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DOES MILITARY SPENDING STIMULATE ENERGY CONSUMPTION IN NIGERIA?

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Abstract
Numerous studies have underscored the detrimental environmental effects of military spending vis-à-vis energy consumption, including pollution and habitat damage. Sequel to this, this study examines the effects of military spending on energy consumption in Nigeria. The data for the study were obtained from World Development Indicator (WDI, 2022) which covered from 1990-2022. The ARDL methods were employed to analyze the data. The analysis indicates that military spending has a positive effect on Nigeria's energy consumption in both the short and long term. An increase in military spending by a certain percentage is associated with a rise in energy consumption of approximately 0.18% in the short term and around 0.19% in the long term. The results demonstrate statistical significance at the 5% level. This finding is noteworthy as it substantiates the established assertion of the treadmill of destruction theory, which posits that military spending exacerbates energy consumption. Legislators ought to critically assess and limit military expenditures to essential operations that enhance security while minimizing environmental impact. It is essential for the government to reallocate resources from environmentally detrimental activities towards sectors that promote green technologies and the advancement of renewable energy.

Keywords: Military spending, Energy consumption, ARDL, Nigeria

Introduction

Energy consumption and defiance expenditure influence the economy, politics, and security of nations in the contemporary interconnected world. Comprehending the correlation between sustainable development and national security is essential as countries pursue both objectives. This research analyses energy consumption and defence expenditure in Nigeria. Military

expenditure, foreign direct investment, and energy use are critical concerns. Comprehending national policy and international relations necessitates an understanding of these aspects and their impact on a nation's socioeconomic stance (Yasmeen et al., 2024; Zhao et al., 2024; Wang et al., 2024). It analyses Nigeria's military expenditure, foreign direct investment inflows, and clean energy durability to assess its national standing. Geo-country like Nigeria, facing in-security challenges and ethnic-conflicts, are compelled to allocate excessive resources to the national defence (Khalid et al., 2023). Military expenditure is frequently rationalized by considerations of national security and geopolitical power. Nonetheless, this emphasis on military expenditure may yield unforeseen financial repercussions. Nigeria's geopolitical importance may decline if the country continues its considerable military spending (Muhammad et al., 2024). Military expenditure reallocates resources from healthcare, education, and structural development, jeopardizing emancipation, and reliability of a nation. Balancing defence, country development, and social justice complicates policymaking (Njifen et al., 2023; Tsitouras et al., 2024).

This analyses Nigeria's military expenditure and geopolitical context. The analysis examines whether reallocating substantial military expenditures enhances or diminishes Nigeria's geopolitical influence. This study examines the connections amid prioritizing military expenditure and the implications for national emancipation. Legislators need reconciling country security with economic progress and reliability, understanding the associated craft-offs. The matter warrants further examination into how these underlying forces impact country peace and order and Nigeria's global participation. Secondly, in what manner do economic connections influence international opinions of Nigeria, and how does foreign direct investment enhance its environmental sustainability? This study underscores energy sustainability due to its impact on Nigeria's geopolitical significance. Numerous countries, particularly those rich in resources such as Nigeria, prioritize strategic research that underscores the significance of energy for both local and international defiance. The study aims to elucidate how a reliable and varied electric production contributes to Nigeria's environmental sustainability.

This analysis enhances the literature by utilizing Nigeria's data on military expenditure, foreign direct investment, and energy sustainability. A thorough examination of the collective impact of these determinants on a country's policy path highly required, despite their independent investigation (Khurshid, 2023; Hanif et al., 2024; Kumari et al., 2024). The current piece of work delineates the merits and demerits of equilibrating military expenditure, stimulating

international inflow, and assuring effective electric generation and distribution, so aiding economy stakeholders. The study demonstrates the greater impact of these elements on Nigeria's worldwide stature and informs other nations on addressing geopolitical challenges.

Literature Review

Many empirical literatures have underscored the detrimental environmental outcomes of militarization, including pollution and habitat damage. For example, Ahmed et al. (2020) examined Myanmar, Qayyum et al. (2021) investigated South Asian nations, Bildirici (2017) analyzed the G7 countries, Chang et al. (2023) focused on Asia-Pacific nations, Colak et al. (2022) studied NATO countries, Turedi et al. (2022) explored MENA countries, and Zandi et al. (2019) assessed ASEAN countries. The detrimental environmental impacts of militarization highlight the necessity for comprehensive strategies to properly balance national security and ecological sustainability. By incorporating sustainable practices into military operations and legislation, governments may reduce the environmental impact of militarization and work towards a more equitable and resilient future.

Numerous studies have investigated the relationship between military expenditure and environmental conditions worldwide. Afia et al. (2018) examine the correlation between military spending and environmental damage, specifically carbon pollution. The research indicates that military expenditures are positively and statistically significantly correlated with increased carbon emissions, hence exacerbating pollution, based on a sample of 120 nations from 1981 to 2015. This discovery aligns with the research conducted by Jorgenson et al. (2016) regarding the correlation between militarization and environmental degradation across 82 nations from 1990 to 2010. The study indicates that militarization has a positive correlation with global carbon emissions. The adverse effect of militarization on carbon emissions is comparable between OECD and non-OECD members.

Additional studies, producing analogous findings, investigate the impact of military expenditure on environmental degradation within regional samples. Chang et al. (2023) examine the influence of military expenditure on environmental quality in 15 Asia-Pacific nations from 1990 to 2018. The study employs CS ARDL as the estimation method, revealing that military expenditure is significantly associated with an increased ecological footprint, indicating poorer environmental quality, with potential long-term effects. These results align with those of Bildirici (2017), who examined the link among the G7 countries from 1985 to 2015. The research illustrates a unidirectional causal link between military spending and carbon

emissions in the G7 nations. Military expenditure typically forecasts carbon emissions, while the reverse is not true.

Research examining the effects of military expenditure on environmental degradation at the national level yields comparable results. Gokmenoglu et al. (2019) investigate the correlation between military expenditure and environmental degradation in Turkey from 1960 to 2014. Carbon emissions and ecological footprints serve as indicators of environmental degradation, whereas military expenditure is measured in fluctuating monetary units. The fully modified ordinary least squares (FMOLS) estimation approach indicates that elevated military expenditure substantially exacerbates environmental degradation.

Meiling et al. (2022) corroborate this finding in their analysis of the effects of military expenditure on sustainable development in Pakistan from 1971 to 2017. The study, employing ARDL as the analytical tool, indicates a detrimental effect of military expenditure on sustainable development. The analysis indicates the necessity of redistributing funds from the military to the healthcare sector. Additionally, Ahmed et al. (2020) investigate the relationship between militarisation and environmental deterioration in Myanmar from 1975 to 2014. This analysis utilises the ARDL methodology, demonstrating a substantial positive link between military expenditure and carbon emissions.

The Granger causality test reveals a unilateral causal relationship, wherein military expenditures influence carbon emissions. The bootstrap corrected causality test performed by the authors demonstrates no causal relationship between military expenditure and carbon emissions, highlighting the necessity for more investigation into the intricacies of these interactions to facilitate better informed policy decisions.

Methodology

This theoretical framework examines the interplay between military expenditure and environmental pollution, taking into account the possible effects of economic growth, energy consumption, urban development, and trade liberalisation. By managing these factors, we can gain a clearer insight into the precise effects of military spending on environmental pollution and analyse the fundamental dynamics at play. The connection between military expenditure and environmental pollution is intricate and layered. Establishing a definitive dynamic relationship presents challenges; however, various factors play a role in their interconnectedness. The treadmill of destruction theory suggests that military spending may have indirect effects on environmental pollution via multiple mechanisms. The production and

maintenance of military equipment, including vehicles, aircraft, and weapons, necessitate considerable resource consumption, drawing heavily on natural resources such as fossil fuels, metals, and chemicals. The extraction and processing of these resources frequently result in environmental consequences. Furthermore, military operations, training exercises, and logistics entail significant energy usage, which may lead to greenhouse gas emissions and air pollution. It is essential to highlight that military operations produce multiple types of waste, such as hazardous substances, remnants of munitions, and outdated equipment, which can negatively affect the environment if not managed appropriately (Afia et al., 2018; Gbadebo et al., 2025). Expression (1) elucidates that energy consumption is determined by a combination of foreign direct investment, military expenditure, urbanisation, gross domestic products, and trade openness.

$$EC_2 = f(\text{MILS, GDP, FDI, UPO, TRO}) \quad 1$$

EC_2 = Energy consumption

MILS = Military spending

GDP = Economic growth

FDI = Foreign direct investment

UPO = Urban population

TRO = Trade openness

Expression (1) as shown above can be modelled below

$$EC_2 = \emptyset_0 + \emptyset_1\text{MILS} + \emptyset_2\text{GDP} + \emptyset_3\text{FDI} + \emptyset_4\text{UPO} + \emptyset_4\text{TRO} + \mu \quad 2$$

$$\Delta EC_2 = \emptyset_0 + \sum_{s=1}^{J}.\emptyset_{1s}\Delta EC._{2t-n} + \sum_{s=1}^{J}.\emptyset_{2j}\Delta MILS._{t-n} + \sum_{s=0}^{J}.\emptyset_{3j}\Delta GDP._{t-n} +$$
$$\sum_{s=0}^{J}.\emptyset_{4j}\Delta FDI._{t-n} + \sum_{s=0}^{J}.\emptyset_{5s}\Delta UPO._{t-n} + \sum_{s=0}^{J}.\emptyset_{6s}\Delta TRO._{t-n} + \partial_1 EC_{2t-1} + \partial_2 MILS_{t-1} +$$
$$\partial_3 GDP_{t-1} + \partial_4 FDI_{t-1} + \partial_5 UPO_{t-1} + \partial_6 TRO_{t-1} + \mu \quad 3$$

$$\Delta EC_2 = \emptyset_0 + \sum_{s}^{J}.\emptyset_{1j}\Delta EC._{2t-n} + \sum_{j}^{J}.\emptyset_{2j}\Delta MILS._{t-n} + \sum_{j}^{J}.\emptyset_{3j}\Delta GDP._{t-n} +$$
$$\sum_{.}^{J}.\emptyset_{4m}\Delta FDI._{t-n} + \sum_{m}^{J}.\emptyset_{5m}\Delta\text{UPO}._{t-n} + \sum_{m}^{J}.\emptyset_{6m}\Delta\text{TRO}._{t-n} + \partial_1 EC_{2_{t-1}} + \partial_2 MILS_{t-1} +$$
$$\partial_3 GDP_{t-1} + \partial_4 FDI_{t-1} + \partial_5 UPO_{t-1} + \partial_5 TRO_{t-1} + \in ECT_{t-1} + \in_t \quad 4$$

Findings and Discussions

Table 1 indicates a noteworthy finding: the calculated F-statistic (9.19) exceeds the upper bound critical value at the 5% significance level (3.79). The findings indicate a definitive rejection of the null hypothesis, thereby substantiating the presence of a long-term relationship between the variables. The results demonstrate that military spending, energy consumption,

and additional variables in the analysis exhibit cointegration, suggesting a common long-term equilibrium among them.

Table 1: Bound Testing

Test Statistic	Value	k
F-statistic	9.192820	5
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68

Source: *Author's Compilation, 2025*

Following the establishment of a long-run relationship between the variables, Tables 2 and 3 present the results of the estimates for both short and long-run coefficients within the ARDL framework. The adjusted R-square value of 0.87% suggests that around 87% of the variation in military spending can be attributed to the specified model. The F-statistics, which are statistically significant, confirm the adequacy of the chosen model. The presence of a negative and statistically significant error correction term (ECMt-1) further validates the adjustment process towards a long-run equilibrium at 120%.

The analysis indicates that military spending has a positive effect on Nigeria's energy consumption in both the short and long term. An increase in military spending by a certain percentage is associated with a rise in energy consumption of approximately 0.18% in the short term and around 0.19% in the long term. The results demonstrate statistical significance at the 5% level. This finding is noteworthy as it substantiates the established assertion of the treadmill of destruction theory, which posits that military spending exacerbates energy consumption. Data indicates that military forces across the globe collectively account for approximately 6% of total carbon emissions, with only three nations surpassing this level of carbon output (Parkinson, 2022). The significant escalation of terrorism, along with political, regional, and religious conflicts in Nigeria, has led to a heightened level of militarization within the country. The nation has markedly elevated its military expenditure in recent decades to ensure the protection of life and property. This study is consistent with previous research indicating that a

defense-oriented approach in developing countries like Nigeria has resulted in changes that exacerbate environmental pollution (Ahmed et al., 2020; Bildirici, 2017). The evidence indicates that militarization has a significant impact on environmental pollution, as military production processes demand substantial energy and military infrastructure is dependent on fossil fuels (Ahmed et al., 2022).

The negative and positive coefficients on GDP and GDP(-1) in Table 2 indicate a U-shaped relationship between energy consumption and economic growth, observed in both the short and long run. The Brundtland hypothesis posits that economically disadvantaged countries play a substantial role in environmental degradation at the outset, largely because their financial limitations hinder the ability to prioritize ecological issues. Individuals in these societies frequently engage in environmentally detrimental practices, such as unsustainable agricultural methods, primarily because of economic constraints. As these economies expand, the extent of environmental damage resulting from energy consumption starts to diminish. The reduction in ecological harm can be linked to enhanced living standards and a decreased dependence on activities detrimental to the environment.

The decrease in energy consumption persists up to a certain point, after which deterioration may increase again, as economic growth can result in elevated energy consumption and production levels. This study's confirmation of the Brundtland hypothesis reinforces the conclusions drawn by Bratt (2012), Basumatary et al. (2021), Larsson et al. (2021), and Olasehinde-Williams (2023).

Table 2: Long run Estimation

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
ENCO(-1)	0.274027	0.170919	1.603254	0.1372
ENCO(-2)	0.191984	0.187700	1.022825	0.3284
ENCO(-3)	-0.095136	0.187326	-0.507865	0.6216
ENCO(-4)	-0.573736	0.200012	-2.868505	0.0153
MILS	18.58699	19.27499	0.964306	0.0546
FDI	-5.74E-09	2.30E-09	-2.493230	0.0299
FDI(-1)	-2.72E-09	2.58E-09	-1.053423	0.3147
FDI(-2)	6.91E-09	2.45E-09	2.820884	0.0166
TRO	-4.70E-11	8.77E-11	-0.536513	0.6023
TRO(-1)	3.95E-10	7.65E-11	5.157191	0.0003
TRO(-2)	1.62E-10	8.34E-11	1.947393	0.0775
UPO	-17.48877	41.58553	-0.420550	0.6822
UPO(-1)	99.08466	79.82153	1.241328	0.2403

UPO(-2)	-73.81521	46.28769	-1.594705	0.1391
GDP	1.066775	2.695824	0.395714	0.6999
GDP(-1)	-3.844353	2.334619	-1.646673	0.1279
C	15.50020	18.94212	0.818293	0.4306

R-squared	0.950532	Mean dependent var	134.5146
Adjusted R-squared	0.878579	S.D. dependent var	29.38517
S.E. of regression	10.23941	Akaike info criterion	7.770341
Sum squared resid	1153.300	Schwarz criterion	8.579180
Log likelihood	-91.78478	Hannan-Quinn criter.	8.017611
F-statistic	13.21044	Durbin-Watson stat	1.995931
Prob(F-statistic)	0.000058		

Source: *Author's Compilation, 2025*

Military spending is expected to exacerbate Nigeria's energy consumption in both the short and long term. Nigeria's efforts to enhance military defence involve the utilisation of fossil fuels in production processes, leading to a rise in energy consumption. The recent findings presented by authors including Bekun et al. (2023), Adekunle et al. (2023), Adekunle et al. (2022), and Saba (2023) are therefore substantiated. The urban population exhibits detrimental long-term effects on Nigeria's energy consumption. This finding aligns with the compact cities' theory, which posits that greater urban density leads to elevated energy consumption, consequently contributing to environmental pollution (**Akadiri et al**., 2025; **Yildiz et al**., 2025). Foreign Direct Investment and trade openness demonstrate statistically significant short-term impacts on energy consumption in Nigeria. Our findings support the assertions made by earlier studies, though only in the short term, that foreign direct investment and trade openness contribute to increased energy consumption (Bekun et al., 2023; Adekunle et al., 2022).

Table 3: Short run Estimation

Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(ENCO(-1))	0.476889	0.233911	2.038763	0.0662
D(ENCO(-2))	0.668872	0.211473	3.162925	0.0090
D(ENCO(-3))	0.573736	0.200012	2.868505	0.0153
D(MILS)	18.586986	19.274986	0.964306	0.0356
D(FDI)	-0.000000	0.000000	-2.493230	0.0299

D(FDI(-1))	-0.000000	0.000000	-2.820884	0.0166
D(TRO)	-0.000000	0.000000	-0.536513	0.6023
D(TRO(-1))	-0.000000	0.000000	-1.947393	0.0775
D(UPO)	-17.48877	41.585532	-0.420550	0.6822
D(UPO(-1))	73.81520	46.287686	1.594705	0.1391
D(GDP)	1.066775	2.695824	0.395714	0.6999
CointEq(-1)	-1.202862	0.261297	-4.603423	0.0008

Source: *Author's Compilation, 2025*

Table 4: Breusch-Godfrey Serial Correlation LM Test

F-statistic	0.288555	Prob. F(2,9)	0.7560
Obs*R-squared	1.687260	Prob. Chi-Square(2)	0.4301

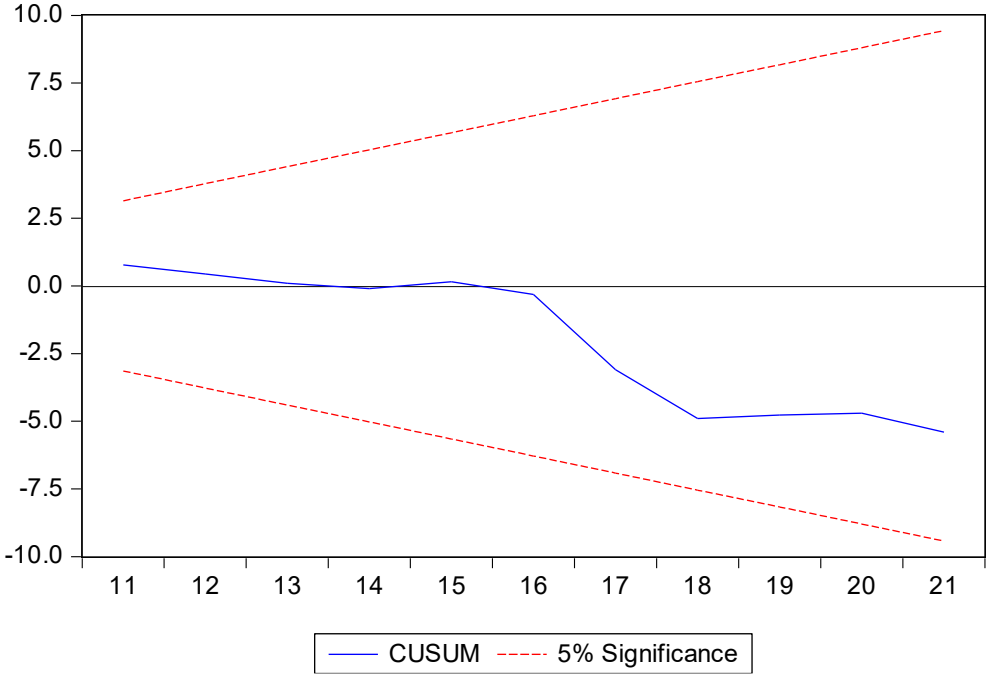
Source: *Author's Compilation, 2025*

Table 5: Heteroskedasticity Test (ARCH)

F-statistic	1.150309	Prob. F(1,25)	0.2937
Obs*R-squared	1.187686	Prob. Chi-Square(1)	0.2758

Source: *Author's Compilation, 2025*

Figure 1: CUSUM



The findings from the diagnostic tests are presented in Table 4, Table 5, and Figures 1. The time series data shows no signs of heteroskedasticity, serial correlation, or issues with model specification. Nonetheless, the investigation refuted the null hypothesis regarding the diagnostic problem. The model structure remains stable as indicated by the CUSUM, as shown in Figure 1.

Conclusion

The findings suggest that the government ought to increase Nigeria's military spending to achieve a balance between energy consumption and the nation's security needs. Legislators ought to critically assess and limit military expenditures to essential operations that enhance security while minimising environmental impact. It is essential for the government to reallocate resources from environmentally detrimental activities towards sectors that promote green technologies and the advancement of renewable energy. Prioritizing energy transitions is essential, particularly in conjunction with enhancing energy efficiency within military facilities and operations. This includes a necessary shift towards renewable energy sources and the adoption of low-carbon technologies. Urban populations ought to promote compact city designs, as these strategies effectively minimise energy consumption. In evaluating military-specific environmental strategies, it is essential for governments to implement green military practices aimed at reducing the environmental footprint of defence operations. This encompasses the transition to energy-efficient and hybrid vehicles, aircraft, and naval equipment, as well as the establishment of sustainable waste management practices within military facilities. Furthermore, it is essential for policymakers to integrate environmental awareness and sustainable practices within military training programs. Personnel must identify and address environmental risks during operations, ensuring a balance between defence objectives and ecological preservation. Moreover, thorough evaluations of environmental impacts must be conducted prior to the initiation of military projects and operations. A monitoring framework should be established to systematically assess the environmental impacts of military activities, guaranteeing that mitigation measures are appropriately enforced as necessary. Finally, it is essential for policymakers to incorporate ecological factors into defence strategies. It is essential for policymakers to focus on allocating resources to sustainable defence technologies and environmentally conscious military strategies to reduce the ecological consequences associated with military expenditures. Adopting biofuels and

hybrid-electric military vehicles presents a substantial opportunity to decrease carbon emissions associated with defiance operations.

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