Environmental disclosures and financial performance amid banking crisis and COVID-19: evidence from Ghana

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Abstract

Purpose – The purpose of this study is to examine the impact of environmental disclosures (END) on the corporate financial performance (CFP) of listed companies in Ghana before and during the Banking crisis (BKC) and the COVID-19 pandemic (COV).

Design/methodology/approach – This study used data from 16 companies listed on the Ghana Stock Exchange between 2012 and 2021. The END Index was used, which uses percentile ranking and is guided by Global Reporting Initiative guidelines. A diverse set of empirical tests were used to examine whether ENDs affect CFP during crises.

Findings – The study offered support for the stakeholder and signaling theories generally applied to the study of END. The results confirmed that ENDs have a significant positive effect on CFP measures, return on equity and earnings per share, before and during the crises. The BKC and COV had no impact on the CFP.

Practical implications – As Ghana is still recovering from the 2017 to 2020 BKC and COV, the findings of this study highlight the need for managers to embrace END reporting and engagement strategies to improve CFP and firm reputation.

Originality/value – To the best of the authors' knowledge, this study is the first to examine the effect of END on CFP in the context of before and considering the Ghanaian BKC and COV. In addition, it is one of the few studies that investigates how ENDs affect the CFP of Ghanaian-listed firms.

Keywords Environmental disclosures, Corporate financial performance, The Ghanaian banking crisis, Covid-19, Robust regression, Ordinary least squares regression, Logistic regression, Return on equity, Earnings per share

Paper type Research paper

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Introduction

With the outbreak of COVID-19 pandemic (COV), which immediately followed the Banking crisis (BKC) in Ghana, corporate activities and their impact on the environment in Ghana became an increasing concern. Due to the massive impact of the BKC and the COV, the need for greater transparency of corporate environmental practices and their impact on corporate financial performance (CFP) has become a public concern. The environmental disclosures (END) produced by companies are nonfinancial in nature but are reliable and indicative of their environmental performance (Tadros *et al.*, 2020). Previous studies found mixed results on the impact of END on CFP. Some studies found that END enhance the issue of shares, attract investors and offer other benefits (Abbas *et al.*, 2023; Magid *et al.*, 2023; Suttipun and Yordudom, 2022), while other studies found that END have a negative impact on CFP (e.g. Adu, 2022).

While some prior research has highlighted on END in Ghana, there is limited empirical evidence of the link between END and CFP in Ghana, particularly in the context of periods before and considering the crises, as illustrated in Figure 1. The scarcity of research on END in developing countries also prompted calls for replicating studies across various industries and time periods by scholars like Joyce (2020) and Malarvizhi and Matta (2016). In response to this call, the main objective of this study is to answer the following key question, "Did END have an impact on the CFP of firms listed on the Ghana Stock Exchange before and during the BKC and COV?" the study aims to understand whether there is a significant relationship between END and CFP of companies listed on the Ghana Stock Exchange, taking into account the occurrence of the BKC and COV. This research developed an END Index (EDI) and formulated a hypothesis to test the relationship between CFP and END of companies listed on the Ghana Stock Exchange.

Due to the COV, environmental protection has become increasingly important to the World. As a result, there is a growing need for companies to inform stakeholders about their environmental performance, even if ENDs are not mandated. However, there is limited research on the impact of END on CFP in times of crisis in emerging markets. By conducting research on the impact of END on CFP in times of crisis, this study aims to fill this gap. The results of this study will help develop strategies for sustainable business practices and provide important new insights into the relationship between END and CFP in times of crisis in emerging markets.

Between 2012 and 2021, Ghana's economy was turbulent. The IMF found that Ghana's economic growth slowed from 8% in 2012 to 3.5% in 2015. The period from 2017 to 2020 was marked by a BKC and an economic crisis caused by the COV. During such turbulent times, businesses have turned to various strategies to improve their performance including

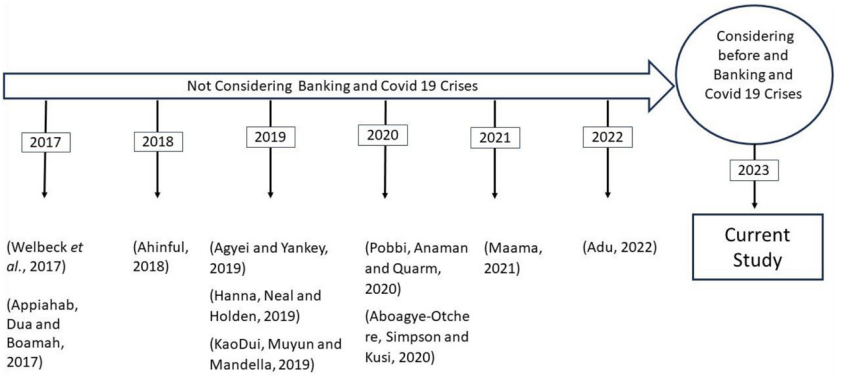


Figure 1.
Some recent research on environmental disclosures in Ghana

Source: Figure by authors

adopting sustainable practices to help them recover from the crises. The findings of this research will make a valuable contribution to the current literature by providing empirical evidence on the relationship between END and CFP, particularly in the context of periods before and considering the Ghanaian BKC and COV.

The results of this research will make a valuable contribution to the current literature on the relationship between END and CFP, especially in times of crisis. This information will help companies understand the potential benefits of END and its impact on CFP in challenging situations. In addition, policymakers can use this information to develop effective regulations and policies that promote sustainable practices and support companies in times of crisis. The next sections of the paper address the theoretical framework, literature review and hypothesis development, research methodology, results and discussion and conclusion.

Theoretical framework

According to stakeholder theory, firms should not only take care of shareholders, but also consider the needs of different stakeholders. A company can demonstrate its commitment to sustainability through accountability and transparency, which builds trust with their stakeholders (Freeman *et al.*, 2010). In times of crisis, stakeholders look to organizations for support and security. They may be concerned about the resilience of organizations and how they respond to environmental issues. Therefore, Ghanaian companies that may prioritize END during times of crisis demonstrate their commitment to responsible business practices and may be better equipped to create value for different stakeholders.

Another theory that plays a role in meeting stakeholder expectations is the theory of signals. Signaling theory is basically concerned with reducing the information asymmetry between two parties (Spence, 2002). From the signaling theory it can be argued that END help reduce information gaps, manage risks, build trust, and give a competitive advantage, especially during crisis time. Therefore, Ghanaian listed Firms thorough END and by the Signaling theory would strengthen their relationship with stakeholders which would enhance their CFP in meeting the demands of its stakeholders.

Literature review and hypotheses development

Environmental disclosures

ENDs communicate information about a company's past, present and future environmental management activities, and performance (Berthelot *et al.*, 2003). Prior studies have confirmed that ENDs have a positive impact on firm performance, reputation and enhance accountability to stakeholders (e.g. Jamil *et al.*, 2015; Kalash, 2021). END may include both qualitative and quantitative data, i.e. past and projected pollution control costs, financing details, pollutants reports, litigation status, compliance with regulations and others. END is voluntary in some countries, while others they are mandatory. The factors influencing END by firms include social demands, enhancing stakeholders' relations, using it as a strategic tool, ensuring legitimacy of firm's operations, as a risk reduction mechanism and other factors as underlined in prior studies (e.g. Jarboui and Moalla, 2022; Magid *et al.*, 2023).

In the Ghanaian context, ENDs are not mandatory. Prior studies have also stressed on the fact that Ghanaian firms provide END. Welbeck *et al.* (2017) observed that listed firms provide END as per Global Reporting Initiative guidelines, yet the level of disclosure remains low. Agyei and Yankey (2019) show that firms provide END to improve stakeholder relations, help them avoid government fines and enhance their reputation. Aboagye-Otchere *et al.* (2020) show that firms provide END to justify their actions to the community. Ghana as emerging country supports environmental regulations in its legislation, such as the Environmental Protection Agency Act 1994, which aims to protect the environment while promoting sustainable development.

Overview of Covid-19 pandemic

SARS-CoV-2, a new coronavirus from the SARS family, caused COVID-19, an acute respiratory disorder, first seen in Wuhan in December 2019 (Beeching *et al.*, 2023). WHO declared it a pandemic on March 11, 2020. Estimated global death toll in 2020 was at least 3 million, with a major economic impact. The pandemic emphasized the importance of public health measures like vaccination, environmental hygiene and others (Shi *et al.*, 2020). The pandemic affected the global economy, hitting emerging economies hard and the recovery is expected to be uneven, with rising debt levels (World Bank, 2022). COVID-19 created a complex economic crisis worldwide (Elmarzouky *et al.*, 2021).

Indeed, several studies have found that the COV had a negative impact on CFP in various countries (e.g. Ren *et al.*, 2021; Shen *et al.*, 2020). Ghana was severely impacted by COVID-19, with 153,514 cases and 1,343 deaths reported by the Ghana Health Service. The pandemic caused food prices to increase, and the lockdown led to economic hardship, resulting in the closure of many businesses. This is confirmed by the UNDP, which reported that 35.7% of Ghanaian firms closed during the lockdown period, resulting in the layoff of 4.0% of Ghanaian workers (UNDP, 2020). Therefore, this study aims to test the hypothesis that:

H1. The COV has a negative impact on the CFP of listed Ghanaian firms.

Ghanaian banking crisis

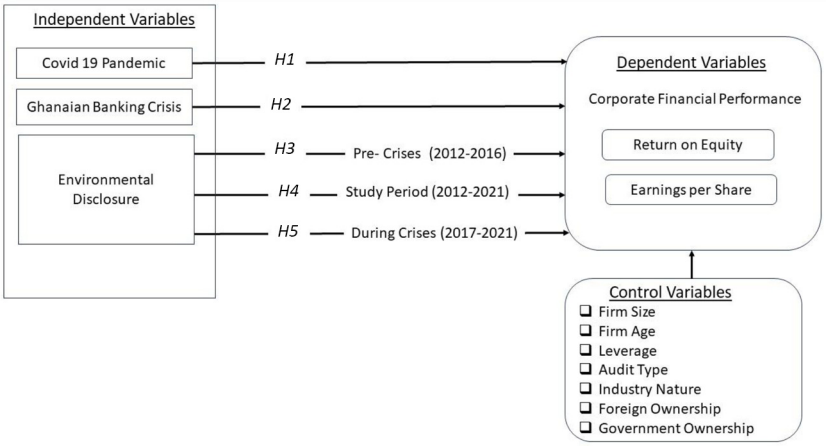
The Ghanaian BKC from 2017 to 2020 led to the collapse of seven local banks in Ghana. Furthermore, it led to the collapse of 347 microfinance companies and 23 savings and loans companies (Blankson *et al.*, 2022). The BKC had negative effects on the economy, leading to financial instability, economic recession, credit crunch and economic hardship. Therefore, it is in the light of this that the study seeks to test the hypothesis that:

H2. The BKC has a negative impact on the CFP of listed Ghanaian firms.

Environmental disclosure and corporate financial performance and during crisis time

Several studies have investigated the relationship between END and CFP. Recently in Bangladesh from 1990 to 2019, Lin and Qamruzzaman (2023) found a positive impact of END on CFP measures of return on equity (ROE), stock return and market value. From South African, Matemane and Wentzel (2019) observed that integrated reporting quality, which considers END, has a positive link to earnings per share (EPS). In China, Wu and Li (2023) from 2008 to 2019 show a positive relationship between END and return on assets (ROA), ROE and EPS when END was measured using saliency, quantifying and timeliness. Also, in China focusing on listed firms on the Shanghai and Shenzhen stock exchanges from 2005 to 2016, Malik *et al.* (2023) show that ENDs positively affect CFP measured by ROA and market value, and this effect was direct as well as through green innovation.

From the Ghanaian perspective, Maama (2021) found that END had a negative impact on ROA and net interest margin for 22 banks from 2010 to 2019. Adu (2022) also confirm that ENDs were negatively associated with ROA and ROE for 220 banks in 16 Sub-Saharan African countries including 24 Ghanaian banks from 2007 to 2018. Appiahab *et al.* (2017) also observed a negative relation between END and CFP. Contrarily, Agyei and Yankey (2019) reported a positive influence of END. Qiu *et al.* (2016) found no relationship between END and profitability with a sample of 629 firms' observations. As the existing literature shows mixed findings on END and CFP relationship, we propose a conceptual framework, shown in Figure 2, and aim to test the hypothesis that:



Source: Figure by authors

Figure 2.
A conceptual model

H3. ENDs positively influence listed Ghanaian firms CFP before the Crises outbreak.

In addition, various laws and initiatives have been implemented in Ghana encouraging sustainable business practices and END before the crises. For example, Air Pollution Act (1967) and Water Pollution and Control Act (1975), all aiming to regulate activities harming the environment and coupled with penalties in violation of the laws. Therefore, given the mixed results of previous research on the relationship between END and CFP, and the Bank of Ghana's issuance of guidelines mandating sustainable business practices and encouraging END for several industries, this study aims to verify the following hypothesis:

H4. ENDs positively influence the CFP of listed Ghanaian firms during the period (2012–2021).

During crisis time, firms with high levels of END outperform those with low levels as it helps them navigate through the crisis (Shahab *et al.*, 2018). In Australia, Jamil *et al.* (2015) confirm that ENDs positively impact on CFP in pre-crisis period, but not during crisis time. In crisis, ENDs help firms achieve sustainable goals, improve stakeholder relations and transparency to mitigate risks, stabilize stock prices and offer other benefits to boost CFP (e.g. Schnietz and Epstein, 2005). However, Cheney and McMillan (1990), confirm that during crisis firms scale back environmental projects to cut costs.

From the Ghanaian perspective considering the BKC and COV, research findings of mixed impact of END on CFP, and Bank of Ghana mandating the adoption of sustainable banking practices and issued guidance notes for various sectors, therefore, this study seeks to test the hypothesis that:

H5. ENDs positively influence CFP of listed Ghanaian firms during the Crises.

Research methodology

Sample selection

The study considers listed firms on the Ghana Stock Exchange over a 10-year period from 2012 to 2021, which is considered as a turbulent economic period in Ghana. We excluded

companies listed less than 10 years before 2021, those with unavailable data, and those delisted or suspended during the investigation period. A final sample of 16 companies was selected from the 29 listed firms. Data from their audited annual reports were analyzed using STATA software. Table 1 outlines the sample selection process.

Variable measurements

The study used key financial indicators, ROE and EPS, which is commonly used to assess CFP, as dependent variables. ROE is measured as net income divided by total equity and EPS as net income divided by number of equity shares outstanding, following previous researchers (Adu, 2022; Kalash, 2021; Lu and Khan, 2023). Regarding the independent variables: (1) END, as there is no formal or open environmental rating organization in Ghana, such as those in the developed countries, this study follows Campbell (2004) and Welbeck *et al.* (2017) in measuring END score. END score was measured by collating a word count of environment-related words based on the Global Reporting Initiative (GRI) framework for each firm in the sample. The 13 environment-related words highlighted by the GRI are Material, Electricity, Water, Biodiversity, Emissions, Effluent, Waste, Product, Services, Compliance, Transport, supplier environmental assessment and environmental grievance procedures. To develop a relative disclosure value for companies and to avoid outliers, the percentile rank used by Gillan *et al.* (2003) and Khanchel (2007) to develop measurement index was used. For this reason, an END index (EDI) was developed by calculating a percentage ranking for each company based on its score for the period. (2) BKC, from 2017 to 2020 is a dummy variable of one for the crisis period and zero for the other period. (3) COV is expected to affect CFP (Elmarzouky *et al.*, 2021), hence, a dummy variable of one is assigned for COV period, zero otherwise.

Based on theoretical relevance and previous empirical studies (e.g. Adu, 2022; Semba and Wu, 2023), seven control variables: Size (FSZ), Age (AGE), leverage (LEV), Type of audit (AUD) and Industrial nature (IND), Foreign ownership (FORO) and Government ownership (GOVO) are used to enhance the precision of the analysis. FSZ of a firm, characterized by a larger number of customers and strong market power, can have a positive impact on performance. This is attributed to economies of scale, which result in lower average costs per customer, as well as greater pricing power due to market dominance. FSZ is measured by the natural logarithm of total assets. The AGE of a firm can have a beneficial effect on its performance through the accumulation of experience and customer relationships and is measured as the difference between the balance sheet date and the stock exchange listing date. LEV affects a company's

Table 1. Sample selection process

Sample size Characteristics of the sample	No. of firms	% of sample
Panel A: description		
Companies listed on the main market of GSE	29	132
Companies listed less than 10 years	(7)	(32)
Companies listed over 10 years	22	100
companies with unavailable annual Reports and insufficient data	4	18
Companies delisted and suspended	2	9
Final sample	16	73

Source: Table by authors

performance by enabling them to generate a favorable return on investment under favorable conditions. However, it also increases financial risk and vulnerability during crises. So, we control it and is calculated as total liabilities divided by total assets. AUD determines the quality of the audit services provided, the effectiveness of risk management, and the level of regulatory compliance by firms. Therefore, is measured as a dummy variable that takes one if the audit firm is Big four and zero otherwise. IND in which a company operates has a significant impact on its performance. Factors such as the features of the IND and economic conditions impact on CFP. Based on the research of, Welbeck *et al.* (2017), a dummy variable of zero is assigned to nonsensitive firms (e.g. banks and insurance), while one is assigned to environmentally sensitive firms (e.g. manufacturing firms). To isolate the specific influence of environmental reporting, we control GOVO and FORO. GOVO is measured by a dummy variable, which equals one if the firm is controlled by government (i.e. as majority ownership of shares), zero otherwise, following Semba and Wu,(2023). FORO is measured as a dummy variable, which equals one if there are FORO (i.e. foreign investors as majority ownership of shares), zero otherwise, following Iwasaki *et al.* (2022). All variables and their measurements are shown in Table 2.

Variables	Code	Type	Description	Source
Return on equity (percent)	ROE	DV	Net income after tax divided by total equity	Annual statement
Earnings per share	EPS	DV	Net income after tax divided by the number of equities shares outstanding	Annual statement
Performance dummy	Dummy		An indicator equals 1 if firm performance is > the median value; 0 otherwise	
Environmental disclosure index	EDI	IV	Percentile rank of 13 environmental-related words count score base on GRI	Annual statement
Environmental disclosure	ENV		An indicator equals 1 if firm issue a sustainability report; 0 otherwise	
Banking crisis	BKC	IV	A dummy variable that equals 1 for the period of 2017–2020 and 0 otherwise	
COVID19	COVID	IV	A dummy variable that equals 1 for the period 2019–2021 and 0 otherwise	
Firm size	FSZ	CV	The natural log of the total assets	Annual statement
Firm age	AGE	CV	The difference between the reporting date and the listed date	Annual statement
Leverage	LEV	CV	Total liability divided by total assets	Annual statement
Audit type	AUD	CV	A dummy variable that equals 1 for using a big 4 audit firm and 0 otherwise	Annual statement
Industry dummy	IND	CV	A sector dummy variable that equals 1 for environmental sensitive firms and 0 for nonsensitive firms	Ghana stock exchange listed firms profile
Government ownership	GOVO	CV	A dummy variable that equals 1 for firms with government as majority shareholder	Annual statement
Foreign ownership	FORO	CV	A dummy variable that equals 1 for firms with foreign investors as majority shareholders	Annual statement

Notes: DV is the dependent variable; IV is the independent variable and CV is the control variable.
Source: Table by authors

Table 2.
Variables and their measurements

Research model

This study tests the effect of END on CFP, using two main models ROE and EPS models.

ROE Model 1: Before the crises (2012–2016):

$$ROE_{it} = \beta_0 + \beta_1 EDI_{it} + \beta_2 FSZ_{it} + \beta_3 AGE_{it} + \beta_4 LEV_{it} + \beta_5 AUD_{it} + \beta_6 IND_{it} + \beta_7 FORO_{it} + \beta_8 GOVO_{it} + \varepsilon_{it}$$

ROE Model 2: During the crises (2017–2021):

$$ROE_{it} = \beta_0 + \beta_1 EDI_{it} + \beta_2 FSZ_{it} + \beta_3 AGE_{it} + \beta_4 LEV_{it} + \beta_5 AUD_{it} + \beta_6 IND_{it} + \beta_7 FORO_{it} + \beta_8 GOVO_{it} + \varepsilon_{it}$$

ROE Model 3: Whole period (2012– 2021):

$$ROE_{it} = \beta_0 + \beta_1 EDI_{it} + \beta_2 BKC_{it} + \beta_3 COV_{it} + \beta_4 FSZ_{it} + \beta_5 AGE_{it} + \beta_6 LEV_{it} + \beta_7 AUD_{it} + \beta_8 IND_{it} + \beta_9 FORO_{it} + \beta_{10} GOVO_{it} + \varepsilon_{it}$$

EPS Model 1: Before the crises (2012–2016):

$$EPS_{it} = \beta_0 + \beta_1 EDI_{it} + \beta_2 FSZ_{it} + \beta_3 AGE_{it} + \beta_4 LEV_{it} + \beta_5 AUD_{it} + \beta_6 IND_{it} + \beta_7 FORO_{it} + \beta_8 GOVO_{it} + \varepsilon_{it}$$

EPS Model 2: During the crises (2017–2021):

$$EPS_{it} = \beta_0 + \beta_1 EDI_{it} + \beta_2 FSZ_{it} + \beta_3 AGE_{it} + \beta_4 LEV_{it} + \beta_5 AUD_{it} + \beta_6 IND_{it} + \beta_7 FORO_{it} + \beta_8 GOVO_{it} + \varepsilon_{it}$$

EPS Model 3: Whole period (2012– 2021):

$$EPS_{it} = \beta_0 + \beta_1 EDI_{it} + \beta_2 BKC_{it} + \beta_3 COV_{it} + \beta_4 FSZ_{it} + \beta_5 AGE_{it} + \beta_6 LEV_{it} + \beta_7 AUD_{it} + \beta_8 IND_{it} + \beta_9 FORO_{it} + \beta_{10} GOVO_{it} + \varepsilon_{it}$$

Using F-test and Breusch–Pagan test for normality, autocorrelation and homoscedasticity to ensure that the robustness of the errors is independent, identically and normally distributed for the models. The study uses Robust regression to investigate the effect of END on CFP during crises period. According to the theory of statistics, robust regression helps to mitigate the bias in standard errors associated with ordinary regression and ensures more accurate statistical inference. In addition, this study adopted Logistic regression and other additional tests to assess the validity of the findings.

Empirical results and discussion

Descriptive statistics

Table 3 shows the descriptive statistics of all the variables. Regarding ROE, the average value is 0.189. Its minimum value is −2.550. The negative minimum value implies that some of the companies did incur losses. For EPS, the minimum value is −2.265 and the mean

Variable	Obs	Mean	SD	Min	Max
ROE	160	0.189	0.474	−2.550	2.505
EPS	160	0.332	0.691	−2.565	3.540
EDI	160	0.493	0.307	0.000	1.000
BKC	160	0.400	0.491	0.000	1.000
COV	160	0.200	0.401	0.000	1.000
FSZ	160	17.694	2.290	13.100	20.784
AGE	160	19.188	6.755	4.000	30.000
LEV	160	0.654	0.301	0.022	1.425
AUD	160	0.813	0.392	0.000	1.000
IND	160	0.563	0.498	0.000	1.000
FORO	160	0.500	0.502	0.000	1.000
GOVO	160	0.250	0.434	0.000	1.000

Source: Table by authors

Table 3.
Descriptive statistics

value is 0.322. The minimum negative value indicates that some shareholders received negative returns on their shares which could be due to the crises. Regarding the EDI it had a mean of 0.493, indicating that most of the firms report on environmental issues and its Standard deviation is 0.307 reflects the dispersion in reporting practices. The BKC and COV had a mean of 0.04 and 0.2 respectively. For the standard deviation they had 0.491 and 0.401, respectively.

Regarding FSZ, the average value is 17.69 with a minimum value around 13. This indicates that the firms are large. For Age, the mean value is 19.188 and the standard deviation is 6.755. Regarding LEV, 65.4% of the firm's capital is from debt and 34.6% is from equity, implying that most of the firms are more indebted. As for the AUD of the firms, the average value is 0.813. This implies that 81.3% of the firms are using big 4 audit firms. IND has a mean value of 0.563, indicating that 56.3% of the firms are environmentally sensitive firms and 43.7% are nonsensitive. Regarding FORO and GOVO, 50% of the firms are controlled by foreigners, while 25% are controlled by the government.

Correlation analysis

Table 4 shows the correlation coefficient results. According to the theory of statistics, a correlation of 0.70 or higher in absolute value may indicate a multicollinearity issue. The results show that the highest correlation coefficient of 0.612 appears between BKC and COV. There is no multicollinearity problem as no correlation coefficients are greater than 0.70. Multicollinearity was also checked by calculating the VIFs. The highest observed VIF value in the study variables is 3.84, which is well below the conventional cut-off of 10.

Breusch–Pagan/Cook–Weisberg test

The Breusch–Pagan/Cook–Weisberg test statistics help determine if there is heteroskedasticity with our data. Table 5 and 6, confirms that for the Breusch–Pagan test the *p*-values for the models are less than 0.05 and rejects the null hypotheses, except for ROE Model 1. Thus, there is evidence of heteroskedasticity. So, the study uses robust regression for the modes, except that the OLS is used for ROE Model 1.

Regression analysis

Before the crises, in Table 7: OLS ROE Model 1, EDI has a positive coefficient (0.64) and is significant at 1% level. Table 8: Robust EPS Model 1, EDI has a positive coefficient (0.45)

Table 4. Correlation matrix and variance inflation factors (VIF)

Variables	(ROE)	(EPS)	(EDI)	(BKC)	(COV)	(FSZ)	(AGE)	(LEV)	(AUD)	(IND)	(FORO)	(GOVO)
ROE	1.000											
EPS	0.358*	1.000										
EDI	0.211*	0.131*	1.000									
BKC	−0.111	0.021	0.002	1.000								
COV	−0.062	−0.014	−0.006	0.612*	1.000							
FSZ	−0.129	−0.196*	0.402*	0.124	0.113	1.000						
AGE	−0.112	0.229*	−0.042	0.243*	0.223*	0.173*	1.000					
LEV	−0.009	0.028	−0.273*	0.039	0.106	−0.252*	−0.016	1.000				
AUD	−0.070	0.171*	−0.091	0.000	0.000	0.071	0.596*	−0.046	1.000			
IND	−0.008	−0.282*	0.268*	0.000	0.000	0.536*	−0.004	−0.110	−0.101	1.000		
FORO	−0.018	0.163*	0.292*	0.000	0.000	0.017	0.548*	−0.089	0.480*	0.126	1.000	
GOVO	0.026	0.005	0.252*	0.000	0.000	0.198*	−0.531*	0.275*	−0.462*	−0.073	−0.577*	1.000
VIF	1.16	1.34	2.30	1.67	1.66	2.51	2.58	1.75	1.86	1.88	2.97	3.84

Notes: *p < 0.01; **p < 0.05; *p < 0.1;* indicate significance at the 1, 5 and 10% levels, respectively
Sources: Table by authors

Table 5. Breusch–Pagan/ Cook–Weisberg test for heteroskedasticity for ROE models

Statistical output	ROE model 1 Period (2012–2016)	ROE model 2 Period (2017–2021)	ROE model 3 Period (2012–2021)
$chi^2(1)$	2.22	25.62	40.06
Prob > chi^2	0.1367	0.0000	0.0000

Source: Table by authors

Table 6. Breusch–Pagan/ Cook–Weisberg test for heteroskedasticity for EPS models

Variables	EPS model 1 Period (2012–2016)	EPS model 2 Period (2017–2021)	EPS model 3 Period (2012–2021)
$chi^2(1)$	39.0.91	5.70	27.44
Prob > chi^2	0.0000	0.0170	0.0000

Source: Table by authors

and is significant at 5% level. These results support *H3*. The positive impact makes our results to be consistent with previous studies (Jamil *et al.*, 2015; Kalash, 2021; Polizzi and Scannella, 2023; Schnietz and Epstein, 2005; Wilmshurst and Frost, 2000), except for Adu (2022) and Maama (2021). This indicates that EDN gave Ghanaian firms a competitive advantage, positive public image and access to sustainable financing options before the crises. Furthermore, this imply that END reduced the risk of noncompliance penalties and enhanced Ghanaian firms CFP. This is consistent with the stakeholder theory highlighting the fact that END demonstrates a commitment to sustainability, which is often valued by various stakeholders to increase CFP. The finding also provides support for the signaling theory, as it can be argued that by engaging in environmentally responsible practices which help in (e.g. reducing information asymmetry and enhancing the firm's image), the firms send a signal to their stakeholders that they are committed to sustainability. This, in turn, strengthens stakeholders' loyalty to them, resulting in an increase in CFP because of END.

Variables	ROE model 1 Before banking and covid-19 crises (2012–2016) OLS	ROBUST	ROE model 2 During banking and covid-19 crises (2017–2021) OLS	ROBUST
EDI	0.641*** (0.145)	0.641*** (0.129)	1.047*** (0.363)	1.047*** (0.326)
FSZ	−0.071*** (0.021)	−0.071*** (0.019)	−0.019 (0.049)	−0.019 (0.056)
AGE	0.019** (0.008)	0.019*** (0.006)	−0.015 (0.016)	−0.015* (0.008)
LEV	−0.001 (0.143)	−0.001 (0.133)	0.622** (0.295)	0.622* (0.318)
AUD	−0.039 (0.114)	−0.039 (0.131)	0.131 (0.222)	0.131 (0.177)
IND	0.231*** (0.087)	0.231** (0.092)	−0.241 (0.176)	−0.241* (0.137)
FORO	−0.362*** (0.113)	−0.362*** (0.093)	−0.243 (0.219)	−0.243 (0.204)
GOVO	−0.137 (0.154)	−0.137 (0.138)	−0.430 (0.271)	−0.430* (0.217)
_CONS	0.986*** (0.318)	0.986*** (0.354)	0.086 (0.786)	0.086 (1.037)
Observations	80	80	80	80
R-squared	0.368	0.368	0.138	0.138
Adj R^2	0.297	0.297	0.041	0.041
F-stat	5.164	10.001	1.420	2.791
P_value	0.0.000	0.000	0.203	0.0096

Notes: ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$; indicates significance at the 1, 5 and 10% levels, respectively Standard errors are in parentheses
Source: Table by authors

Table 7. Regression results for ROE models before and during crises time

Variables	EPS model 1 Before banking and covid-19 crises (2012–2016) OLS	ROBUST	EPS model 2 During banking and covid-19 crises (2017–2021) OLS	ROBUST
EDI	0.448** (0.173)	0.448*** (0.114)	0.975* (0.526)	0.975** (0.384)
FSZ	−0.083*** (0.025)	−0.083*** (0.015)	−0.177** (0.071)	−0.177*** (0.047)
AGE	0.035*** (0.009)	0.035*** (0.008)	0.043* (0.024)	0.043** (0.020)
LEV	−0.095 (0.171)	−0.095 (0.101)	−0.143 (0.429)	−0.143 (0.227)
AUD	0.127 (0.136)	0.127 (0.089)	0.269 (0.323)	0.269 (0.168)
IND	−0.085 (0.104)	−0.085 (0.075)	−0.242 (0.256)	−0.242* (0.134)
FORO	−0.051 (0.135)	−0.051 (0.114)	−0.040 (0.318)	−0.040 (0.275)
GOVO	0.310* (0.184)	0.310*** (0.101)	0.466 (0.394)	0.466** (0.213)
_CONS	0.844** (0.380)	0.844*** (0.244)	2.116* (1.141)	2.116** (0.888)
Observations	80	80	80	80
R-squared	0.407	0.407	0.243	0.243
Adj R^2	0.340	0.340	0.158	0.158
F-stat	6.092	13.211	2.855	6.606
P_value	0.000	0.000	0.0083	0.000

Notes: ***p< 0.01; **p < 0.05; *p < 0.1; indicates significance at the 1, 5 and 10% levels, respectively Standard errors are in parentheses
Source: Table by authors

Table 8. Regression results for EPS models before and during crises time

During the crises, in Table 7, ROE Model 2 for the robust column, EDI has a positive coefficient (1.05) significant at 1% level and for Table 8, for EPS Model 2 focusing on robust, EDI has a positive coefficient (0.98) and significant at 5% level. These results support *H5*. These results are consistent with prior studies (Schnietz and Epstein, 2005; Shahab *et al.*, 2018), however, it is inconsistent with Jamil *et al.* (2015), they found no relationship between END and CFP during

crisis. The results show that Ghanaian firms maintained their environmental responsibility during the crisis, which aligns with stakeholder and signaling theories as this positively enhance their performance in meeting stakeholders' expectation.

For the period 2012–2021, Table 9, as shown below, focusing on the robust columns, ENDs have positive coefficients of (0.54) and (0.74) for ROE and EPS models, respectively, with 1% significant levels for the models. These results support *H4*. This affirms that END positively impacts ROE and EPS of Ghanaian listed firms. The results are consistent with prior studies (Habib and Mourad, 2023; Kalash, 2021; Song *et al.*, 2017). However, it contradicts the findings of Adediran and Alade (2013), Adu (2022) and Maama (2021). These findings also give credence to the stakeholder and the signaling theories as previously discussed.

The Ghanaian BKC and COV have insignificant impact on ROE and EPS in Table 9. These do not support *H1* and *H2*. This is similar to Kalash (2021) observation that currency crisis in Turkey has no impact on listed companies. The insignificant effect of Covid 19 on ROE is inconsistent with the results of Habib and Mourad (2023). This implies that the nonimpact of the crises could be attributed to EDN helping the firms to be resilient in the mist of the crises.

In summary, ENDs have a positive impact on CFP, while the BKC and COV have insignificant impact. In relation to the control variables in the models, the inconsistent significance levels could be attributed to the turbulent economic period.

Robustness analysis

To strengthen the validity of our results, three additional Robustness tests were conducted. First, Binary logistic regression (BLR) as statistical theory explains that it is not subject to the same degree of classical assumptions underlying OLS. Considering ROE and EPS Models 3: Whole Period (2012– 2021), as our baseline regressions, ROE and EPS are

	ROE model 3 During period of study (2012–2021)		EPS model 3 During period of study (2012–2021)	
Variables	OLS	ROBUST	OLS	ROBUST
EDI	0.543** (0.242)	0.543*** (0.191)	0.736*** (0.178)	0.736*** (0.143)
BKC	0.006 (0.129)	0.006 (0.123)	−0.089 (0.095)	−0.089 (0.068)
COV	−0.096 (0.157)	−0.096 (0.188)	0.021 (0.116)	0.021 (0.134)
FSZ	−0.115*** (0.034)	−0.115*** (0.021)	−0.054** (0.025)	−0.054* (0.028)
AGE	0.042*** (0.012)	0.042*** (0.011)	−0.001 (0.009)	−0.001 (0.006)
LEV	−0.185 (0.215)	−0.185 (0.123)	0.155 (0.158)	0.155 (0.189)
AUD	0.160 (0.171)	0.160 (0.099)	0.055 (0.125)	0.055 (0.114)
IND	−0.168 (0.135)	−0.168** (0.074)	0.039 (0.099)	0.039 (0.097)
FORO	0.014 (0.168)	0.014 (0.147)	−0.277** (0.124)	−0.277** (0.127)
GOVO	0.476** (0.221)	0.476*** (0.145)	−0.240 (0.162)	−0.240 (0.149)
_CONS	1.257** (0.520)	1.257*** (0.375)	0.858** (0.382)	0.858 (0.531)
Observations	160	160	160	160
R-squared	0.252	0.252	0.140	0.140
Adj R^2	0.202	0.202	0.082	0.082
F-stat	5.022	8.373	2.419	5.876
P_value	0.000	0.000	0.0107	0.000

Table 9.
Regression analysis for the study period (2012–2021)

Notes: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$, indicates significance at the 1, 5 and 10% levels, respectively Standard errors are in parentheses
Source: Table by authors

allocated one if they are above the median for the firms, and zero otherwise and Model 4 is used for the assessment.

Model 4:

$$Financial\ \ Performance\ \ dummy_{it} = \beta_0 + \beta_1 EDI_{it} + \beta_2 BKC_{it} + \beta_3 COV_{it} + \beta_4 FSZ_{it} + \beta_5 AGE_{it} + \beta_6 LEV_{it} + \beta_7 AUD_{it} + \beta_8 IND_{it} + \beta_9 FORO_{it} + \beta_{10} GOVO_{it} + \varepsilon_{it}$$

Table 10 confirms that the coefficient of EDI, our primary concern for both ROE and EPS BLR are positive and significant, while some control variables showed mixed results with some significant levels.

Second, with the baseline regressions we replace the measure of EDI with a dummy variable of 1 if the firm issues a sustainable report in accordance with the Global reporting requirements, otherwise 0. And the dummy variable is represented by (ENV), the model used for the assessment is shown below.

Model 5:

$$Financial\ \ Performance_{it} = \beta_0 + \beta_1 ENV_{it} + \beta_2 BKC_{it} + \beta_3 COV_{it} + \beta_4 FSZ_{it} + \beta_5 AGE_{it} + \beta_6 LEV_{it} + \beta_7 AUD_{it} + \beta_8 IND_{it} + \beta_9 FORO_{it} + \beta_{10} GOVO_{it} + \varepsilon_{it}$$

Table 11 shows that after replacing the measurement of EDI with a dummy variable (ENV) based on reporting in accordance with the Global reporting requirements, the results also confirm that the coefficients of ENV are positive and significant.

Finally, the baseline regression models are replaced with CFP measure of ROE and EPS being allocated one if they are above the median for the firms, and zero otherwise. In addition, replace the measure of EDI with a dummy variable (ENV) of 1 if the firm issues a

Variables	ROE dummy	ESP dummy
EDI	4.149*** (0.971)	7.502*** (1.463)
BKC	−0.580 (0.460)	0.196 (0.534)
COV	−0.500 (0.567)	0.237 (0.641)
FSZ	−0.413*** (0.140)	−0.376** (0.156)
AGE	0.056 (0.043)	0.070 (0.050)
LEV	1.029 (0.767)	0.122 (0.910)
AUD	1.364** (0.669)	1.446* (0.796)
IND	1.049** (0.535)	−1.381** (0.607)
FORO	−1.800*** (0.655)	−2.076*** (0.800)
GOVO	−0.599 (0.817)	−2.081* (1.085)
_CONS	3.193* (1.932)	2.413 (2.214)
Observations	160	160
Pseudo R^2	0.167	0.331
Chi^2	37.144	73.393
p_value	0.000	0.000

Notes: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$, indicate significance at the 1, 5 and 10% levels, respectively Standard errors are in parentheses. ROE and EPS are measured as 1 if greater than its median value and 0 otherwise

Source: Table by authors

Table 10. Robustness test: Logistic regression with ROE and EPS as dummy variables for the period (2012–2021)

Variables	ROE model		EPS model	
	OLS	ROBUST	OLS	ROBUST
ENV	0.452*** (0.107)	0.452*** (0.104)	0.365** (0.145)	0.365*** (0.101)
BKC	−0.082 (0.094)	−0.082 (0.066)	0.012 (0.128)	0.012 (0.121)
COV	0.025 (0.115)	0.025 (0.135)	−0.095 (0.156)	−0.095 (0.185)
FSZ	−0.033 (0.025)	−0.033 (0.026)	−0.098*** (0.034)	−0.098*** (0.022)
AGE	−0.008 (0.009)	−0.008 (0.006)	0.036*** (0.012)	0.036*** (0.010)
LEV	0.135 (0.155)	0.135 (0.201)	−0.183 (0.211)	−0.183 (0.153)
AUD	0.072 (0.126)	0.072 (0.109)	0.179 (0.171)	0.179* (0.091)
IND	0.096 (0.098)	0.096 (0.084)	−0.125 (0.133)	−0.125 (0.079)
FORO	−0.195* (0.112)	−0.195 (0.127)	0.058 (0.152)	0.058 (0.095)
GOVO	−0.246 (0.162)	−0.246 (0.160)	0.448** (0.220)	0.448*** (0.146)
_CONS	0.572 (0.393)	0.572 (0.514)	1.017* (0.534)	1.017** (0.406)
Observations	160	160	160	160
R-squared	0.143	0.143	0.258	0.258
Adj R^2	0.086	0.086	0.208	0.208
F-stat	2.489	3.803	5.181	6.874
p_value	0.0087	0.0001	0.000	0.000

Table 11. Additional robustness test: Ordinary and robust regression where EDI is replaced with ENV for the period (2012–2021)

Notes: ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$; indicate significance at the 1, 5 and 10% levels, respectively Standard errors are in parentheses; EDI is replaced with ENV which is measured by a dummy variable equal to 1 if a firm reports on sustainability issues in their annual reports and 0 otherwise

Source: Table by authors

sustainable report in accordance with the Global reporting requirements, otherwise 0. The model used is shown below.

Model 6:

$$Financial\ Performance\ dummy_{it} = \beta_0 + \beta_1 ENV_{it} + \beta_2 BKC_{it} + \beta_3 COV_{it} + \beta_4 FSZ_{it} + \beta_5 AGE_{it} + \beta_6 LEV_{it} + \beta_7 AUD_{it} + \beta_8 IND_{it} + \beta_9 FORO_{it} + \beta_{10} GOVO_{it} + \varepsilon_{it}$$

Table 12 indeed confirms that the coefficients of ENVs are positive and statistically significant at the 1% level. This indicates that ENDs are positively associated with the CFP of the listed firms.

Discussion

END is proven to have a positive and significant impact on ROE and EPS for the Ghanaian listed firms, before and during the BKC and COV, in addition for the period (2012–2021). The positive impact of END for Ghanaian listed firms throughout the period (2012–2021) aligns with the stakeholder theory by emphasizing the Ghanaian firms' responsiveness to stakeholder interests, and it supports signaling theory by demonstrating how the Ghanaian firms use proactive END as a credible signal of their commitment to sustainability, thereby attracting investors and creating value for stakeholders, even in the mist of crises. This confirms the observations about the benefits of END asserted by Agyei and Yankey (2019), Shahab *et al.* (2018).

This may be because listed companies in Ghana may have prioritized END to demonstrate their commitment to sustainable practices in times of crisis. Therefore, it may have improved its reputation with stakeholders. A positive reputation can attract investors and consumers (Polizzi and Scannella, 2023), leading to better CFP, as reflected in ROE and

Variables	ROE dummy	ESP dummy
ENV	2.122*** (0.590)	2.265*** (0.607)
BKC	−0.540 (0.451)	0.071 (0.481)
COV	−0.450 (0.551)	0.257 (0.594)
FSZ	−0.283** (0.133)	−0.108 (0.125)
AGE	0.012 (0.042)	−0.006 (0.044)
LEV	0.703 (0.776)	−0.947 (0.837)
AUD	1.244* (0.644)	1.683** (0.681)
IND	1.358** (0.537)	−0.806 (0.514)
FORO	−1.106* (0.585)	−0.201 (0.616)
GOVO	−0.474 (0.805)	−0.665 (0.870)
_CONS	1.913 (2.064)	0.183 (1.988)
Observations	160	160
Pseudo R^2	0.139	0.209
Chi^2	30.771	46.352
p_ value	0.000	0.000

Notes: ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$; indicate significance at the 1, 5 and 10% levels, respectively Standard errors are in parentheses
Source: Table by authors

Table 12. Further analysis. Logit regression: ROE and EPS are dummy and EDI is replaced with ENV

EPS. Furthermore, information on END may have enabled the listed companies to manage environmental risks effectively to reduce potential financial losses relating to environmental liabilities (Hassan *et al.*, 2011; Jamil *et al.*, 2015; Kalash, 2021) and, thus, improve CFP before and during the crises period. This emphasized the need for firms to commit to sustainable practices, through END.

In addition, green practices and technologies which is been promoted within the business environment in Ghana might have accounted for the positive relation between END and CFP. In Ghana, from the year 2012, there has been massive call for businesses to adopt green practices. Listed firms in Ghana might now have become aware of the benefits associated with END and green practices. Therefore, the Ghanaian listed firms their adoption and awareness of green practices in businesses might have resulted in cost savings through energy efficiency, waste reduction and resource optimization. These cost reductions may have improved their profitability and had a positive impact on ROE and EPS. Therefore, listed businesses and their stakeholders must focus on engaging other stakeholders on the need to encourage sustainable practices, through END as observed by prior research scholars (Cooper, 2017; Huang and Kung, 2010; Hussain *et al.*, 2018).

Similarly, the Ghanaian listed companies may have complied with government and regulatory agency requirements for environmental regulations and reporting requirements before and during the crisis period. This puts Ghanaian listed businesses in a better position to avoid penalties and legal issues. Therefore, compliance with environmental regulations might have contributed to their financial stability and have had a positive impact on their CFP before and in the mist of the BKC and COV. This emphasized the need to monitor and enforce compliance with environmental regulations and disclosure requirements, ensuring firms adhering to established standards since END results in improved CFP (Jamil *et al.*, 2015; Malik *et al.*, 2023; Shahab *et al.*, 2018).

Finally, the Ghanaian firms in meeting the expectations of socially responsible investors on environmental issues may have inspired their loyalty, and positive stakeholder perceptions could have led to good performance reflected in CFP. These results are consistent with previous studies (Agyei and Yankey, 2019; Habib and Mourad, 2023; Kalash, 2021). They show that

ENV have a positive impact on business performance. So, END might have helped the firms to reduce their market risk before and during the crisis period which supports the findings of Hassan *et al.* (2011) on voluntary disclosure and risk in an emerging market.

Although END positively impacted Ghanaian listed firms CFP before and during the crises, this emphasized the need for the businesses and government to recognize sustainability standards and certifications to guide firms in their END efforts (Shahab *et al.*, 2018). Maama (2021) found that END negatively impacted the performance of the Ghanaian banking sector over the period 2010–2019. Welbeck *et al.* (2017) found that END of listed Ghanaian companies is negatively related to CFP between 2003 and 2012. Environmental performance negatively affects disclosure of mining and manufacturing firms in Ghana (Aboagye-Otchere *et al.*, 2020). While Agyei and Yankey (2019) reported a positive influence of END. These mixed results may be attributed to the evolving acceptance of END and environmentally friendly practices by companies, as well as the challenges posed by the Ghanaian BKC and COV. In addition, the growing demand for sustainable business practices by stakeholders could contribute to diverse outcomes. Adu (2022) further extended these findings to the Sub-Saharan African context, including Ghana, by noting a negative impact of END on CFP. This suggests that the specific circumstances of the Ghanaian banking crises, the COVID-19 and the sustainability demands from stakeholders may explain the different results observed in these studies.

The Ghanaian BKC and COV had a severe negative impact on Ghana's economy, the study findings show that they had no impact on CFP of listed firms on the Ghana Stock Exchange. On the contrary: the CFP is positively influenced by END before and during the crises. END with its benefits could have contributed to the financial stability of listed companies during the crisis period and improved their CFP (Alareeni and Hamdan, 2020). Another reason could be that the products and services of listed companies may have been less affected by the BKC and COV, and the diversification of operations may also have helped them to mitigate crisis-related risks. Moreover, the financial situation of the listed companies had to be good to enable them to survive in turbulent times. In addition, the support of the Ghana Government with subsidies for electricity and water could also have helped. Finally, the innovation adopted by the listed companies may also have contributed to the lesser impact of the BKC and COV.

Conclusion

The purpose of this study is to empirically examine the impact of END on the CFP of listed companies before and during the BKC and COV. The financial indicators used in the study are ROE and EPS. The sample for this study consists of 16 companies listed on the Ghana Stock Exchange during 2012–2021. A significant positive correlation was found between END and ROE and EPS. These results are consistent with previous research that concluded that END improves CFP before crisis time and in times of crisis (Agyei and Yankey, 2019; Habib and Kayani, 2022; Kalash, 2021). This signals to managers and shareholders that END improve CFP. Furthermore, the results suggest that the Ghanaian BKC and COV did not have a significant impact on listed companies in Ghana. This shows that the listed firms have played an important role in improving their performance and addressing the consequences of the BKC and COV by disclosing their environmental activities, even though the BKC had a very negative impact on companies and the COV also had a significant impact on all companies (Habib and Mourad, 2023). The END improved the performance of Ghanaian listed companies before and during the crisis, and this might have contributed to why Ghanaian listed companies were less affected by the BKC and COV. This supports the assertion of Voorhes (SIF Report, 2009, p. 2), SIF Research Director, that "the demand for corporate responsibility and disclosure is truly global and companies in emerging markets are beginning to respond and, in some cases, lead the way."

This research provides important insights for shareholders and managers regarding the need to improve and support END; set clear objectives and monitor key sustainability indicators for environmental performance; allocate resources to sustainable business activities; and engage stakeholders in environmentally responsible practices as asserted by previous researches (Adu, 2022; Hussain *et al.*, 2018). In addition, it emphasized the need for managers and shareholders to understand the financial implications of environmental risks and educate and promote the relationship between END and corporate performance as observed by previous researches (Agyei and Yankey, 2019; Alareeni and Hamdan, 2020). Finally, it emphasizes the importance of engaging with industry peers and stakeholders to continuously improve and report on the financial benefits of sustainable practices in relation to END as posit by previous research (Hussain *et al.*, 2018). This emphasizes the importance of developing and implementing strategies and policies that improve their companies' END as this can improve CFP, especially for companies in emerging markets such as Ghana. In addition, the findings of this study may impact investors who prioritize environmental issues, particularly when making investment decisions in crisis-prone emerging markets. Furthermore, as END are not mandatory in Ghana, the government and regulatory bodies can incentivize firms to disclose their environmental practices by offering tax incentives. This would improve END and result in better CFP.

The results of this study can provide recommendations for future research to expand the research and examine how END affects the financial performance of small and medium-sized enterprises (SMEs) during the BKC and COV in Ghana and consider behavioral and psychological economics perspectives to understand how investor attitudes and consumer behavior are influenced by END and how this in turn affects financial outcomes. Given the benefits of END for listed companies underscored in the study, there is also a need for future research to examine the legal framework in Ghana that encourages or mandates END by companies. Further research should also consider industry-specific factors and government policies to better understand this complex relationship between END and CFP. The study has limitations as it only used data from 16 companies listed on the Ghana Stock Exchange (main market) for 2012–2021, which was the most recent data available at the time of the study. Future studies could expand the sample size by including all the listed companies in Ghana and examining governance and social issues related to performance during the Ghanaian BKC and COV.

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