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EFFECTS OF ENVIRONMENTAL COSTS ON THE VALUE OF LISTED INDUSTRIAL GOODS COMPANIES IN NIGERIA

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ABSTRACT
This study examines the impact of environmental costs on the value of listed industrial goods companies in Nigeria. A correlational research design was employed, analyzing nine listed companies over a ten-year period (2013–2022). The independent variable proxied by environmental pollution cost (EPC), environmental health and safety (EHS), and environmental waste management (EWM) were regressed against firm value, measured by Tobin's Q. Data were sourced from audited annual reports. Multiple regression analysis revealed a positive and significant impact of EPC on firm value, while EHS and EWM had negative and significant impacts. The study recommends prioritizing EPC spending to enhance firm value while optimizing EHS and EWM expenditures.

Keywords: Environmental Pollution Cost, Environmental Health and Safety, Environmental Waste Management Cost, Tobin's Q, Firm Value

INTRODUCTION
Businesses operate within an environmental context, impacting it directly or indirectly and necessitating mitigation measures. In Nigeria, industrial goods companies have expanded rapidly, often outpacing regulatory oversight, leading to environmental degradation through emissions of harmful hydrocarbons during production, which endanger human health and ecosystems (Kurawa & Shuaibu, 2022). Nigeria is a significant contributor to global environmental issues, including climate change, oil spills, gas flaring, and deforestation. Environmental costs are categorized as prevention, appraisal, internal failure, and external failure costs (Eltaib, 2012). Prevention costs address issues proactively; appraisal costs monitor impacts; internal failure costs correct internal issues; and external failure costs involve external remediation, such as fines and reputational damage.
Global concerns like rising temperatures and natural disasters have heightened environmental management priorities (Barako & Brown, 2018). Nigeria's 2022 Environmental Performance Index (EPI) ranking of 162 out of 168 underscores

poor environmental performance, impacting economic growth and firm value. Industrial waste, including chemicals and plastics, exacerbates air, land, and water pollution (Wahab, Akinola & Dare, 2022). Advisory frameworks like the Global Reporting Initiative (GRI, 1997), New Economic Regulation (NER, 2001), and Environmental Matters (2002) exist, but their non-mandatory nature results in inconsistent environmental reporting.

Communities near industrial sites, such as those around Lafarge Plc (Ashaka Cement) in Gombe State, face pollution from hydrocarbon black and limestone dust, causing health issues like leukemia and land degradation (Eze, Nweze & Enekwe, 2016). These communities often demand compensation (Kornom & Aenan, 2020). Prior studies, such as Mogaka and Ambrose (2013), Godwin (2019), and Amaegbu and Onyali (2021), explored environmental costs, mostly in oil and manufacturing, with Godwin (2019) focusing on industrial goods. Recent studies in manufacturing (Ezeagba et al., 2024), energy (Okafor & Umeh, 2025), and agriculture (Udeh & Okoye, 2025) highlight evolving impacts, necessitating updated research in industrial goods.

LITERATURE REVIEW

Concept of Environmental Cost

Environmental costs encompass expenses to prevent, reduce, or restore environmental damage (Agboola & Oroge, 2019). These include regulatory compliance, reducing hazardous releases, and mitigation activities (Odesa, Igbru & Agbasi, 2016). Definitions vary, complicating classification, with some costs ambiguous (Okafor, 2018). Aert, Cormier, and Magnam (2013) describe costs as linked to degradation creation, detection, remediation, and prevention, categorized as caused or borne.

EPC: Costs for managing substances/energy released beyond environmental capacity (Agboola & Oroge, 2019). EHS: Costs for ensuring health and safety within and outside the firm (Amahalu, Okoye & Obi, 2018). EWM: Costs for waste reduction, recycling, and disposal (Samuel, Aruna, Amahalu & Nestor, 2020).

Classification of Environmental Costs

Oyadonghan and Eze (2013) categorize costs as prevention costs which is aimed at avoiding pollution (e.g., training, recycling); evaluation costs to Ensure compliance (e.g., audits); internal failure costs meant for correcting pre-release issues (e.g., reworking scraps); and external failure costs targeting post-pollution remediation (e.g., cleanup, fines).

Concept of Firm Value

Firm value reflects assets owned (Godwin, 2019) or a business's worth at a given time (Ijeoma, 2015). It measures success through share prices (Pengaruf, Terhadad & Terdaftar, 2019) and aligns with shareholder wealth. Tobin's Q, the ratio of market to replacement value, indicates over/undervaluation (Hayes, 2019; Bond & Cummins, 2014). High Tobin's Q signals effective management.

Empirical Review

Mogaka and Ambrose (2013) found environmental costs negatively impacting ROCE and EPS but positively affecting net profit margin in Indian firms, advocating tax incentives. Akinlo and Iredele (2014) reported aggregate positive but variable-specific negative impacts (e.g., waste management) on market value in Nigerian firms. Arong, Ezugwu, and Egbere (2014) confirmed positive relationships in Nigeria's oil sector, noting external reporting gaps. Godwin (2019) showed non-financial indicators positively affecting industrial goods firm value, with performance indicators negative. Agboola and Oroge (2019) linked environmental costs to improved cement firm performance.

Recent studies enrich this context. Adegbie et al. (2024) found environmental conservation costs enhancing manufacturing firm performance in Nigeria through cost savings and efficiency. Okere (2024) demonstrated green accounting practices boosting firm value via stakeholder trust. Abdullahi (2023) reported insignificant environmental cost impacts on industrial goods firms' Tobin's Q, possibly due to sector-specific dynamics. Dagunduro et al. (2023) linked conservation costs to quarry firm performance, emphasizing long-term benefits. Odoemelam (2024) confirmed positive disclosure impacts in manufacturing. Adegbie (2023) and Dagunduro (2023) found similar positive effects in manufacturing and aviation, respectively. Nzekwe et al. (2024) noted non-disclosure negatively affecting oil and gas performance. Ezeagba et al. (2024) and Udeh and Okoye (2025) reinforced positive impacts in manufacturing and agriculture, respectively. These studies highlight sector-specific variations and the growing role of environmental practices in firm value, necessitating focused research in industrial goods.

Theoretical Background

This study is primarily anchored on signaling theory, which posits that firms disclose environmental costs in their annual reports to signal environmental responsibility to stakeholders, particularly investors. By incurring and reporting costs like EPC, firms demonstrate commitment to sustainability, potentially increasing market valuation through enhanced investor confidence and share prices (Godwin, 2019; Adegbie et al., 2024). This is particularly relevant in Nigeria, where environmental performance influences investor perceptions due to weak regulatory enforcement (Kurawa & Shuaibu, 2022).

The stakeholder theory complements this framework by emphasizing that firms must balance the interests of various stakeholders, including communities, regulators, and investors, when managing environmental costs. Investments in

EHS and EWM, while potentially costly, address stakeholder demands for safety and waste management, impacting firm value through reputation and compliance (Amahalu et al., 2018; Okere, 2024). However, excessive costs may signal inefficiency, reducing value, as seen in some industrial contexts (Abdullahi, 2023).

The resource-based view (RBV) further explains how strategic allocation of environmental costs can create competitive advantages. EPC investments, for instance, can enhance operational efficiency and brand value, contributing to higher Tobin's Q (Dagunduro et al., 2023). Conversely, misallocated EHS or EWM resources may deplete firm capabilities without proportional returns (Nzekwe et al., 2024). These theories collectively provide a robust framework for understanding how environmental costs influence firm value in Nigeria's industrial goods sector, where regulatory and stakeholder pressures shape strategic decisions.

METHODOLOGY

A correlational design assessed environmental costs' impact on firm value. Data (2013–2022) were sourced from annual reports and NSE fact books. The population included all listed industrial goods companies as of December 31, 2022. Census sampling with filters (listed by 2013, complete data) yielded nine companies.

Table 1: Variables and Their Measurement

Variable	Type	Measurement	Source
TQ	DV	(Market Value of Equity + Book Value of Debt) / Book Value of Total Assets	Hayes (2019); Bond & Cummins (2014)
EPC	IV	Natural log of costs for pollution control/remediation	Agboola & Oroge (2019); Eltaib (2012)
EHS	IV	Natural log of costs for health/safety activities	Amahalu et al. (2018); Okafor (2018)
EWM	IV	Natural log of costs for waste reduction/recycling	Samuel et al. (2020); Oyadonghan & Eze (2013)
FS	Ctr	Natural log of total assets	Wahab et al. (2022)
FA	Ctr	Years since incorporation	Abayomi et al. (2018)

Model Specification

$V_{i,t} = \alpha + \beta 1\ EPC_{i,t} + \beta 2\ EHS_{i,t} + \beta 3\ EWM_{i,t} + \beta 4\ FS_{i,t} + \beta 5\ FA_{i,t} + e_{i,t}$

RESULTS AND DISCUSSIONS

Diagnostic tests confirmed no multicollinearity (VIF=1.73), heteroskedasticity (p=0.000), and fixed effects suitability (Hausman p=0.000).

Table 2: Diagnostic Tests

Model	Multicollinearity VIF Test	Heteroskedasticity Test	Hausman Test
1	1.73	0.000	0.000

Source: Generated by the researcher from annual reports using STATA 14.0

VIF < 5 indicates no multicollinearity; heteroskedasticity p=0.000 suggests variable error terms; Hausman p=0.000 supports fixed effects model.

Descriptive Statistics

Table 3: Descriptive Statistics of the Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
TQ	90	1.6661	2.0320	0.005	8.995
EPC	90	3.8965	0.9920	0.368	7.6098
EHS	90	6.2751	0.6729	4.2589	7.6161
EWM	90	5.9148	0.6079	4.0108	6.7688
FS	90	10.3756	1.3422	8.3096	12.7715
FA	90	27.2778	11.9541	3	44

Source: Generated by the researcher using STATA 14.0

TQ mean=1.67 indicates 167% market value over assets; variability reflects market and asset differences. No outliers detected.

Correlation Matrix

Table 4: Correlation Matrix

	TQ	EPC	EHS	EWM	FS	FA
TQ	1.0000					
EPC	0.8913	1.0000				
EHS	-0.4370	-0.0949	1.0000			
EWM	-0.1514	0.1158	0.5647	1.0000		
FS	-0.4232	-0.2840	0.3797	0.5194	1.0000	
FA	-0.0960	0.0242	0.3341	0.4288	-0.0197	1.0000

Source: Generated by the researcher using STATA 14.0

TQ strongly correlates with EPC (0.89); negatively with EHS (-0.44), EWM (-0.15), FS (-0.42), FA (-0.10).

Regression Results

Table 5: Fixed Effects Regression Results

Variable	Coefficient	Std. Err.	T	P>|t|
Constant	19.1819	5.0628	3.79	0.000
EPC	1.3482	0.1026	13.14	0.000
EHS	-0.5908	0.2510	-2.35	0.021
EWM	-0.5082	0.1519	-3.35	0.001
FS	-1.5487	0.5311	-2.92	0.005
FA	0.0005	0.0237	0.02	0.983
R-squared	0.5600			
Adj. R-squared	0.5472			
F(5,76)	73.26			
Prob > F	0.0000			

Source: Generated by the researcher using STATA 14.0

R^2=0.56 indicates 56% variation explained; model significant at 5%.

Environmental Pollution Cost

EPC positively impacts firm value (β=1.35, p=0.000), indicating higher investments enhance value by improving reputation and investor appeal, per signaling theory. This aligns with Agboola and Oroge (2019), Akinlo and Iredele (2014), Kornom and Aenan (2020), and Adegbie et al. (2024), who linked conservation costs to manufacturing performance. Okere (2024) supports this via green accounting's role in trust-building. Contrasts with Abdullahi (2023), possibly due to sample differences. Implications**:** Firms should prioritize EPC to leverage regulatory and investor pressures for value growth, aligning with stakeholder theory and resource-based view (RBV).

Environmental Health and Safety

EHS negatively impacts value (β=-0.59, p=0.021), suggesting excessive spending strains resources without proportional returns, potentially seen as non-core by investors. This reflects short-term cost burdens, consistent with Godwin (2019), Odesa et al. (2016), Saman (2019), and Nzekwe et al. (2024) on non-disclosure effects. Contrasts with Amahalu et al. (2018) on health benefits. Implications**:** Optimize EHS to compliance levels; integrate with ESG strategies to balance stakeholder demands and resource use, per stakeholder theory and RBV.

Environmental Waste Management

EWM negatively impacts value (β=-0.51, p=0.001), indicating high costs reduce value due to operational inefficiencies. Aligns with Odesa et al. (2016), Agboola and Oroge (2019), Chiamogu and Okoye (2020), and Dagunduro (2023) in aviation, but contrasts with Bassey and Okon (2013). Odoemelam (2024) suggests disclosures mitigate negatives. Implications**:** Streamline EWM with technology; advocate mandatory reporting to enhance value, aligning with signaling and stakeholder theories.

CONCLUSION AND RECOMMENDATIONS

The study concludes that EPC positively drives firm value while EHS and EWM negatively impact it. In view of the above conclusion the study recommends that the industrial firms should: prioritize EPC spending for value enhancement; optimize EHS and EWM to cost-effective levels; comply with environmental laws and adopt uniform reporting; and future research should employ cross-sectoral studies with extended periods.

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