

“Impact of blue accounting on corporate environmental performance: Panel data analysis of South African JSE-listed marine-sensitive companies”

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IMPACT OF BLUE ACCOUNTING ON CORPORATE ENVIRONMENTAL PERFORMANCE: PANEL DATA ANALYSIS OF SOUTH AFRICAN JSE-LISTED MARINE-SENSITIVE COMPANIES

Abstract

This study aims to examine the impact of blue accounting disclosures on the corporate environmental performance of 14 marine-sensitive companies operating in shipping, logistics, fishing, oil, and gas listed on the Johannesburg Stock Exchange (JSE). The study covered five years from 2019 to 2023. Data on environmental performance were collected and measured using Bloomberg environmental scores. Blue accounting disclosures were scored using a 5-point Likert scale. Various statistical and econometric techniques were employed, including descriptive statistics, correlation analysis, panel data analysis, and pooled ordinary least squares regression analysis. The findings show a significant positive correlation between environmental performance and firm size (coefficient: 16.07; p -value: 0.00), adherence to environmental guidelines (coefficient: 7.48; p -value: 0.02), and reporting costs (coefficient: 6.35; p -value: 0.01). Conversely, environmental obligations (coefficient: -3.92; p -value: 0.02) and firm age (coefficient: -0.18; p -value: 0.00) negatively correlated with environmental performance. The study recommends that marine-sensitive companies adopt blue accounting sustainability guidelines, like the Global Reporting Initiative (GRI), and that policymakers develop and enforce a blue accounting framework to promote sustainable marine practices. This study presents a novel model that integrates blue accounting disclosures. Through empirical and theoretical contributions, this study provided managerial, practical, policy, and implications for the quality of blue accounting disclosures, interventions, and policies to strengthen national and global sustainability goals. It added voice to the United Nations Sustainable Development Goals, specifically SDG 6 and SDG 14. This study also provided a robust research agenda for future research.

Keywords

blue accounting, environmental performance,
disclosures, marine sustainability, corporate reporting

JEL Classification

Q56, M41, Q01, Q53, G38

INTRODUCTION

A growing debate among scholars on how blue accounting in South Africa and elsewhere impacts environmental performance is currently taking place (Drempetic et al., 2020; Failler et al., 2023). Blue accounting seeks to provide the company and its stakeholders with useful information to recognize, evaluate, gauge, and report on ocean opportunities, risks, and sustainability of the company's interaction with ocean life (Abreu et al., 2019). The systematic reporting of the organization's activities, impact, and practices in relation to marine sustainability is referred to as blue accounting disclosures (Abreu et al., 2019; Rahmayanti & Sari, 2023). Marine ecosystems play a vital role in biodiversity, climate regulation, and economic activity (Gephart et



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al., 2021; Perkiss et al., 2022; Rahmayanti & Sari, 2023). However, these ecosystems are under growing pressure from overexploitation, pollution, and unsustainable industrial practices (Castro-Cadenas et al., 2022; Potgieter, 2018).

While environmental accounting frameworks have advanced for land and air-based impacts, marine-specific accounting remains underdeveloped (Failler et al., 2023). In South Africa, where marine resources are economically significant, corporate reporting on marine impacts is fragmented and inconsistent (Failler et al., 2023; Failler & Seisay, 2021). This limits effective stakeholder decision-making, as various stakeholders, including investors, regulators, and policymakers, lack standardized and comparable information (Winarsih et al., 2020).

The scientific problem addressed in this study is the absence of empirical evidence on the extent to which blue accounting disclosures influence environmental performance in marine-sensitive industries. This gap creates uncertainty about whether blue accounting can fulfil its intended role in enhancing accountability, informing policy, and supporting sustainable management of marine resources. The critical question is whether these theoretical claims hold in the context of South Africa's marine-sensitive companies listed on the Johannesburg Stock Exchange (JSE).

1. LITERATURE REVIEW

Research on sustainability reporting has evolved substantially over the last three decades, moving from the balanced scorecard and triple bottom line towards integrated reporting (Massingham et al., 2019; Struwig et al., 2024; Syah et al., 2020). Within this shift, blue accounting has emerged as a novel but underdeveloped framework for reporting on marine resources and ecosystems (Abreu et al., 2019; Failler et al., 2023). This review synthesizes theoretical, conceptual, and empirical contributions to clarify how blue accounting relates to corporate environmental performance, with emphasis on the South African context, where empirical studies remain limited.

Scholars widely acknowledge that corporate disclosure behavior cannot be explained by a single theoretical lens (Alsayegh et al., 2020; Bellamy et al., 2020; Wirawan et al., 2020). Four theories considered relevant for the study were information asymmetry theory, signaling theory, legitimacy, and stakeholder theory (Alsayegh et al., 2020; Bellamy et al., 2020). Legitimacy theory suggests firms disclose environmental information to align with social expectations and secure their "license to operate" (Deegan, 2019; Hora & Subramanian, 2019; Pittrakkos & Maroun, 2020; Silva, 2021). These disclosures allow the stakeholders to evaluate whether organizations meet their implied social contract, since traditional financial reporting

tends to omit many environmental effects (Maama & Mkhize, 2020; Mukhtar et al., 2023). Evidence from empirical work supports this view, showing that transparent environmental disclosures are positively associated with public approval, reduced reputational risk, and improved stakeholder relationships (Helfaya & Whittington, 2019; Izzo et al., 2020; O'donovan, 2002; Phaswana, 2018; Sun et al., 2024).

Stakeholder theory highlights how diverse stakeholders, such as investors, regulators, and communities, influence corporate environmental strategies (Albitar et al., 2020; Freeman, 2010; Rahmayanti & Sari, 2023). In marine-sensitive sectors, growing stakeholder demands drive voluntary disclosures with blue accounting serving as an emerging tool for transparency, accountability, and value creation (Brogi & Lagasio, 2019; Khan et al., 2020b).

Signaling theory and information asymmetry perspectives emphasize that voluntary disclosures reduce uncertainty, build trust, and signal strong performance to stakeholders (Alsayegh et al., 2020; Braam & Peeters, 2018; Karaman et al., 2020). Stakeholders interpret these disclosures, especially the non-financial ones, as signals of positive, neutral, or negative organizational behavior (Khanifah et al., 2020; Ngole & Mabonesho, 2023). Detailed environmental disclosures are considered positive signals that enhance the organiza-

tion's reputation, competitiveness, and stakeholder confidence (Baalouch et al., 2019; Hassan et al., 2021). Conversely, limited disclosures are considered to be a possible signal for non-compliance or a lack of sound environmental practices (Chiu et al., 2020; Doan & Sassen, 2020). Information asymmetry theory complements this view by highlighting that the organization's management often holds more information than external stakeholders, creating imbalances that can be reduced through transparent sustainability and integrated reporting (Cui et al., 2018; Lakhani & Herbert, 2022; Zyznarska-Dworczak, 2020). This becomes relevant, especially considering the environmental reporting. Collectively, these theories provide a conceptual rationale for why marine-sensitive companies might engage in blue accounting as mechanisms to reduce information asymmetry, signal responsibility, and build credibility (Benjamin et al., 2023; Haque & Ntim, 2018).

Blue accounting extends traditional environmental and green accounting by explicitly focusing on marine and freshwater resources (Rahmayanti & Sari, 2023; Syah et al., 2020). It seeks to identify, measure, and report on "blue assets," integrating ecological value into corporate decision-making (Abreu et al., 2019). While countries such as Indonesia have piloted blue accounting approaches to link biodiversity and corporate accountability, global blue accounting frameworks remain fragmented (Syah et al., 2020). Scholars argue for a standardized system that aligns financial concepts such as asset recognition and cost allocation with ecological accounting to support the United Nations (UN) Sustainable Development Goals, particularly SDG 14, Life Below Water (Perkiss et al., 2022; Winarsih et al., 2020). Beyond Africa, studies in Asia and Europe emphasize the blue accounting role in valuing marine assets and integrating them into sustainability strategies (Fridman et al., 2021; Rodrigues et al., 2014). In Africa, blue accounting is still in its infancy, but its relevance is heightened by the growing blue economy, which sees growing dependence on marine resources for food security, employment, and trade (Struwig et al., 2024; Walker, 2018).

The adoption of blue accounting also relies on enabling policy frameworks. In South Africa, initiatives such as Operation Phakisa highlight the eco-

nommic importance of the ocean economy, while King IV supports integrated reporting principles (Esser & Delpont, 2018; Wachira et al., 2020). However, fragmented regulation, weak enforcement, and climate pressures undermine these efforts (Fridman et al., 2021; Sumaila et al., 2021). Blue accounting can complement such frameworks by quantifying ecosystem value and promoting sustainable practices (Pattinaja et al., 2023; Satizábal et al., 2020).

Environmental performance reflects how companies manage their ecological footprint through reductions in emissions, protection of biodiversity, and effective water resource management (Agyemang et al., 2021; Singh et al., 2020). Evidence suggests that robust environmental disclosures enhance performance by improving efficiency, stakeholder trust, and investor confidence (Dragomir, 2018; Wendling et al., 2022). In marine contexts, blue accounting can raise awareness of ecological costs and incentivize sustainable practices (Failler et al., 2023; Rahmayanti & Sari, 2023). Studies show that companies facing high stakeholder pressure disclose more environmental data, often beyond regulatory requirements (Brogi & Lagasio, 2019; Ngorima, 2019). By improving transparency and stakeholder communication, it can also strengthen organizational legitimacy and investor confidence (Rahmayanti & Sari, 2023). Ultimately, blue accounting can help organizations align environmental goals with operational strategies, fostering a culture where economic development and ecological preservation coexist (Albitar et al., 2020; Shah et al., 2021).

Despite global momentum, marine-focused disclosure remains underdeveloped in South Africa. Firms lack consistent disclosure practices, and policy frameworks remain fragmented, leaving a significant empirical gap (Larasasti et al., 2025). Contradictions, however, remain, as some argue that disclosures may serve symbolic or impression management purposes, creating the risk of "blue washing" (Al-Shaer & Hussainey, 2022). In South Africa, despite extensive reliance on marine resources and a strong integrated reporting tradition, no empirical studies have examined whether blue accounting disclosures influence environmental performance among Johannesburg Stock Exchange (JSE)-listed marine-sensitive firms.

The literature shows that blue accounting is conceptually promising and theoretically justified through stakeholder, legitimacy, and signaling theories. It could enhance sustainability reporting by integrating marine ecosystem values into decision-making, thereby improving environmental performance. However, most evidence is drawn from Asia and Europe; Africa, and South Africa in particular, remain under-researched. Marine-specific disclosure frameworks are fragmented, and empirical tests of the link between blue accounting and performance are absent in the South African corporate context. To address this gap, this study empirically investigates how blue accounting disclosures influence the environmental performance of marine-sensitive companies listed on the JSE, aiming to provide evidence-based insights for theory, practice, and policy.

2. METHODS

This study employed a quantitative research strategy to empirically investigate the impact of blue accounting disclosures on corporate environmental performance among South Africa's marine-sensitive JSE-listed companies. Fourteen marine-sensitive JSE-listed organizations with operations in the shipping, logistics, oil, fishing, and energy sectors were purposively selected. The study covers the period from 2019 to 2023. This produced a balanced panel of 70 firm-year observations. The period was chosen because from 2019 onwards, integrated and sustainability reports became consistently available, containing blue accounting disclosures in their environmental disclosures (Maroun, 2019; Rossi & Candio, 2023). Annual integrated and sustainability reports in PDF format were downloaded from the company websites. Blue accounting disclosures were manually extracted and evaluated. The quality of blue accounting disclosures was scored using a 5-point Likert scale as follows:

- 1) very inadequate information, or no information;
- 2) inadequate or limited information;
- 3) average information provided to some extent;
- 4) strong information largely provided;
- 5) extremely adequate and detailed information provided.

This approach aligns with prior studies on non-financial disclosures and environmental disclosures, where the Likert scale scoring was used (Dragomir, 2018). The literature review revealed independent variables reflecting blue accounting disclosures. These variables include regulatory framework, obligations, reporting guidelines, value-added initiatives, environmental reporting costs, environmental marine policy, waste management, effluent management, and marine water quality (Abreu et al., 2019; Failler et al., 2023; Perkiss et al., 2022). Reliability was ensured by independent scoring from us and an independent peer reviewer, with discrepancies reconciled through discussion.

The dependent variable, environmental performance, was measured using Bloomberg environmental scores, which translate qualitative ESG disclosures into quantitative values, enabling robust statistical analysis (Doan & Sassen, 2020). This method is widely used in environmental performance research (Deswanto & Siregar, 2018; Yu & Van Luu, 2021). These were downloaded from the Bloomberg terminal. The use of the Bloomberg environmental scores as a proxy for environmental performance is in line with prior studies (Tadros et al., 2020; Yu & Van Luu, 2021). The control variables included firm size (log of total assets) and firm age, consistent with prior ESG studies (Bashir et al., 2023; Benjamin et al., 2023; Dremptic et al., 2020).

Multiple regression analysis, including the fixed effects, random effects, and pooled ordinary least squares (OLS) models, was carefully evaluated. The fixed effects model was excluded due to its inability to estimate time-invariant variables and its limited statistical power in small panel settings (Adams & Balogun, 2020; Nguyen et al., 2020). This study employs a small panel consisting of a sample of 14 organizations over a five-year period. The random effects model was rejected due to potential correlation between unobserved heterogeneity and regressors (Mashele, 2021). After evaluating model fit and assumptions, the pooled Ordinary Least Squares (OLS) model was deemed appropriate due to its efficiency in capturing both time-series and cross-sectional data variability (Majeed & Mazhar, 2019; Shabbir & Wisdom, 2020). The pooled OLS choice is consistent with earlier ESG and environmental performance studies (Alam et al., 2019; Khan et al., 2020a).

The econometric model is specified as follows:

$$\begin{aligned}
 EP_{it} = & \beta_0 + \beta_1 REG_{it} + \beta_2 OBLI_{it} \\
 & + \beta_3 GUID_{it} + \beta_4 VA_{it} + \beta_5 ENVIR \\
 & + \beta_6 EMP_{it} + \beta_7 WM_{it} + \beta_8 EM_{it} + \beta_9 MWQ_{it} \\
 & + \beta_{10} FIRMSIZE_{it} + \beta_{11} FIRMAGE_{it} + \varepsilon_{it},
 \end{aligned} \quad (1)$$

where: EP_{it} = the dependent variable, environmental performance, depending on the specified company (i) at time (t); REG = Regulatory framework of ocean-based companies (i) at time (t); $OBLI$ = Obligations of ocean-based companies (i) at time (t); $GUID$ = Reporting guidelines of ocean-based companies (i) at time (t); VA = Value added for ocean-based companies (i) at time (t); EMP = Environmental marine policy of ocean-based companies (i) at time (t); WM = Waste management of ocean-based companies (i) at time (t); EM = Effluent management of ocean-based companies (i) at time (t); MWQ = Marine water quality of ocean-based companies (i) at time (t); $FIRMSIZE$ = Firm size (log of total assets); $FIRMAGE$ = Firm age (years); β_0 = Constant; β_n = The regression coefficient for the independent variables; $\chi_{i,t}$ = Explanatory independent variable of the company for i at a particular time t ; ε_{it} = Error term to account for unobserved organizations and time effects; i = sample company; t = period (year).

All statistical analyses were conducted using EViews 14, with significance thresholds set at 1%, 5%, and 10% (Kwak, 2023; Obilor & Amadi, 2018; Ullah et al., 2022). The methodological approach outlined above provides the basis for addressing the study's objective, which is to empirically assess the relationship between blue accounting disclosures and environmental performance among marine-sensitive companies listed on the JSE. This analysis is performed by examining which specific blue accounting disclosures are most strongly related to environmental performance and whether organizational characteristics, specifically firm size and firm age, influence environmental performance. The dataset comprising extracted blue accounting disclosure scores, Bloomberg environmental performance scores, and control variables is made publicly available on Zenodo (Mvunabandi et al., 2025). This ensures transparency and replicability. This dataset has not been used in any previous studies.

To ensure clarity and replicability, the research procedure followed a structured algorithm, summarized as follows. First, 14 marine-sensitive JSE-listed companies (Appendix B) were purposively selected, covering the period 2019 to 2023, to produce 70 firm-year observations. Second, annual integrated and sustainability reports were downloaded from the company's websites, and blue accounting disclosures were extracted and scored using a five-point Likert scale across the nine blue accounting dimensions. Third, environmental performance was measured using Bloomberg environmental scores, while firm size and firm age were included as control variables. Fourth, panel regression models (fixed effects, random effects, and pooled OLS) were tested, and pooled OLS was retained as the most suitable model given the small panel size. Fifth, the regression model was applied to assess the effect of disclosure variables on environmental performance. Finally, all analyses were conducted in EViews 14, and the dataset was archived in Zenodo to enhance transparency and reproducibility.

3. RESULTS

3.1. Descriptive statistics

Table A1 presents the mean of the blue accounting disclosures and environmental performance across the sample period, including the overall mean (median) scores, standard deviations, minimum and maximum values for each of the sampled organizations. Table A1 shows that environmental performance (EP) has a mean of 53.33 and a standard deviation (SD) of 19.47. The reporting guidelines (GUID) recorded the highest mean score of 4.44 and the lowest standard deviation of 0.58. Obligations (OBLI) showed a moderate mean (3.66) but the highest variability (Std. Dev: 1.01). Waste management (WM) also had a moderate mean (3.01) and relatively high variability (0.81). Low means were recorded for value-added disclosures (VA: 2.59), environmental reporting costs (ENVIR: 2.49), environmental policy (EMP: 2.50), effluent management (EM: 2.61), and marine water quality (MWQ: 2.87). The control variables included firm size (mean log of assets = 4.85) and firm age (mean = 62.5 years).

3.2. Correlation matrix

Table A2 shows the correlational analysis of environmental performance and blue accounting. The correlation matrix indicated strong positive correlations between environmental performance and variables such as firm size ($r = 0.79$), environmental reporting costs ($r = 0.48$), and reporting guidelines ($r = 0.56$). Effluent management and marine water quality also exhibited a high intercorrelation ($r = 0.76$). Variance Inflation Factor (VIF) values for all independent variables were below 10, confirming the absence of multicollinearity in the regression model.

3.3. Regression analysis

Table A3 reflects the panel regression results for the pooled OLS model. The overall model explained 78% of the variation in environmental performance ($R^2 = 0.78$; adjusted $R^2 = 0.74$), confirming the model's robust explanatory power. The model was statistically significant (F -statistic = 19.18, $p < 0.01$), with no evidence of multicollinearity.

Significant positive coefficients were observed for the firm size ($\beta = 16.07$, $p < 0.01$), environmental reporting costs ($\beta = 6.35$, $p < 0.01$), and reporting guidelines ($\beta = 7.48$, $p < 0.05$). Conversely, environmental obligations ($\beta = -3.92$, $p < 0.05$) and firm age ($\beta = -0.18$, $p < 0.01$) showed significant negative coefficients. The remaining disclosure variables, value-added disclosures, environmental policies, waste management, effluent treatment, and marine water quality, did not show statistically significant relationships with environmental performance at conventional levels ($p > 0.05$).

4. DISCUSSION

The study examined the relationship between blue accounting disclosures and environmental performance among marine-sensitive companies listed on the JSE. The findings provide empirical evidence supporting the relevance of stakeholder, legitimacy, and signaling theories in explaining environmental disclosure behavior in the marine industry. The descriptive statistics showed that reporting guidelines achieved the highest mean disclosure score (4.44) with low variability, indi-

cating that most companies consistently apply recognized sustainability reporting frameworks. This aligns with stakeholder and legitimacy theories: companies use formal guidelines to meet stakeholder expectations and maintain legitimacy by demonstrating compliance with established standards (Deegan, 2019; Freeman, 2010). In contrast, variables such as environmental obligations, waste management, effluent management, and marine water quality had lower mean scores and higher variability. This suggests that while some firms disclose these issues in detail, others do so minimally or not at all. Such inconsistency may indicate attempts at impression management or "blue washing," where disclosures are symbolic rather than substantive (Al-Shaer & Hussainey, 2022).

The regression results revealed that firm size, reporting guidelines, and environmental reporting costs were positively associated with environmental performance. Larger firms may disclose more because they face greater public scrutiny, consistent with stakeholder theory. Investments in structured reporting and disclosure costs appear to enhance transparency and signal environmental responsibility to stakeholders, supporting signaling theory (Braam & Peeters, 2018; Shah et al., 2021). Conversely, environmental obligations and firm age were negatively associated with environmental performance. The negative effect of obligations suggests that disclosure of penalties or compliance failures reflects underlying weaknesses in environmental management rather than improvements. Firm age being negatively related may indicate that older firms lag in adopting modern environmental practices or innovative disclosure strategies, consistent with studies suggesting that legacy structures can impede sustainability adoption (Drempetic et al., 2020).

These findings extend earlier work on ESG disclosures and environmental performance by showing that blue accounting, though underdeveloped, has measurable links to corporate outcomes in a South African context. They also highlight contradictions in the literature, i.e., while some studies find positive impacts of disclosure across all dimensions, others caution that not all disclosures translate into improved performance (Agyemang et al., 2021; Haque & Ntim, 2018). The present study confirms that only certain disclosure dimensions

(environmental reporting guidelines and environmental reporting costs) are consistently effective predictors, while others remain weak.

The results reinforce the relevance of a multi-theoretical approach. Stakeholder theory explains why larger firms disclose more; legitimacy theory explains compliance with reporting guidelines; and signaling theory explains how cost-based disclosures can demonstrate accountability. At the same time, the negative findings highlight the limits of

these theories, particularly in contexts where disclosure is inconsistent or compliance-driven.

For practitioners, the results suggest that companies can enhance environmental performance by investing in structured reporting frameworks and transparently accounting for environmental costs. For policymakers, the findings highlight the need for a standardized national blue accounting framework, complementing the already existing marine sustainability principles.

CONCLUSION

The aim of this study was to investigate whether blue accounting disclosures influence the environmental performance of marine-sensitive companies listed on the Johannesburg Stock Exchange between 2019 and 2023. The analysis demonstrated that reporting guidelines, environmental reporting costs, and firm size were positively and significantly associated with environmental performance, while environmental obligations and firm age were negatively associated. Other disclosure dimensions, including waste management, effluent management, and marine water quality, showed no significant effect. These results confirm that blue accounting is not a uniform driver of performance but rather that specific dimensions, particularly structured guidelines and transparent reporting costs, provide measurable improvements. The study contributes novelty by offering the first empirical evidence on blue accounting in South Africa, addressing a major gap in African sustainability research.

Practically, the findings highlight the importance of marine sensitive companies adopting consistent reporting frameworks and investing in an environmental management reporting system, which can enhance legitimacy and stakeholder confidence. For policymakers, the results provide a basis for developing a national or international blue accounting framework that complements existing governance codes and aligns with international sustainability goals.

Further research should examine whether blue accounting disclosures correspond to actual ecological outcomes rather than reported performance alone. Comparative studies across African economies could reveal whether these patterns are unique to South Africa or can be generalized to other countries. Expanding the timeframe beyond 2023 would also help assess long-term dynamics between blue accounting disclosure practices and the organization's environmental performance. Further research should assess the ecological outcomes of blue accounting practices beyond disclosure-based performance measures, explore cross-country comparisons in Africa, and extend the time horizon to evaluate the long-term effects of disclosure practices.

AUTHOR CONTRIBUTIONS

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Formal analysis: Jean Damascene Mvunabandi, Ntombizandile Mbiza, Bomi Cyril Nomlala.

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APPENDIX A

Table A1. Descriptive statistics

Source: Adapted from eViews 14.

Variable	EP	REG	OBLI	GUID	VA	ENVIR	EMP	WM	EM	MWQ	FIRM SIZE	FIRM AGE
Mean	53.33	2.83	3.66	4.44	2.59	2.49	2.50	3.01	2.61	2.87	4.85	62.50
Median	62.19	3.00	4.00	4.00	2.00	3.00	2.00	3.00	3.00	3.00	4.77	51.00
Maximum	82.80	4.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	6.42	138.00
Minimum	10.66	2.00	1.00	3.00	2.00	1.00	1.00	2.00	1.00	1.00	3.31	8.00
Std. Dev.	19.47	0.78	1.01	0.58	0.69	0.78	0.68	0.81	0.98	0.96	0.89	39.35
Skewness	-0.70	0.31	-1.00	-0.45	0.75	-0.14	0.43	-0.03	-0.09	-0.33	0.20	0.37
Kurtosis	2.30	1.72	3.52	2.27	2.39	2.61	2.78	1.56	2.00	2.07	2.06	1.94
Jarque-Bera	7.07	5.83	12.37	3.89	7.65	0.68	2.26	6.09	3.00	3.83	3.01	4.83
Probability	0.03	0.05	0.00	0.14	0.02	0.71	0.32	0.05	0.22	0.15	0.22	0.09
Sum	3,732.97	198.00	256.00	311.00	181.00	174.00	175.00	211.00	183.00	201.00	339.31	4,375.00
Sum Sq.	225,238.00	602.00	1,006.00	1,405.00	501.00	474.00	469.00	681.00	545.00	641.00	1,699.58	380,295.00
Sum Sq. Dev.	26,166.22	41.94	69.77	23.27	32.99	41.49	31.50	44.99	66.59	63.84	54.82	106857.50

Table A2. Correlational analysis of environmental performance and blue accounting disclosure variable

Source: Adapted from eViews 14.

Variable	EP	REG	OBLI	GUID	VA	ENVIR	EMP	WM	EM	MWQ	FIRM SIZE	FIRM AGE	VIF
EP	1.00	-	-	-	-	-	-	-	-	-	-	-	-
REG	-0.23	1.00	-	-	-	-	-	-	-	-	-	-	1.59
OBLI	0.22	0.22	1.00	-	-	-	-	-	-	-	-	-	2.00
GUID	0.56	0.04	0.56	1.00	-	-	-	-	-	-	-	-	2.15
VA	0.20	0.24	0.36	0.36	1.00	-	-	-	-	-	-	-	1.93
ENVIR	0.48	0.07	0.20	0.32	0.46	1.00	-	-	-	-	-	-	2.26
EMP	0.19	0.39	0.21	0.13	0.48	0.39	1.00	-	-	-	-	-	2.26
WM	0.22	0.17	0.38	0.33	0.32	0.22	0.33	1.00	-	-	-	-	3.48
EM	0.39	0.14	0.50	0.46	0.55	0.53	0.60	0.57	1.00	-	-	-	3.67
MWQ	0.47	0.07	0.46	0.36	0.44	0.55	0.55	0.58	0.76*	1.00	-	-	3.48
FIRM SIZE	0.79*	-0.20	0.29	0.47	0.33	0.52	0.30	0.35	0.46	0.57	1.00	-	2.39
FIRM AGE	-0.03	-0.01	-0.24	-0.17	0.31	0.42	0.15	0.04	0.04	0.08	0.29	1.00	1.91

Note: * High correlation. REG: Regulatory framework; OBLI: Obligations; GUID: Reporting Guidelines; VA: Value Add; ENVIR: Environmental reporting costs; EMP: Environmental Marine Policy; WM: Waste management; EM: Effluent management; MWQ: Marine Water Quality; FIRM SIZE: Firm Size (log of total assets); and FIRM AGE: age of the firm.

Table A3. Impact of blue accounting disclosure on environmental performance

Source: Adapted from eViews 14.

Total panel (balanced) observations: 70				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
REG	-1.27	1.92	-0.66	0.51
OBLI	-3.92	1.67	-2.35	0.02**
GUID	7.48	3.00	2.49	0.02**
VA	-0.22	2.38	-0.09	0.93 ^
ENVIR	6.35	2.30	2.76	0.01***
EMP	0.13	2.64	0.05	0.96 ^
WM	-0.91	1.98	-0.46	0.65
EM	-1.23	2.32	-0.53	0.60
MWQ	0.51	2.30	0.22	0.83 ^
FIRM SIZE	16.07	2.06	7.80	0.00***
FIRM AGE	-0.18	0.04	-4.22	0.00***
C	-39.89	11.71	-3.41	0.00
R-squared	0.78	Mean dependent var	53.33	
Adjusted R-squared	0.74	S.D. dependent var	19.47	
S.E. of regression	9.86	Akaike info criterion	7.57	
Sum squared resid	5,643.17	Schwarz criterion	7.96	
Log likelihood	-252.97	Hannan-Quinn criterion	7.72	
F-statistic	19.18	Durbin-Watson stat	1.03	
Prob(F-statistic)	0.00		-	

Note: significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, ^ p -value > 0.10 , insignificant.

APPENDIX B

Table B1. List of sampled companies

No.	Company
1.	SOUTH32 Limited
2.	AECI Limited
3.	MC Mining Limited
4.	Merafe Resources Ltd
5.	Wilson Bayly Hlm-Ovc Ltd (WHO)
6.	Sappi Southern Africa Ltd CB
7.	Grindrod Ltd
8.	Oceana Group Ltd
9.	Glencore plc
10.	BHP Group Limited
11.	Mondi Plc
12.	Anglo American plc
13.	Bidvest Ltd
14.	Harmony Limited

Note: The following companies were excluded due to missing data (Environmental scores for the 5 years) in Bloomberg: Grindrod Shipping Hldg Ltd and Sea Harvest Group Ltd.