensome (Gbonegun, 2024). The negative impacts of fuel subsidy removal on material and labour costs can be minimized through targeted strategic planning and supportive government policies (Alintah-Abel, Okeke & Enebe, 2025).

B. Effects of Fuel Subsidy Removal on Construction Material Costs

Construction material costs are crucial for project budgets and housing affordability. In Nigeria, where construction is fuel-intensive, policy changes affecting fuel prices have direct implications on material costs. The removal of fuel subsidies in 2023 has significantly influenced the construction industry by increasing production and transportation costs. Concrete remains a major construction material in residential building projects, and its performance is highly dependent on its mechanical properties. The static modulus of concrete is a fundamental structural property influencing its deformation behaviour under load (Ngwu, Orji & Onoh, 2021). Fuel is a significant input for producing and transporting construction materials such as cement and steel. Following the subsidy removal, fuel prices surged, leading to higher transportation costs passed on to consumers (Ozili & Obiora, 2023). Akindele (2024) notes a strong correlation between rising fuel prices and construction material costs; as fuel prices increase, so do logistics expenses. Fuel price increases lead to higher transportation costs, which impact the logistics and supply chains for construction materials. According to Mahmoud et al. (2020), fluctuations in fuel prices can cause significant disruptions in the pricing and delivery of materials, especially in regions where transportation is heavily reliant on fuel-powered vehicles. In Abuja, a city that depends on the importation of raw materials, the price escalation of cement and other critical materials has contributed to the rising cost of housing.

C. Labour Costs and Fuel Subsidy Removal

Labour costs in construction are also highly sensitive to fuel price changes. When fuel prices rise, the cost of commuting for construction workers increases, leading to demands for higher wages. Although unskilled labour may reduce immediate labour costs, its deployment often undermines project efficiency and quality, leading to significant negative implications for project outcomes, as workers demand compensation for increased living and transportation costs (Obodoh *et al*, 2024).

A study by Bawa *et al* (2020), indicates that labour costs in the construction sector are sensitive to fluctuations in fuel prices, as workers negotiate for higher pay in response to rising living expenses. Furthermore, rising inflation can create expectations of future price increases among workers, leading to further wage demands.

D. Plant and Equipment Costs

The removal of the fuel subsidy also led to a significant increase in plant and equipment costs. Construction machinery, such as concrete mixers, generators, and cranes, rely on diesel for operation. As fuel prices rose, so did the operating costs for these machines. Fuel is a critical component of the operating costs for construction machinery. According to Akinradewo *et al* (2021), fuel costs account for approximately 40% to 64.5% of total operating expenses for heavy equipment, depending on the type of machinery and its usage. As fuel prices rise, these operating costs increase correspondingly, placing additional financial strain on contractors. For instance, a significant increase in diesel prices reported to have risen by 74% over the past year has led to a substantial rise in the overall cost of operating heavy machinery. The increased fuel consumption required to power construction machinery further inflated project costs, especially for larger developments requiring heavy machinery (Okeagu et al., 2024).

In Abuja, the increase in fuel prices has been directly linked to rising equipment operating costs, which are now a key determinant of overall construction costs. As plant and equipment costs rise, developers face higher operational expenses, which are ultimately passed on to consumers through higher housing prices.

Methodology

To achieve the aim of this study, a quantitative research approach was employed to assess the effects of fuel subsidy removal on direct cost components in building construction in Abuja, Nigeria. The study focused on three direct cost components: materials, labour, and plant costs. Data were gathered from market surveys and cost records of building projects in Abuja between 2020 and 2025, with a particular emphasis on the period after the fuel subsidy removal in 2023. Meanwhile Pearson Correlation and linear regression were used to determine the strength of the relationship between fuel prices and the cost components and also to predict the effect of fuel price changes on the construction cost components (Okeagu et al., 2025).

This study tested the Null Hypothesis;

$H0_1$: Fuel subsidy removal has no significant effect on the direct cost components of building construction in Abuja.

Results

The effect of fuel price fluctuations on key construction cost components in Abuja (2020-2025) was assessed, focusing on post subsidy effects (mid-2023). Fuel price relationships with materials, labour, and plant costs are analysed using Jamovi. Table 1 shows the annual fuel and selected construction cost components (materials, labour, and plant) used for correlation and regression analysis.

Table 1. Yearly Cost Data for Fuel and Construction Components (2020–2025)

		Materials						Labor		Plant	
Year	Fuel (₦/Ltr)	Cement(₦/bag)	Reinforcement(₦/ton)	Granite(₦/20-ton)	Sand(₦/20-ton)	Block(₦/unit)	Roofing sheet(₦/M²)	Mason (₦/day)	Helper (₦/day)	Concrete Mixer(₦/day)	Generator Fueling(₦/day)
2020	147	2,500	250,000	140,000	35,000	180	2,400	4,300	2,300	6,500	2,300
2021	162	2,700	300,000	150,000	38,000	210	2,500	4,700	2,700	7,500	2,800
2022	168	3,500	370,000	160,000	45,000	240	2,800	5,800	3,000	8,500	3,800
2023	185	3,800	450,000	180,000	48,000	260	3,800	6,300	3,500	9,500	4,500
2024	525	4,800	650,000	210,000	65,000	300	6,000	7,500	4,800	11,500	6,300
2025	650	7,000	780,000	250,000	80,000	400	7,500	8,500	5,800	14,000	7,300

Analysis of the Relationship between Fuel Price and Construction Cost Components

Statistical analysis uses Pearson correlation, linear regression, and charts to assess fuel subsidy removal effects on direct construction costs (materials, labour, plant) from 2020-2025 (Okeagu et al., 2025; Ono & Okeagu, 2026). Each cost component is analysed separately, starting correlation testing, followed by regression modelling and visual interpretation through charts. The aim is to determine the strength and direction of relationships between fuel price changes and each construction input. A summary of the correlation and regression results is presented in Table 2

Table 2: Regression Results between Fuel Price and Construction Cost Components (2020–2025)

Cost Component	R	R^2	Slope (Fuel Coefficient)	p-value	Interpretation
CEMENT	0.935	0.874	7.02	0.006	Strong, significant positive effect
REINFORCEMENT	0.962	0.925	901	0.002	Very strong, highly significant
GRANITE	0.954	0.91	179	0.003	Strong, significant
SAND	0.97	0.941	75.8	0.001	Very strong, highly significant
BLOCK	0.921	0.849	0.324	0.009	Strong, significant
ROOFING SHEET	0.981	0.963	9.36	<.001	Extremely strong, highly significant
Skilled Labour (Mason)	0.915	0.838	6.65	0.01	Strong, sigificant
Unskilled Labour	0.969	0.939	5.9	0.001	Very strong, significant
CONCRETE MIXER	0.942	0.888	11.7	0.005	Strong, sigificant
GENERATOR FUELLING	0.94	0.884	8.33	0.005	Strong, sigificant

4.1 Annual Prices and Percentage Change in Construction Materials (2020–2025)

The chart below in figure 1–4 shows the change in price trend in construction cost components between (materials) between 2020 and 2025.

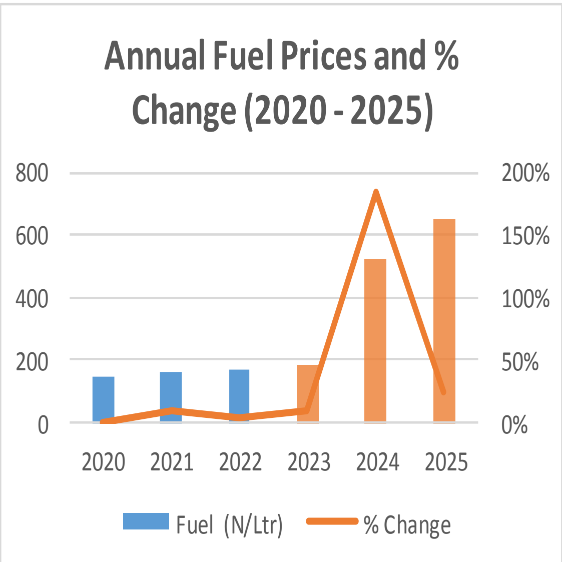

Figure 1: Annual Fuel prices and percentage change (2020-2025)

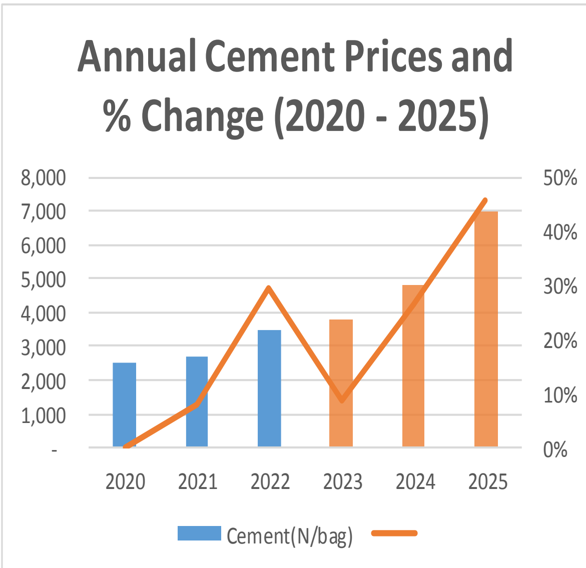

Figure 2: Annual Cement prices and percentage change (2020-2025)

Figure 1 illustrates the trend in fuel prices between 2020 and 2025. While prices increased moderately from 2020 to 2023, there was a sharp surge of 183.8% in 2024 following the removal of fuel subsidy, followed by an additional 23.8% increase in 2025. This dramatic escalation served as a primary catalyst for rising costs across various construction components. Figure 2 shows the annual changes in cement prices. The data reveal a notable increase of 29.6% in 2022 and a more significant spike of 45.8% in 2025, underscoring cement's high energy demands and dependence on fuel for both production and transportation.

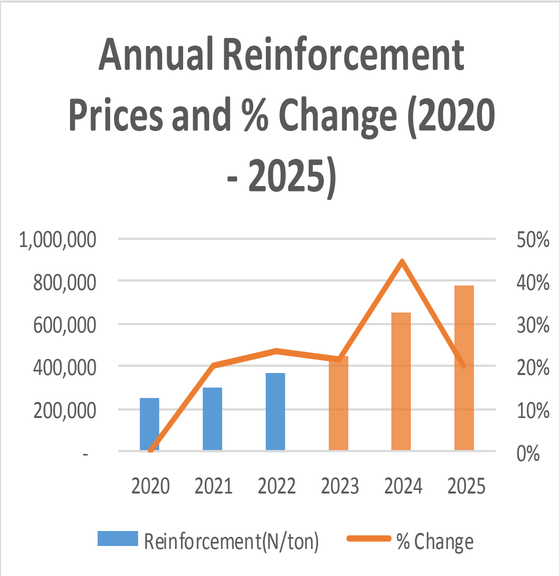

Figure 3: Annual Reinforcement prices and percentage change (2020-2025)

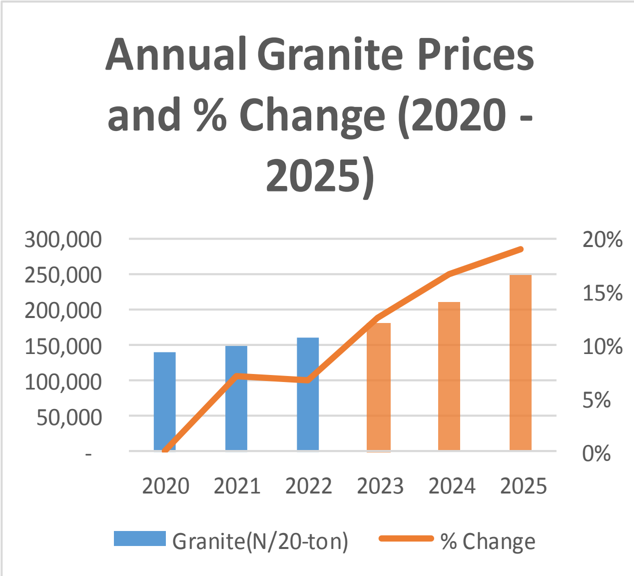

Figure 4: Annual Granite prices and percentage change (2020-2025)

Figure 3 illustrates the annual changes in reinforcement prices. A moderate increase of 20% was recorded in 2021, followed by a sharp spike of 44.4% in 2024, the highest within the observed period before prices began to stabilize thereafter. Figure 4 depicts the trend in granite prices, which rose significantly by 25% in 2024 and 19% in 2025. These increases were largely driven by elevated quarrying and transportation costs, both of which are heavily dependent on fuel. Similarly**,** there is an upward trend in sand prices, with a notable increase of 35.4% in 2024 and 23.1% in 2025. These spikes reflect the rising cost of transporting bulk materials over long distances, a process heavily influenced by fuel price volatility. The progression of block prices rose consistently over time but experienced a sharp increase of 66.7% in 2024 and a further 25% in 2025. This surge highlights the combined effects of material inflation and increased labour costs following the removal of fuel subsidies. There is a steep rise in roofing sheet prices, recording a 58% increase in 2024 the highest among all components. This surge is attributed to the soaring cost of manufacturing inputs, many of which are imported or highly energy intensive.

Mason wages increased by 9.3% in 2021, peaked at 25% in 2024, and moderated to 13.3% in 2025. The sharp rise in 2024 can be attributed to heightened inflation and increased commuting costs triggered by fuel price escalation. Significant changes in helper labour wages were also recorded over the same period. A significant rise of 17.4% in 2021 was followed by a sharp jump of 37.5% in 2024 and 20.8% in 2025. These figures underscore the heightened vulnerability of unskilled labour to inflationary pressures resulting from fuel subsidy removal. The concrete mixer operating costs increased by 15.4% in 2022 and further by 21.7% in 2025. These increases are attributed to the high fuel consumption associated with daily construction site operations. There were changes in generator fueling costs, which surged by 22.2% in 2021 and continued with a 15.9% increase in 2025. This reflects the cumulative impact of rising fuel prices on equipment-dependent construction activities.

Hypothesis

Fuel subsidy removal has no significant effect on the direct cost components of building construction in Abuja.

Y= a + bX

Where:

- Y = Cost Component (e.g. Cement Cost, Labour Cost, etc.)
- a = Intercept (the baseline cost when fuel price is zero)
- b = Slope (Fuel Coefficient; it represents how much the cost increases for every ₦1 rise in fuel price)
- X = Fuel Price (₦/liter)

Table 3: Model Summary

				Overall Model Test			
Model	**R**	**R^2**	**Adjusted R^2**	**F**	**df1**	**df2**	**p**
Cement	0.935	0.874	0.843	27.8	1	4	0.006
Reiforcement	0.962	0.925	0.906	49.2	1	4	0.002
Granite	0.954	0.91	0.887	40.4	1	4	0.003
Mason	0.915	0.838	0.797	20.6	1	4	0.01
Cocrete Mixer	0.942	0.888	0.86	31.7	1	4	0.005

Note. Models estimated using sample size of N=6

Table 4: Omnibus ANOVA Test

	Sum of Squares	df	Mean Square	F	p
fuel	1.21E+07	1	1.21E+07	27.8	0.006
Residuals	1.74E+06	4	436044		

Note. Type 3 sum of squares

Table 5: Coefficients

				95% Confidence Interval			
	Predictor	**Estimate**	**SE**	**Lower**	**Upper**	**t**	**p**
Cement	Intercept	1901.78	488.7	544.93	3258.6	3.89	0.018
	fuel	7.02	1.33	3.32	10.7	5.27	0.006
Reinforcement	Intercept	190688	47177	59705	321671	4.04	0.016
	fuel	901	129	545	1258	7.01	0.002
Granite	Intercept	126795	10346.2	98069	155521	12.26	<.001
	fuel	179	28.2	101	257	6.36	0.003
Mason	Intercept	4145.8	537.94	2652.24	5639.4	7.71	0.002
	fuel	6.65	1.47	2.59	10.7	4.54	0.01
Concrete Mixer	Intercept	5987.8	765.72	3861.84	8113.8	7.82	0.001
	fuel	11.7	2.09	5.95	17.5	5.63	0.005

The results reveal that the overall model is strong and has statistically significant relationships. For instance, cement cost showed a correlation coefficient of r = 0.935, with a p-value of 0.006, while other components such as reinforcement, granite, labour, and plant also demonstrated high significance levels ($p < 0.05$). Thus, the null hypothesis is rejected. These findings validate that fuel subsidy removal significantly affects material, labour, and equipment costs in building construction.

Conclusion

Based on the findings of this study, it was observed that the removal of fuel subsidies in Nigeria has led to significant, yet inconsistent, impacts on housing costs in Abuja, particularly in relation to building materials and labour. The research reveals a strong correlation between the fluctuations in fuel prices and increases in material costs which in turn influence overall housing prices. For instance, cement costs demonstrated a correlation coefficient of r = 0.935 with fuel prices, empirically validating the assertion by Akindele (2024) that rising fuel prices by driving up logistics and production costs which lead to significant increases in material prices such as cement. This reinforces the argument that subsidy removal impacts sectoral cost structures and project affordability. Regression analysis confirmed that 87.4% of the variance in cement prices could be attributed to fuel price fluctuations.

Statistical analysis reveals a significant effect of fuel subsidy removal on labour and equipment costs. Notably, wage increases among masons and helpers rose sharply post-2023, empirically supporting the assertion by Ozili & Obiora (2023) that higher transportation costs prompted construction workers to demand wage adjustments of 20–35% within six months of the subsidy removal. This effect was further supported by Bawa *et al* (2020), who emphasized that labour markets especially in informal construction sectors are highly sensitive to rising commuting and living costs. The observed surge in generator fuelling and mixer operation costs reinforces the transmission of fuel price shocks into equipment-related expenditures at the project level.

In light of these challenges, the study recommends that the Nigerian government implement policies aimed at mitigating the adverse effects of fuel subsidy removal on the housing sector. Key recommendations include the establishment of subsidies for essential construction materials, the promotion of local production of critical building materials to reduce dependency on imports, and the introduction of effective fiscal policies to curb inflationary pressures. Furthermore, the government should focus on improving the stability of power to the construction sector, reducing electricity tariffs, and encouraging local refining of petroleum products to alleviate transportation and operational costs in the construction industry,

By implementing these measures, the Nigerian government can help to stabilize housing costs, thereby fostering a more sustainable and affordable housing market in Abuja and across Nigeria. These steps will also contribute to the overall development of the construction industry, ensuring that the sector remains resilient and capable of meeting the demands of a growing population.

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