

Environmental Cost Accounting and Return on Assets of Manufacturing Firms in Douala

Ndzebir Chrysantus Shiyghan¹, Samuel Tanjeh Mukah², Andrew Wujung Vukenkeng³

¹Department of Accounting, Faculty of Economics and Management Sciences, University of Bamenda, Bamenda, Cameroon

²Department of Accounting, Faculty of Social and Management Sciences, University of Buea, Buea, Cameroon

³General Inspectorate for Administration, Ministry of Higher Education, Yaoundé, Cameroon

Email: shiyghanchrysantus45@gmail.com, sammukah2003@yahoo.com, vukenkengwujung@yahoo.com

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Abstract

The UN Sustainable Development Goal 12—“Responsible consumption and production” targets efficient use of resources and the lessening of waste and pollution. Organisations strive to measure and manage their impact on the environment in addition to identifying openings for resource efficiency and waste reduction. This study aimed at evaluating the effect of Environmental Cost Accounting on the return on assets of manufacturing firms in the Douala Industrial Zone. Data was collected through a descriptive survey and a questionnaire using a sample size of 128. The study adopted a descriptive statistic and ordered logit model to do the data analysis. The results showed a positive relationship between employee health and safety compliance cost, and pollution prevention cost. It therefore recommended the application of environmental prevention policies, in order to reduce resource spending on restoration and environmentally friendly product production.

Keywords

Environmental Cost Accounting, Pollution Prevention Costs, Return on Assets, Douala Industrial Zone

1. Introduction

The constant use of natural resources by manufacturing companies has increasingly attracted global attention as they contribute greatly to environmental costs. In order to respond to these major environmental challenges to human existence and sustainable development, a series of movements and conferences were organised in an attempt to overcome the challenges. In 1972, the first global conference on environment was organised by the United Nations with the main goal of

protecting and enhancing the human environment. It also aimed at providing solutions and preventions to its negative impacts. The major achievement of this conference was the drafting of a document on “Universal Declaration on the Protection and Preservation of the Human Environment” (UNCED, 1992). The second conference on environment and development, referred to as “Earth Summit,” was held in Rio Di Janeiro, Brazil in 1992. In this summit, 27 principles were adopted, concurring with the declaration of the first conference of 1972 (UNCED, 1992). The third major conference, which took place after 20 years in Rio Di Janeiro in 2012, was on sustainable development under the theme Rio + 20. A document expressing commitment to clear and practical measures for implementing sustainable development through economic growth, social improvement and environmental protection is in line with the goals of Earth Summit in 1992 (Finance Division, 2014).

Environmental accounting emergence in the 1970s was due to an increase in environmental awareness and concern for social and environmental well-being (Khalid et al., 2012). It was also a response to the challenges faced by the traditional accounting systems in relation to environmental activities (Birkin, 1996; Ferreira et al., 2010). According to Hussain et al. (2016), environmental accounting started with a period of doubtfulness and has four stages of progress. The first stage of progress was characterised by descriptive character from 1970 to 1980. This period witnessed the beginning of the first research in the area of environmental accounting. The second stage of progress was from 1981 to 1984, with key debates on disclosure of environmental accounting results. The third stage was from 1995 to 2001, when environmental accounting reached the maturity stage with the launch of environmental audits. In developed economies, this concept was now deliberated both theoretically and practically. The fourth stage witnessed the issue of environmental laws and regulations from 2002 to present.

Besides, in the colonization era, major projects were launched, such as: agro-industrial plantations, construction of dams, forest exploitation, urbanisation, mine extraction, construction of railways, ports, airports and so on. The excessive utilisation of natural resources brought about by such an intensification of economic activities was evident. This often led to environmental degradation and its repercussions on the quality of soil, water, and air just to mention a few (Bitondo, 2000).

In Africa, especially in Nigeria, the manufacturing sector has attracted a lot of public outcries on matters related to environmental concerns. The major activities of oil and gas industries are usually linked to several health implications and environmental degradations, which, in recent days, have brought a lot of social disputes and disruption of some multinational companies’ economic activities (Uwaoma & Ordu, 2016). Organisations are expected to demonstrate their ability to address the impact of their activities on the environment and society as a whole (Uwuigbe & Jimoh, 2012). In order to do so, there is a need for Environmental Cost Accounting (ECA) to generate information about the use of resources with environmentally

related influences and effects on the financial position and performance of an organisation (Burrill et al., 2001). Oluwamayowa and Omowunmi (2018) explained that the main aim of Environmental Accounting (EA) is to provide management with vital information about environmental costs and performance.

Cameroon, like numerous other African countries, faces major challenges regarding its environment (air, land, and water). As a result, Cameroon associates with other countries and local and international non-governmental organisations on matters involving air pollution, wildlife trafficking, illegal logging, and unsustainable commercialisation of meat from endangered faunae. Like progressive countries, Cameroon has a responsibility to preserve the business environment, which already faces the challenge of deteriorating natural resources caused by the activities of these businesses (Mukah, 2021).

The 1994 constitution of Cameroon recognises the right of residents to a sound environment. It also considers environmental protection as a shared responsibility. Besides, pressures from government institutions should positively affect the intention and willingness of manufacturing companies to adopt EA (Jamil et al., 2015). In Cameroon, according to Law No. 96/12 of 5 August 1996 on the framework law relating to environmental management, economic agents are obliged to consider the incorporation of environmental protection aspects into their company strategies. Section II Article 17 of the said law requires that firms carry out an impact assessment to determine the direct or indirect incidence of their activities on the ecological balance of the zone or region where they operate.

Manufacturing firms are a subset of the industrial sector in any economy. It contributes greatly to the country's economy as it plays a pivotal role in the country's social and economic transformation process. The expansion of this sector can contribute to assuaging poverty, creating employment opportunities, increasing export income, as well as developing technological and productive capacities of the economy. The manufacturing sector in Cameroon focuses on the transformation of agricultural produce such as sugar refining, tobacco and cotton spinning, wood processing, and clothing and textiles. The government's role as a major player in this sector has reduced drastically following a raft of privatisation that began in the 1990s. The manufacturing sector worldwide contributes a lot to the Gross Domestic Product (GDP), accounting for one-fifth in the late 20th century. Again, the value added from the sector has increased from 9.82% in 1972 to 14.42% in 2019 (World Bank, 2021).

Manufacturing companies need to adopt ECA because they closely and directly transact with the environment (Chathurangani & Madhusanka, 2019). These companies make use of the resources of the host communities so as to attain their business goals of profit maximisation, growth and sustainability. By so doing, they taint the environment with waste disposal, noise, pollution, etc. Adopting the ECA is of strategic importance to these manufacturing companies to strike a balance between the social and economic interests. Conventionally, company performance measurements focused mainly on how the activities of the firms affect shareholders'

value, hence ignoring the interests of other stakeholders. However, in this contemporary period, the perspective has changed, resulting in a wider stakeholder consideration (Nwaimo, 2020).

The exploitation of natural resources by manufacturing companies and the impact of their activities contribute to environmental costs such as degradation cost. Poor waste treatment and hazardous substance release affect communities where they operate. Conventional accounting systems in their attempt to effectively manage environmental costs often allocate these costs to general overhead expenses. In this way, there is absence of systematic traceability of environmental costs to processes and products responsible for the costs (UNSD, 2003).

There have been several views in agreement and disagreement on the effect of these environmental costs on the profitability of a company. The employees' health and safety compliance costs are for example incurred to secure and guarantee safe work place for profit generation. Dedi et al. (2020) support this assertion by opining that the work safety has significant effects on company performance. Even though this is not in agreement with Oti and Mbu-Ogar (2018) who argued that employee health and safety costs do not significantly affect firm performance. Oshiole et al. (2020) hold that remediation costs have a positive and significant effect on the financial performance of a company, thus contradicting the view of Ilelaboye and Alade (2022) that restoration costs negatively and insignificantly affect financial performance of a company. Furthermore, implementing pollution prevention practices could enhance organisational performance, gaining a competitive advantage and improving financial performance (Nwanwu, 2022; Decker & Jalbert, 2014; Hanim Mohamad Zailani et al., 2012). This contradicts the view that there exists a negative relationship between pollution prevention costs and financial performance (Sarkis & Cordeiro, 2001).

Based on these conflicting views of environmental costs and their effect on profitability, the study investigated the effect of environmental cost accounting on the financial performance of manufacturing firms in the Douala Industrial Zone. Specifically, the study evaluated the effect of environmental restoration costs, community development costs, employees' health and safety compliance costs, and pollution prevention costs on the return on assets of manufacturing firms in the Douala Industrial Zone and assumed that each of these costs has a significant effect on the return on assets of manufacturing firms in the Douala Industrial Zone.

The rest of the paper is organised to cover the literature review, methodology, results, conclusion and policy recommendations.

2. Literature Review

This section did a conceptual, theoretical and empirical literature review. The concepts: environmental cost accounting, environmental restoration costs, community development costs, employee's health and safety compliance costs, pollution prevention costs, and return on assets were reviewed. According to Letmathe and

Doost (2000), an environmental cost accounting system is a flow and decision-oriented extension of traditional cost accounting systems. Environmental Cost Accounting emphasised the recognition and reclassification of environmental impacts and costs geared at improving the quality of the decision-making (Gloria et al., 2013). It is also a step taken by the company in establishing an environmentally friendly accounting system that expedites the collection of information relating to material flows, social responsibility, and sustainable development (Zeng et al., 2019).

Environmental Cost Accounting is a cost accounting system oriented to properly allocate costs associated with emissions, waste disposal, and other wastes (Bucior & Irwanda, 2021). Environmental Cost Accounting therefore shows the actual costs of inputs and commercial processes (Letmathe & Doost, 2000). With environmental cost accounting, the firm ensures compliance with the law, which saves the firm's operational costs. Letmathe and Doost (2000) asserted that environmental cost accounting assists in establishing an internal pricing system that evaluates inputs, processes, and products at their actual costs. The procedure for executing environmental cost accounting then produces decision-oriented information for the company's planning, controlling, and monitoring external and internal environment. Aside from procedures, environmental cost accounting improves understanding of business processes. ECA is not new in companies and is attracting public attention (Le et al., 2019). Le et al.'s (2019) research elucidated environmental cost accounting to be a valuable tool for managing, measuring, and providing information about environmental performance.

Environmental Restoration Cost is another concept and it refers to cost incurred in making sure that a company respects and upholds the regulations and voluntary standards including costs for investigating environmental transactions, reviewing goods and developments, increasing ecological activity processes, analysing pollution and assessing its adulteration extent (Okezie et al., 2019). Restoration costs are incurred to comply with regulatory standards in a bid to reduce or eliminate release of hazardous substances and corporate practices aimed at reducing environmental impacts of a company's operation (Chinedu et al., 2019). Besides, no business operates in a vacuum. As such, the business depends on the environment the same way environment needs companies to carry out activities that are environmentally friendly.

Another concept Community Development Cost is an aspect of an organisation's social responsiveness. It holds that companies have a duty towards the society and business decisions should be linked to ethical values and respect for individuals, society and environment. Thus, organisations as corporate citizens are expected to give back to the society, especially the host communities (ICAN, 2014). Community development is linked to the philanthropic expectation placed on organisations at any given time (Carroll, 1991). Also, Oti et al. (2017) emphasised that the aim of community development placed on firms are mainly to cushion them on the effects of their externalities on the host communities resulting from the

operating activities. Disclosing community developments costs of a business shows that the business entity is on the right path and assures stakeholders of the firm's ability ethical in its operations.

Employees' Health and Safety Compliance Cost is the costs incurred in caring for the safety and health of the employees of an establishment (Chinedu et al., 2019). Health and safety cost are geared towards securing and promoting safety and health of staff, both physical and mental. Safe workplaces are profitable workplaces and, as such, activity should be carried out to preserve the health of employees, sub-contractors, and the general public (Oshiole et al., 2020).

Pollution Prevention Costs concept saves industrial production process costs and creates a new source of income. Several pollution prevention costs are quite cheap to implement and can be relatively profitable. Others must be analysed carefully to consider their profitability. The analysis involved is in a current process and is likely a pollution prevention option (Okezie et al., 2019) The costs of pollution to society are of two kinds, costs that arise if no action is taken to address pollution, and the costs that arise if action is taken (Nwanwu, 2022).

Return on Assets (ROA) is a ratio that measures assets and turnover for a particular period. A higher return on assets is advantageous to firms, as it can be used as bait to attract investors to subscribe to their shares (Arumona et al., 2020). ROA gives the profitability of the assets of the firm after meeting all expenses and taxes. It measures the profit of the firm after tax for each CFAP invested in assets (Horne & Wachowicz, 2005). ROA is therefore a ratio that shows how much an asset plays in creating a net profit (Hery, 2015). The higher the ROA ratio, the more effective and efficient the management (Hanafi, 2010).

$$\text{ROA} = \frac{\text{Net Profit After Tax}}{\text{Total Assets}}$$

The theoretical literature reviewed the stakeholder theory, polluters pay principle, social exchange theory and institution theory. The stakeholder theory is a theory of organisational management and business ethics that addresses morals and values in managing an organisation. Stakeholder theory extends the narrow focus of agency theory on shareholders' interest to stakeholders to take into account the interests of many different groups and individuals, including interest groups related to social, environmental and ethical considerations (Freeman et al., 2004). The pioneer philosopher of stakeholder's theory is Freeman (1984). Stakeholder's theory was founded on the premise that corporations are an integral part of a social system with a pivotal focus revolving around the various stakeholders' groups drawn from the ranks of society. This theory perceives organisations as systems that take into consideration not only the interest of the owners, but also the interests of other groups within the environment in which the business operates.

On the other hand, the Polluter Pays Principle (PPP) as captured in the work of Chukwuma (2015) holds that a firm that accounts for and discloses its environmental costs boosts the confidence and good image of the firm, which eventually culminates to increasing the firm's performance. The PPP requires that those who

produce pollution bear the costs of managing it to avert impairment to human health and/or the environment. For instance, where a company's by-product is poisonous the company should be held responsible to safely dispose of it. Together with other principles the PPP guides sustainable development worldwide and was formally known as the 1992 Rio Declaration.

Another theory considered in this study is the Social Exchange Theory. It states that social behaviour is the result of an exchange process that aims at maximising benefits and minimising costs. It requires that people evaluate the potential benefits and risks of social relationships before engaging in the relationship. The primary assumption of the theory is that individuals interact for profit or the expectation of it. Desiring to secure their health and safety at work employees are expected to evaluate their relationship with their organisations and make rational decisions on the type of relationship to have with the company. For example, it could be an emotional, continuous, or normative relationship. [Fulk and Fishbacher \(2000\)](#) contend that there is a behavioural response to an action that is perceived as either kind or unkind. As a result, the more an action is considered kind or unkind, the more it is rewarded or punished respectively.

The last theory reviewed is the institutional theory based mainly on social and economic theoretical views ([DiMaggio & Powell, 1983](#)). This theory explores how organisational structure and actions are shaped by institutional forces like the government, professional bodies, and society that surround the institutions. Institutional theory assumes that institutions are governance structures, comprising rules for social conduct. Groups and organisations complying with these rules are bestowed legitimacy, a condition that contributes to their existence.

The empirical literature review was done according to the specific objectives of the study. [Odesa et al. \(2016\)](#) examined the impact of environmental costs on business performance. He analysed a few Nigerian manufacturing and oil and gas industries. Data was for the period 2010 to 2014. After a regression analysis, it was demonstrated that there is a positive and substantial relationship between corporate social responsibility, employee health and safety costs, waste management, and firm performance. In order to improve their corporate reputation and preserve positive relationships with their host communities, the report advises businesses to make more investments in the development of these communities.

[Cna Acti et al. \(2013\)](#) investigated the impact of environmental cost on corporate performance: a study of oil companies in Niger Delta states of Nigeria using Returns on Total Assets (ROTA) as a performance measure. A multiple regression analysis was used. The study reveals that EHSC has a positive significant relationship with corporate performance. It was therefore recommended that investment in social and environmental responsibilities such as employee health and safety cost was likely to improve the return on assets of the environmentally conscious firms.

[Oti and Mbu-Ogar \(2018\)](#) investigated the analysis of environmental and social costs and financial performance of selected quoted oil and gas companies in

Nigeria. Five oil and gas businesses provided time series data, which were analysed using the ordinary least square regression method during a five-year period. The statistical analysis findings disclosed that waste management expenses had a positive and considerable impact on business financial performance. It was recommended that oil and gas companies evaluate their waste management plan and use specialised technologies in order to reduce the environmental effect of their operations.

[Polycarp \(2019\)](#) analyses environmental accounting and financial performance of oil and gas companies in Nigeria. The study's data collected for the period 2015-2017 from eleven randomly chosen oil corporations was analysed through a multiple regression. The findings disclosed that there was no significant correlation between environmental accounting and ROCE, NPM, DPS, and EPS.

Furthermore, the impact of environmental costs disclosure on listed oil and gas companies in Nigeria was examined by [Oshiole et al. \(2020\)](#) utilising employee health and safety expenses, and environmental remediation costs as surrogates during the period of 2010 to 2019. Panel Least Square (PLS) regression analysis and correlation were made. According to the results, the financial performance of the companies was positively and significantly impacted by the expenditures associated with environmental remediation, and environmental health and safety.

[Nwaimo's \(2020\)](#) study examined the impact of environmental costs on the performance of 64 industrial firms in Sub-Saharan Africa, including South Africa, Nigeria, Ghana, and Tanzania. The models for the study were estimated using Ordinary Least Squares (OLS) regression built on panel data analysis. The results showed that environmental costs such as employee health and safety, waste management, and community development costs did not significantly affect return on capital employed, earnings per share, and return on equity. However, in Ghana, waste management cost had a significant effect on return on capital employed and return on equity. The study suggested that firms should adequately engage in documented environmental responsibility. In the same vein, a study was carried out by [Mukah \(2021\)](#) to investigate the cost accounting implications on timber company productivity in Cameroon. Data was collected through a survey and an analysis done using the Ordinary Least Squares (OLS) estimation technique. The results disclosed that the profitability of timber companies increases when they carry out cost accounting to prevent pollution, contribute to environmental conservation, and resource recycling. The study recommended that businesses be sensitised on the benefits that accrue from incorporating environmental conservation costs in their financial statements.

[Chinedu et al. \(2019\)](#) examined the impact of environmental disclosure on the performance of cement companies in Nigeria using environmental health and safety cost as one of the explanatory variables. Secondary data was gotten from the annual reports of the companies covering the period 2006-2017. Through the use of a panel regression model, the outcome indicated that environmental health and

safety costs had a negative and significant impact on the firms' performance.

Ilelaboye and Alade (2022) studied the impact of environmental accounting on the performance of family-owned companies in Nigeria, using restoration cost, community development cost, and health & security costs as surrogates. The study found that restoration cost had a negative and insignificant effect on financial performance, community development cost had a negative and significant effect, while health safety cost had a positive and insignificant effect on financial performance.

3. Methodology

This research used a descriptive survey design to gather data from 128 manufacturing companies in the Douala industrial zone, registered with Mission Development and Management of Industrial Zones (MAGZI) and Cameroon employers' Association (GICAM). The target population included all registered companies in the Bonaberi and Bassa industrial areas. The study made use of both open and closed-ended questionnaires to gather data from the manufacturing firms in the Douala Industrial Zone.

Probability sampling techniques were used including stratified and simple random sampling. The statistical formula derived by Taro Yamare in 1967 was used to determine the current sample size, with an accepted error term of 5%. **Table 1** shows the industrial zone areas and the number of companies operating there. It also shows a total sample size of 134 (48 for Bonaberi and 86 for Bassa). However, the effective sample size was reduced to 128.

Table 1. Determination of sample size.

Industrial zone	Number of companies	Calculation	Sample size	Effective sample size
Bonaberi	71	$(71/200) 134 = 47.57$	48	46
Bassa	129	$(129/200) 134 = 86.43$	86	82
Total	200	Total sample size	134	128

Source: Author's compilation (2023).

Meanwhile, **Table 2** shows the operationalisation of the variables by giving each variable a symbol, an interval range, data collection method, and the analytical tools.

Model Specification

Ordered Logit (OL) models were used to predict a definite outcome founded on a set of explanatory variables. The OL model is a member of the wider class of cumulative ordinal models where the logit function is replaced by a general link function, such as logit, probit, and complementary log-log (Lu, 1999; Thissen & Steinberg, 1986). These models are known in psychometrics as graded response models or difference models. They assume that the logit of each cumulative probability is a linear function of the covariates with regression coefficients constant across response categories. An ordered logit model for an ordinal response

Table 2. Operationalisation of variables

Independent variables	Variables	Symbol	Measurement	Data collection method	Analytical tool
Environmental cost accounting	Environmental Restoration Cost	ERC	Interval range	Questionnaire	Mean, variance, standard deviation, correlation
	Community Development Cost	CDC	Interval range	Questionnaire	Mean, variance, standard deviation, correlation
	Employee Health and Safety Compliance Cost	EHSCC	Interval range	Questionnaire	Mean, variance, standard deviation, correlation
	Pollution Prevention Cost	PPC	Interval range	Questionnaire	Mean, variance, standard deviation, correlation
Other control variables	Job position	JOPPOS	Closed ended	questionnaire	Mean variance, standard deviation, correlation
	Education	EDUC	Closed ended	questionnaire	Mean variance, standard deviation, correlation
	Longevity	LONGE	Interval range	Questionnaire	Mean variance, standard deviation, correlation
	Turnover	TURN	Interval range	Questionnaire	Mean variance, standard deviation, correlation
	Longevity of Business	LONGBIZ	Interval range	Questionnaire	Mean variance, standard deviation, correlation
	Business Nature	BIZnature	Closed ended	Questionnaire	Mean variance, standard deviation, correlation
Dependent variable	Return on Assets	ROA	Interval range	Questionnaire	Ordered logit model

Source: Author’s compilation (2023).

Y_i with C categories is defined by a set of $C-1$ equations where the cumulative probabilities are related to a linear predictor through the logit function (Mckelvey & Zavoina, 1975; Samejima, 1969). The parallel regression assumption implies that increasing a covariate with a positive slope is associated with a shift towards the right end of the response scale, thereby increasing the probabilities of higher categories (Winship & Mare, 1984). The model of the effects of environmental cost accounting on return on assets of manufacturing firms in the Douala Industrial Zone is as follows:

$$ROA = \beta_0 + \beta_1 ERC + \beta_2 CDC + \beta_3 EHSCC + \beta_4 PPC + \beta_5 JP + \beta_6 EDU + \beta_7 LONGE + \beta_8 TURN + \beta_9 LONGBIZ + \beta_{10} BIZnature + \epsilon_i$$

where β_1 to β_n are parameter correlation coefficients and ϵ_1 is the idiosyncratic term that captured other possible factors that can affect return on assets. β_0 was assumed to be constant.

Table 3 presents the ordered logistics regression results. Environmental restoration

cost has a coefficient of -0.2178 with a standard error of 0.2114 , resulting in a z -value of -1.03 and a p -value of 0.303 . The 95% confidence interval ranges from 0.6321 to 0.1966 . This indicates that the effect of environmental restoration costs on the return on assets of manufacturing firms in the Douala Industrial Zone is not statistically significant at the 5% level. Thus, changes in environmental restoration costs do not have a discernible effect on the return on assets of manufacturing firms in the Douala Industrial Zone.

Community development costs have a coefficient of 0.7442 and a standard error of 0.2518 . The z -value is 2.96 and the p -value is 0.003 . The 95% confidence interval ranges from 0.2507 to 1.2376 . This shows a statistically significant positive effect on the return on assets of manufacturing firms in the Douala Industrial Zone. It suggests that higher community development costs are associated with higher assets, implying that investment in community development may enhance firm assets.

Table 3. Ordered logistics regression results.

ROAS	Coef.	Standard error	z	$p > z$	[95% conf.	interval]
ERC	-0.2177532	0.2113875	-1.03	0.303	-0.632065	0.1965587
CDC	0.7441723	0.2517782	2.96	0.003	0.250696	1.237649
EHSCC	0.0100352	0.2105597	0.05	0.962	-0.4026542	0.4227247
PPC	-0.3537186	0.2030363	-1.74	0.081	-0.7516624	0.0442253
JOB POSITION	1.968328	0.6911849	2.85	0.004	0.6136308	3.323026
EDUC	-1.889124	0.5120777	-3.69	0.000	-2.892778	-0.8854703
LONGE	2.702657	0.6466582	4.18	0.000	1.43523	3.970084
TURNOVER	-2.109662	0.6159194	-3.43	0.001	-3.316842	-0.9024823
LONGBIZ	0.8227771	0.6775639	1.21	0.225	-0.5052237	2.150778
BIZ NATURE	-0.1519193	0.3291644	-0.46	0.644	-0.7970697	0.4932311
/CUT1	-2.101631	1.420827			-4.886401	0.683139
/CUT2	-1.314401	1.385942			-4.030797	1.401995
/CUT3	-1.013079	1.377768			-3.713454	1.687296
/CUT4	-0.614749	1.37699			-3.3136	2.084102
/CUT5	0.8927317	1.393349			-1.838182	3.623645
/CUT6	2.491065	1.433114			-0.3177873	5.299918
Number of obs = 128						
LR $\chi^2(10) = 111.77$						
Prob > $\chi^2 = 0.0000$						
Prob > $\chi^2 = 0.0000$						
Pseudo $R^2 = 0.2627$						

Source: Author's compilation (2024).

Employee health and safety compliance cost has a coefficient of 0.0100 with a standard error of 0.2106, resulting in a z -value of 0.05 and a p -value of 0.962. The 95% confidence interval ranges from -0.4027 to 0.4227 . This indicates there is no statistically significant effect on the return on assets of manufacturing firms in the Douala Industrial Zone. Therefore, changes in employee health and safety compliance costs do not significantly influence firm assets.

Pollution prevention cost has a coefficient of -0.3537 with a standard error of 0.2030, resulting in a z -value of -1.74 and a p -value of 0.081. The 95% confidence interval ranges from -0.7517 to 0.0442 . Although the effect is not statistically significant at the 5% level, it is marginally significant at the 10% level, suggesting that higher pollution prevention costs might be associated with a lower return on assets for manufacturing firms in the Douala Industrial Zone.

The position occupied in the venture has a coefficient of 1.9683 with a standard error of 0.6912. The z -value is 2.85, and the p -value is 0.004. This indicates a statistically significant positive effect on the return on assets of manufacturing firms in the Douala Industrial Zone. Higher positions within the venture are associated with a higher return on assets for manufacturing firms in the Douala Industrial Zone.

The distribution of respondents by educational attainment has a coefficient of -1.8891 with a standard error of 0.5121. The z -value is -3.69 , and the p -value is 0.000. This shows a statistically significant negative effect on the return on assets of manufacturing firms in the Douala Industrial Zone. Higher educational attainment among respondents is associated with lower firm assets, indicating that educational attainment might inversely relate to the return on assets of manufacturing firms in the Douala Industrial Zone.

Longevity in service has a coefficient of 2.7027 with a standard error of 0.6467. The z -value is 4.18, and the p -value is 0.000. The 95% confidence interval ranges from 1.4352 to 3.9701. This indicates a statistically significant positive effect on the return on assets of manufacturing firms in the Douala Industrial Zone. Longer service durations among respondents are associated with higher firm assets, suggesting that employee experience and tenure positively influence the return on assets of manufacturing firms in the Douala Industrial Zone.

Turnover has a coefficient of -2.1097 with a standard error of 0.6159. The z -value is -3.43 , and the p -value is 0.001. The 95% confidence interval ranges from -3.3168 to -0.9025 . This indicates a statistically significant negative effect on the return on assets of manufacturing firms in the Douala Industrial Zone. Higher turnover rates are associated with lower firm assets, suggesting that employee retention is crucial for maintaining the return on assets of manufacturing firms in the Douala Industrial Zone.

The longevity of the business has a coefficient of 0.8228 and a standard error of 0.6776. The z -value is 1.21, and the p -value is 0.225. The 95% confidence interval ranges from -0.5052 to 2.1508. This shows no statistically significant effect on the return on assets of manufacturing firms in the Douala Industrial Zone.

The distribution of respondents by the nature of the business has a coefficient of -0.1519 with a standard error of 0.3292 . The z -value is -0.46 , and the p -value is 0.644 . The 95% confidence interval ranges from -0.7971 to 0.4932 . This indicates there is no statistically significant effect on the return on assets of manufacturing firms in the Douala Industrial Zone.

The cut points (/CUT1 - /CUT6) provide thresholds for the ordered logistic model, indicating the points at which the dependent variable changes categories. The log-likelihood ratio chi-square (LR χ^2) value of 111.77 with a p -value of 0.0000 indicates that the model as a whole is statistically significant. The pseudo- R^2 value of 0.2627 suggests that approximately 26.27% of the variability in return on assets of manufacturing firms in the Douala Industrial Zone is explained by the model.

Table 4 shows the marginal effects of environmental cost accounting on return on assets of manufacturing firms in the Douala Industrial Zone. Environmental restoration cost has a marginal effect (dy/dx) of 0.0371 with a standard error of 0.0364 , resulting in a z -value of 1.02 and a p -value of 0.308 . The 95% confidence interval ranges from -0.0342 to 0.1083 . This indicates that changes in environmental restoration costs have no statistically significant effect on the probability of return on assets of manufacturing firms in the Douala Industrial Zone, given that the p -value is greater than 0.05 . The mean value of environmental restoration costs is 3.85938 .

Table 4. Marginal effect on the effect of environmental cost accounting on return on assets.

Variable	dy/dx	Std. Err.	z	$p > z$	[95%	C.I.]	X
ERC	0.0370712	0.03636	1.02	0.308	-0.034189	0.108332	3.85938
CDC	-0.1266908	0.04417	-2.87	0.004	-0.213269	-0.040113	2.52344
EHSCC	-0.0017084	0.03583	-0.05	0.962	-0.071943	0.068526	3.79688
PPC	0.0602184	0.03495	1.72	0.085	-0.008288	0.128725	3.78125
JOBPOS~N	-0.3350959	0.12179	-2.75	0.006	-0.573796	-0.096396	2.53906
EDUC	0.3216119	0.09421	3.41	0.001	0.136955	0.506268	3.90625
LONGE	-0.460111	0.12695	-3.62	0.000	-0.70893	-0.211292	3.00781
TURNOVER	0.3591571	0.11299	3.18	0.001	0.137696	0.580618	3.55469
LONGBIZ	-0.1400728	0.11491	-1.22	0.223	-0.365286	0.085141	2.25781
BIZ_NA~E	0.0258633	0.0559	0.46	0.644	-0.083694	0.13542	4.38281

Source: Author's compilation (2024).

Community development costs have a marginal effect of -0.1267 and a standard error of 0.0442 . The z -value is -2.87 , and the p -value is 0.004 . The 95% confidence interval ranges from -0.2133 to -0.0401 . This indicates a statistically significant negative effect on the probability of return on assets of manufacturing firms in the Douala Industrial Zone. An increase in community development costs decreases the probability of a higher return on assets for manufacturing firms in

the Douala Industrial Zone. The mean value of community development costs is 2.52344.

Employee health and safety compliance cost has a marginal effect of -0.0017 with a standard error of 0.0358 , resulting in a z -value of -0.05 and a p -value of 0.962 . The 95% confidence interval ranges from -0.0719 to 0.0685 . This indicates no statistically significant effect on the probability of return on assets of manufacturing firms in the Douala Industrial Zone. The mean value of employee health and safety compliance costs is 3.79688 .

Pollution prevention costs have a marginal effect of 0.0602 with a standard error of 0.0350 . The z -value is 1.72 , and the p -value is 0.085 . The 95% confidence interval ranges from -0.0083 to 0.1287 . Although the effect is not statistically significant at the 5% level, it is marginally significant at the 10% level, suggesting that an increase in pollution prevention costs might increase the probability of a higher return on assets for manufacturing firms in the Douala Industrial Zone. The mean value of pollution prevention costs is 3.78125 .

The position occupied in the venture has a marginal effect of -0.3351 with a standard error of 0.1218 . The z -value is -2.75 , and the p -value is 0.006 . The 95% confidence interval ranges from -0.5738 to -0.0964 . This indicates a statistically significant negative effect on the probability of return on assets of manufacturing firms in the Douala Industrial Zone. Higher positions within the venture decrease the probability of a higher return on assets for manufacturing firms in the Douala Industrial Zone. The mean value of the position occupied is 2.53906 .

Educational attainment has a marginal effect of 0.3216 with a standard error of 0.0942 . The z -value is 3.41 , and the p -value is 0.001 . The 95% confidence interval ranges from 0.1370 to 0.5063 . This indicates a statistically significant positive effect on the probability of return on assets of manufacturing firms in the Douala Industrial Zone. Higher educational attainment among respondents increases the probability of a higher return on assets for manufacturing firms in the Douala Industrial Zone. The mean value of educational attainment is 3.90625 .

Longevity in service has a marginal effect of -0.4601 with a standard error of 0.1270 . The z -value is -3.62 , and the p -value is 0.000 . The 95% confidence interval ranges from -0.7089 to -0.2113 . This indicates a statistically significant negative effect on the probability of return on assets of manufacturing firms in the Douala Industrial Zone. Longer service durations among respondents decrease the probability of a higher return on assets for manufacturing firms in the Douala Industrial Zone. The mean value of longevity in service is 3.00781 .

Turnover has a marginal effect of 0.3592 with a standard error of 0.1130 . The z -value is 3.18 , and the p -value is 0.001 . The 95% confidence interval ranges from 0.1377 to 0.5806 . This indicates a statistically significant positive effect on the probability of return on assets of manufacturing firms in the Douala Industrial Zone. Higher turnover rates increase the probability of a higher return on assets for manufacturing firms in the Douala Industrial Zone. The mean value of turnover is 3.55469 .

The longevity of the business has a marginal effect of -0.1401 with a standard error of 0.1149 . The z -value is -1.22 , and the p -value is 0.223 . The 95% confidence interval ranges from -0.3653 to 0.0851 . This indicates no statistically significant effect on the probability of return on assets of manufacturing firms in the Douala Industrial Zone. The mean value of the longevity of the business is 2.25781 .

The nature of the business has a marginal effect of 0.0259 with a standard error of 0.0559 . The z -value is 0.46 , and the p -value is 0.644 . The 95% confidence interval ranges from -0.0837 to 0.1354 . This indicates no statistically significant effect on the probability of return on assets of manufacturing firms in the Douala Industrial Zone. The mean value of the nature of the business is 4.38281 .

4. Discussion of Results

Environmental restoration costs have a negative relationship with the ROA of manufacturing firms in the Douala Industrial Zone. This relationship is not significant at the 5% level. This concurs with [Ilelaboye and Alade \(2022\)](#) who examined the effect of environmental accounting on the performance of family-owned companies in Nigeria using restoration costs, community development costs, and health and security costs as surrogates. He argued that restoration costs have a negative and insignificant effect on financial performance. The result is in disagreement with [Okegbe and Ofurum \(2019\)](#) who determined the effect of environmental management accounting costs on the corporate performance of quoted Nigerian consumer goods firms and found that environmental restoration and environmental protection costs have a significant effect on the return on assets of quoted Nigerian consumer goods firms. This difference could be a result of the geographical disparity in which the two studies are being carried out. Secondly, time differences and the method by which data were collected could explain that.

Community development costs have a positive relationship with the ROA of manufacturing firms in the Douala industrial zone. This relationship is significant at the 5% level. This is in line with [Akinleye and Olaoye \(2021\)](#), who revealed that a unit increase in community development costs of 1 billion naira led to an increase in return on assets of 0.7%. By implication, this result showed that an increase in the level of community development costs for manufacturing firms in the Douala industrial zone significantly influenced the financial performance measured in terms of return on assets.

Employees' health and safety costs have a positive and insignificant relationship with the return on assets of manufacturing firms in the Douala Industrial Zone. This is in line with [Cna Acti et al. \(2013\)](#) in terms of relationship, but they disagreed in terms of the level of significance. This could be explained by the different time periods in which the two studies were conducted, as well as the different geographical areas. The level of compliance and health training in an entity differs, especially between two countries where pollution prevention costs have a significant negative relationship with the return on assets of manufacturing firms in the Douala industrial zone. [Okegbe and Ofurum \(2019\)](#) found that pollution prevention

and environmental protection costs have a significant effect on the return on assets of quoted Nigerian consumer goods firms. The study aligns with polluter pay principles, social exchange theory, and stakeholders' theory, arguing that corporate firms should disclose environmental costs, prioritize employee health and safety, and consider the interests of other stakeholders, such as shareholders, to boost confidence and performance.

5. Conclusion and Recommendations

The study reveals a negative relationship between environmental restoration cost and return on assets for manufacturing firms in the Douala Industrial Zone. Pollution prevention cost has a positive relationship with return on assets, while community development cost has a non-significant relationship. The study recommends that the management of manufacturing firms in Douala adopt environmental prevention policies (that enable, for instance, recycling of waste, treatment of waste before releasing it into the environment, and tree planting) in order to reduce resources spent on restoration. They should also put in place pollution prevention policies for environmentally friendly products and continue exercising corporate social responsibility. Additionally, employees should adhere to workplace health and safety policies and regulations. The study's statistical significance suggests the need for environmental cost accounting by all these companies.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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