



DOI:10.22144/ctujoisd.2024.308

Factors influencing environmental and circular economy disclosure of Viet Nam listed companies

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Article info.

Received 29 Dec 2023

Revised 18 Jan 2024

Accepted 14 May 2024

Keywords

Circular economy, disclosure, environment

ABSTRACT

This study examines the environmental and circular economy disclosures (ECED) level and factors influencing this level of 32 Vietnamese listed companies from 2018 to 2022. The content and frequency analyses are performed to determine the level of ECED, and regression analysis is to investigate the influencing factors. Drawing on a sample of 160 sustainable development and annual reports following the Global Reporting Initiative frameworks (GRI), the study evidenced that 32 listed companies paid great attention to the GRI 300 category (on environment topics) with the top three GRI standards 302 (energy), 307 (environmental compliance), and 303 (water and effluents), respectively. In addition, the Feasible Generalized Least Square method results showed that the companies with government ownership and Big4 audit services had a higher level of ECED. In comparison, larger companies had a lower disclosure level. Meanwhile, companies in the manufacturing sector with foreign shares and the independence of the Board of Directors did not affect the disclosure information disclosure level in the studied sample.

1. INTRODUCTION

In recent years, scholars, policymakers, and investors have increasingly focused on disclosing environmental and circular economy (CE) information within sustainable development or integrated reports (Barnabè & Nazir, 2021; Tiscini et al., 2022). CE aims to convert a traditional linear growth economy depending on resource consumption into an economy based on the development of ecological resource circulation, an important strategy to safeguard the environment and resources and achieve sustainable development. This transformation is expected to change companies' organizational and business models: integrating sustainability into business operations and updating the way of measuring, managing, and disclosing sustainability measures—your business's

environmental and social impacts. Some pioneering corporations, governments, and societies have begun to focus on ensuring sustainability in production and business activities, supply chains, and investment decisions by publishing environmental and CE information in their reports. In Vietnam, the Ministry of Finance issued Circular 155/2015/TT-BTC (effective on 1/1/2016), guiding information disclosure on the stock market. Accordingly, the Annual Report of a listed company should contain information on environmental and social impacts (Ministry of Finance, 2015). Information to be disclosed includes materials management, energy and water consumption, compliance with environmental protection regulations, employee-related policies, and responsibility to the local community. Despite the

expected benefits for stakeholders, the guidelines from the State Securities Commission of Vietnam (SSC), and recognition through awards such as the Vietnam Listed Company Awards, the SSC has found that information disclosure remains quite limited, particularly regarding CE practices (Nguyen et al., 2022). Similarly, according to the Survey of Sustainability Reporting 2022 of Klynveld Peat Marwick Goerdeler (KPMG, 2022), the disclosure quality among companies has become unstandardized and incomparable due to the lack of a mandatory reporting regime.

Vietnam embraces global economic integration and plays an increasingly significant role in worldwide supply chains. Consequently, all Vietnamese businesses must release sustainability reports that adhere completely to international standards. This is essential to honor their pledge to foster sustainable growth and operations, thereby meeting stakeholders' requirements, whether based in Vietnam or elsewhere in the world (KPMG, 2022). In addition, most previous studies have focused on corporate social responsibility disclosure, environmental information disclosure, or integrated reporting implementation. More specific research on the environment and CE disclosure needs to be conducted. It is necessary to have research on the application of international standards (such as GRI) on the level of environmental information disclosure and circular economy to help companies, as well as management agencies, clarify the concept or relevant theoretical understanding that helps improve awareness and the ability to apply these standards to management practice. Therefore, this study was carried out to (i) synthesize information disclosure frameworks (such as the Global Reporting Initiative (GRI), the Carbon Disclosure Project (CDP), and the International Integrated Reporting Council (IIRC)) related to environmental and CE information (ii) evaluate the extent of application of the GRI 300 category to disclose CE information on Sustainable Development Reports by listed firms, and (iii) examine factors influencing the environment and CE disclosure of listed companies in Vietnam.

The structure of this article is as follows: The reviews of the literature, including frameworks, hypotheses, and compiled affecting elements, are the main focus of Section 2. An explanation of the data and the used research models is given in Section 3. A thorough presentation and discussion of all the results and analysis are provided in Section 4. The study reaches its conclusion in Section 5.

2. FRAMWORKS, THEORIES, AND LITERATURE REVIEWS ON THE ENVIRONMENT AND CIRCULAR ECONOMY DISCLOSURES

2.1. Frameworks

2.1.1. *Circular economy and environmental disclosure frameworks*

Several good quality reporting frameworks are in place to guide businesses in disclosing information related to the environment and CE. Separate standards tailored to specific industries have also been established, and many countries are issuing national guidance in this area. The following frameworks can be named:

The GRI framework was a valuable initial reference point due to its widespread adoption and recognition. Numerous dimensions of social, environmental, and economic performance are also covered by the framework, together with technical (conventional) guidelines for reporting and measuring these issues. Businesses that better analyze, manage, and disclose their impacts can improve stakeholder relationships, minimize risks, find commercial opportunities, and make more strategic decisions. (www.globalreporting.org).

The Carbon Disclosure Project (CDP) is a nonprofit organization that manages the environmental impact of cities, governments, regions, corporations, investors, and the public through a global disclosure system. CDP Scoring describes a company's environmental performance and claims, fully complies with standards and management, and provides comparability across the market. Through reporting to CDP, companies can be included in the database, enhancing their likelihood of obtaining improved sustainability evaluations from investors (www.cdp.net).

The United Nations Global Compact is a strategic policy initiative for companies committed to aligning their operations and strategies with ten globally recognized principles in the areas of human rights, labor, the environment, and anti-corruption. By participating in the Global Compact, businesses pledge to submit an annual Communication on Progress (COP), a document shared with relevant stakeholders—including investors, consumers, civil society, and government—detailing their progress in applying these principles and supporting the broader goals of the United Nations. Following a standardized structure, the COP should be published on the Global Compact website and accessible to

pertinent stakeholders. The information provided in the COP is relevant to the sustainability report or annual report (www.unglobalcompact.org).

International Finance Corporation's Sustainable Development Framework (IFC- a member of the World Bank Group and the largest global development investment organization focusing on supporting the private sector in countries under development) includes Environmental and Social Performance Standards applicable to IFC-invested businesses to guide how to identify and manage environmental risks and impacts and social. During the investment lifecycle, businesses must keep IFC and relevant partners informed about compliance with the Performance Standards and any other agreed Action Plans, including information about significant events. This information may be relevant to be incorporated in a sustainability report or an annual report (www.ifc.org/sustainability).

The International Integrated Reporting Council (IIRC) is an international effort to develop a global framework for Integrated Reporting (IR). By integrating financial and sustainability information, a business provides a more comprehensive and meaningful picture of its business model and operations to investors and stakeholders (www.theiirc.org). Building on the 2013 IR framework, IR has emerged not only as one of the latest innovations in corporate reporting and sustainability but also as potentially a good fit for interested organizations in the comprehensive presentation of CE-related information. (Barnabè & Nazir, 2021).

The Global Investment Impact Rating System (GIIRS) is a system used to assess the environmental and social impact of businesses and investment funds. The rating facilitates businesses to call for capital from like-minded investors based on the impact of their operations and business activities on the environment and society. GIIRS provides criteria for ranking each business's environmental and social impacts, including overall ranking, ranking scale for 15 sub-categories, KPI performance indicators relevant to the industry, Geographic location, scale, and social mission of the business (<http://giirs.org>).

BS 8001 is the first practical framework and guidance for organizations implementing CE principles and has been written in a way that can be

used anywhere in the world. This standard is intended to apply to any organization, regardless of location, size, sector, and type. It will help organizations rethink holistically how their resources are handled to enhance financial, environmental, and social outcomes. It will also be helpful to people with different levels of expertise and awareness about CE (www.bsigroup.com).

2.1.2. *Global reporting initiative standards on environment and circular economy*

According to KPMG's corporate responsibility reporting survey (2022), the GRI remains the dominant standard used worldwide and in Vietnam. The GRI Sustainability Reporting Standards (GRI Standards) assist organizations in enhancing transparency and conveying their positive and negative effects on sustainable development. These standards comprise a modular framework of interrelated components. Three series of standards support the reporting process: the GRI Universal Standards, which apply to all organizations (GRI 1-Foundation 2021, GRI 2-General Disclosure 2021, GRI 3: Material Topics 2021); the GRI Sector Standards, applicable to specific sectors (GRI 11: Oil and Gas Sector 2021, GRI 12-Coal Sector 2022, GRI 13-Agriculture, Aquaculture, and Fishing Sectors 2022; and the GRI Topic Standards, each listing disclosures relevant to a particular topic (GRI 200-Economic, GRI 300-Environmental, GRI 400-Social) (<https://www.globalreporting.org>).

Among the above GRI standards, GRI 300 is the most relevant guidance for corporations to disclose Environmental Information and CE (Table 1). Although these standards are about the environment, they provide direct, implicit, and explicit keywords for the CE. For example, CE's direct keywords are 'product service system' and 'product share,' which are mentioned in GRI 306, and the most prominently used explicit keyword in disclosure is "recycle". It appears in GRI 301, 305, and 306. Likewise, the implicit keyword with the most frequent occurrences, "environmental impact," is a mandatory disclosure in four GRI standards (GRI: 302, 303, 305, and 308) (Gunaratne et al., 2021, p. 798). It is observed that when corporate reporting standards outline specific disclosure requirements, reporting entities are more likely to include these disclosures in their sustainability reports.

Table 1. The level of ECEDI alignment checklist (GRI 2016 Guidance)

Standards	Disclosure items
GRI 301- Material 2016 (3 disclosures)	Disclosure 301-1-Materials used by weight or volume Disclosure 301-2 Recycled input materials used Disclosure 301-3 Reclaimed products and their packaging materials
GRI 302: Energy 2016 (5 disclosures)	Disclosure 302-1 Energy consumption within the organization Disclosure 302-2 Energy consumption outside of the organization Disclosure 302-3 Energy intensity Disclosure 302-4 Reduction of energy consumption Disclosure 302-5 Reductions in energy requirements of products and services
GRI 303: Water and Effluents 2016 (3 disclosures)	Disclosure 303-1 Water withdrawal by sources Disclosure 303-2 Water sources significantly affected by the withdrawal of water Disclosure 303-3 Water recycled and reused
GRI 304- Biodiversity 2016 (4 disclosures)	Disclosure 304-1 Operational site owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas Disclosure 304-2 Significant impacts of activities, products, and services on biodiversity Disclosure 304-3 Habitats protected or restored Disclosure 304-4 IUCN Red List species and national conservation list species with habitats in areas affected by operations
GRI 305: Emissions 2016 (7 disclosures)	Disclosure 305-1 Direct (Scope 1) GHG emissions Disclosure 305-2 Energy indirect (Scope 2) GHG emissions Disclosure 305-3 Other indirect (Scope 3) GHG emissions Disclosure 305-4 GHG emissions intensity Disclosure 305-5 Reduction of GHG emissions Disclosure 305-6 Emissions of ozone-depleting substances (ODS) Disclosure 305-7 Nitrogen oxides (NOx), sulfur oxides (SOx), and other significant air emissions
GRI 306: Effluents and Waste 2016 (5 disclosures)	Disclosure 306-1 Water discharge by quality and destination Disclosure 306-2 Waste by type and disposal method Disclosure 306-3 Significant spills Disclosure 306-4 Transport of hazardous waste Disclosure 306-5 Water bodies affected by water discharges and runoff
GRI 307: Environmental Compliance 2018	Disclosure 307-1 Environmental Fines
GRI 308: Supplier Environmental Assessment 2016 (2 disclosures)	Disclosure 308-1 New suppliers that were screened using environmental criteria Disclosure 308-2 Negative environmental impacts in the supply chain and actions taken

(Source: authors synthesized, 2023)

2.2. Theories

Legitimacy theory posits that firms can adopt a proactive or reactive strategy to establish legitimacy. Numerous research studies have revealed indications of a reactive approach, implying that companies disclose environmental and social data in reaction to specific events or crises affecting their organization or industry. According to Deegan (2002), countering threats to an organization’s legitimacy is a strong driver of information disclosure. The publication of

environmental and social reports can be a response to negative media propaganda, as a result of environmental and social incidents, or overly negative assessments—Poles of the rating agencies. On the contrary, a proactive approach that considers environmental information disclosure and CE helps positively impact business operations, increase competitive advantage, and improve company image (Deegan, 2002)

Stakeholder Theory provides a useful framework for understanding the role of environmental disclosure

and CE. This theory posits that companies will voluntarily share social and environmental information, driven by the need to gain legitimacy with influential stakeholders. Consequently, it implies that organizations participate in voluntary disclosure to obtain legitimacy from their stakeholders or the public or to maintain their current legitimacy. Gelb & Strawser (2001) have shown that companies may disclose more information due to a sense of responsibility towards their stakeholders. Consequently, disclosure serves as an expression of socially responsible conduct. Hence, information is a primary means for businesses to engage with diverse stakeholder groups to earn support and endorsement or eliminate opposition—their opposition and disapproval (Deegan, 2002).

Institutional Theory (IT) indicates that organizations will modify their structures and operations to align with external standards of what is considered appropriate. Environmental disclosure and CE may result from more than rational decision-making by organizations acting independently. Instead, it may become institutionalized, decided to some extent on the choice of the institution. (Deegan & Blomquist, 2006) argues that IT provides a complementary perspective to both ST and LT for examining corporate voluntary reporting practices and understanding how organizations understand and respond to the pressures of Changing societies, institutions, and expectations. One could make the case that LT is more valuable for understanding why a specific organization discloses particular information in the short term. This text provides valuable insights into the reasons behind the prevalence of specific information disclosure practices within an organization. It primarily focuses on external influences that can drive businesses to improve their performance measurement systems by incorporating environmental and CE factors. Additionally, the increasing awareness of financial markets regarding publicly traded companies' social and environmental behaviors is prompting these firms to increase their information disclosures in response to stakeholder inquiries.

Positive Accounting Theory (PAT) can be applied to Explain the reasons behind companies' disclosure of environmental information and CE. Positive accounting theory seeks to delineate, elucidate, and foresee the accounting practices carried out by managers. PAT expresses neoclassical economic theory, which relies on the conviction that rational

human decision-making and opportunistic actions are the fundamental underpinnings for all economic endeavors. From the perspective of Positive Accounting Theory (PAT), the company is seen as a web of agreements essential for incentivizing individuals (such as managers, lenders, and employees) to collaborate and act to maximize shareholder value. However, because contractual costs are associated with contracts (e.g., negotiating and monitoring stakeholders' performance), PAT assumes that companies will seek to minimize these costs. This will affect the policies applied, including accounting policies. Companies will be pushed to disclose certain information, such as environmental disclosure and company CE, to minimize contract costs.

2.3. Literature reviews on environmental and circular economy disclosures

Transitioning to the CE model is considered necessary and benefits businesses greatly. The CE has received increased attention in academic research, although the number of studies on this topic is limited. Most studies are just conceptual reviews of previous research (Geissdoerfer et al., 2017, Opferkuch et al., 2021) or analysis of the integrated reporting framework (Barnabè & Nazir, 2021) and the disclosure level for CE information (Gunarathne et al., 2021). More specifically, Geissdoerfer et al., (2017) conducted an extensive literature review and offered conceptual clarity by differentiating the terms and synthesizing various relationships between CE and Sustainability. After that, Opferkuch et al., (2021) explored how companies could include CE principles in their corporate sustainability reports by conducting an academic literature review and performing a content analysis of existing reporting approaches.

Through textual content analysis, the study of Barnabè & Nazir (2021) presents data concerning the reporting practices related to CE for 74 organizations operating globally, underscoring the variations in reporting preferences and the influence of Integrated Reporting (IR) concepts. Through an exploratory case study, it offers valuable insights into how IR principles facilitate the analysis and (re)presentation of information pertinent to CE. This study is considered one of the first studies advocating and exploring the interplays between CE and IR. Additionally, Gunarathne et al., (2021) explored the influence of CE concepts on the sustainability and integrated reporting practices of corporations in Sri Lanka. By examining the direct,

explicit, and implicit keyword disclosures of the top 20 companies recognized for their sustainability and integrated reporting efforts, it was revealed that there are minimal disclosures related to direct and explicit keywords associated with circular economy principles at the organizational level.

Moreover, the communication of CE-related business activities through corporate reporting is almost unexplored in the extant literature (Bassi & Dias, 2020). Previous studies mainly focus on influencing factors on information disclosure related to corporate social responsibility, environment, society, and governance. However, CE transition is also seen as a way to express corporate social responsibility in environmental protection, resource exploitation, and the requirement to sustain economic activities in harmony with the environment. Therefore, the results of these studies could be seen as a basis for building a similar research model for disclosing information related to the circular economy.

Accordingly, the literature shows that two groups of factors affect this decision. Internal determinants refer to the company's internal characteristics, including Company values and goals, creating images, improving profits and reputation in the future (Adams, 2002), characteristics of the company's board of directors (gender, age, professional experience...), factors of corporate governance (Nguyen et al., 2022); Ownership (family company, public company, state ownership, corporation, cooperative...) (Reverte, 2009, Özcan, 2020), firm size (McWilliams & Siegel, 2001, Nguyen et al., 2022), financial performance (Özcan, 2020), stock trading volume, stock price, and risk (Pistoni & Songini, 2013). External factors refer to the social, political, cultural, and economic context, institutions and media pressures, and related parties (Reverte, 2009, Özcan, 2020). Pistoni Songini (2013) suggests that stakeholder theory and legitimacy theory mainly highlight information disclosure's internal dynamics, while institutional and positive accounting theories focus on external decision factors.

3. METHODOLOGY

3.1. Research settings

Vietnam is actively pursuing global economic integration and assuming a more crucial role in global supply networks. The significance of its commitment to achieving sustainable growth and operations has never been more pronounced.

Whether large or small, public or private, businesses recognize the inseparable connection between sustainability and the future. As a result, both public and private entities are dedicated to fostering a more sustainable and improved future for Vietnam and its citizens. Setting clear objectives is a crucial step, and reporting on the progress is equally vital. To this end, the State Securities Commission of Vietnam has made it mandatory for all publicly listed companies to disclose specific sustainability-related information. Most companies include their sustainability disclosures in their annual reports rather than prepare separate sustainability reports. The moment has arrived for Vietnamese companies of all sizes to release sustainability reports that adhere entirely to global standards, catering to stakeholders' requirements within Vietnam and on a global scale (KPMG, 2022). These reports usually present a unified report that combines sustainability reports aligned with GRI standards within the International Integrated Reporting Council (GRI, 2022). Hence, in this research, we employ the term 'sustainability reports' to refer to a singular document from companies that adhere to GRI principles, encompassing their annual and sustainability reports.

3.2. Data sources

It is recognized that companies considered pioneers in sustainability within their respective sectors experience substantial public exposure and are under increased pressure from stakeholders to provide more comprehensive information in their sustainability and integrated reports (Vieira et al., 2020). Accordingly, out of 32 companies, there were 12 from The Vietnam Listed Company Award (VLCA) from 2018 to 2022. The remaining 20 were from the Ho Chi Minh Stock Exchange (HOSE), which has sustainable development reports based on GRI frameworks (visit <https://vietstock.vn/> for the company profiles and <https://www.aravietnam.vn/> for the Listed Company Award).

VLCA is an extension of the Annual Report Voting. In addition to evaluating the Annual Report and Sustainable Development Report, the VLCA Election will conduct a deeper assessment of the corporate governance situation of listed businesses with a separate set of criteria, thereby encouraging the application of international standards and practices on corporate governance to guide businesses in building a business environment based on sustainable development.

3.3. Research model and variable measurement

3.3.1. Variable selection and research model:

Previous studies provided several explanations about strong associations between internal factors of industry type, board characteristics, ownership, audit quality, firm sizes, and disclosure. Firstly, corporations operating in industries with manufacturing processes that adversely affect the environment tend to disclose and report significantly more information compared to those in other sectors (Reverte, 2009, Nguyen et al., 2022). Secondly, independent directors are seen as a tool for monitoring management behavior, which leads to a rise in the voluntary sharing of company information. Vitolla et al., (2020) and Özcan, (2020) revealed that an increased percentage of independent directors on the board enhanced the oversight of the quality of disclosure on environmental, social and governance disclosure and on IR quality, respectively. Thirdly, due to the fact that annual reports can be utilized to lower monitoring costs, agency interactions are probably going to play a significant role in the disclosure strategy of businesses. Therefore, managers of companies with a distributed ownership structure have an incentive to divulge more information so that shareholders can monitor their actions. (Uyar & Kiliç, 2012). Fourthly, in addition to reviewing financial statements, auditors can assist companies in improving corporate reporting, especially large auditing companies like Big4. They can enhance a company's corporate reporting culture and raise awareness of voluntary disclosure among businesses. Lastly, due to the resource accessibility of larger corporations and their increased propensity for disclosure, it is reasonable to anticipate that these firms will achieve higher disclosure scores (Özcan, 2020).

In addition, the theories of legitimacy and stakeholders posit that the company will disclose social and environmental information voluntarily, and the desire to legitimize with powerful stakeholders has been indicated. This implies that engage in voluntary disclosure to either acquire or sustain legitimacy among stakeholders or the

general public. Gelb & Strawser (2001) have shown that companies may provide more disclosure information due to a sense of responsibility towards their stakeholders.

Inheriting previous studies, the model measuring the impact of internal factors on the level of environmental and CE disclosure of Vietnam-listed firms on HOSE was built as follows:

$$ECEDI_{i,t} = \beta_0 + \beta_1 IND_{i,t} + \beta_2 BIND_{i,t} + \beta_3 FO_{i,t} + \beta_4 Big4_{1,t} + \beta_5 GO_{1,t} + \beta_6 FS_{i,t} + \varepsilon_{i,t}$$

3.3.2. Variable measurement

Dependent variable:

This article applies the GRI 300 (Global Sustainability Standards Board [GSSB], 2016) Standards to calculate the environmental and CE disclosure index (ECEDI) for selected sustainable development or annual reports. Accordingly, the total score is 30, corresponding to 30 disclosed items (Table 1), giving a score of 1 if the company discloses the item and 0 if the company does not disclose the item, depending on the number of items disclosed in its sustainable development or annual report. By adopting the IRD score from the study of Nguyen et al. (2022), the ECEDI is calculated by dividing the items disclosed by the maximum number of items that a firm could disclose as follows:

$$ECEDI_i = \frac{\sum_{j=1}^t GRI300}{t}$$

Where:

$ECEDI_i$ = the score of GRI300 by the firm i ;

$GRI300$ = "1" if item j was disclosed in the sustainable development or annual report and "0" otherwise; and $t = 30$, which is the maximum number of GRI300 items that a firm could disclose alignment with the GRI300 (GSSB, 2016).

Independent variables:

All calculations and data sources for independent variables are summarized in Table 2.

Table 2. Independent variable measurement

Variable	Denote	Measurement	Data sources	Expected Signs	Preferences
IND	Type of industry	“1” if a firm operates in the manufacturing industry and “0” otherwise	Vietstock	+	Nguyen et al. (2022)
BIND	Board independence	% of non-executive/independent directors to total directors	Annual reports	+	Nguyen et al. (2022)
FO	Foreign ownership	% of shares held by foreign stockholders	Annual reports	+	Ghazali (2007), Nguyen et al. (2022)
GO	Government ownership	% of shares held by the government	Annual reports	+	Özcan (2020), Ghazali (2007), Nguyen et al. (2022)
Big4	Big4 Audit firms	“1” if a firm is audited by the Big4 audit firms and “0” otherwise	Annual reports, Vietstock	+	Nguyen et al. (2022)
FS	Firm size	The natural logarithm of total assets	Annual reports, Vietstock	+	Nguyen et al. (2022), Marrone and Oliva (2019), Gerwanski (2020)

(Source: authors synthesized, 2023)

4. RESULTS AND DISCUSSION

4.1. Levels of environmental and circular economy disclosures by listed firms

4.1.1. Environmental and Circular Economy reporting disclosure levels by disclosure items

We used 8 Environmental standards in the GRI 300 category (Table 1). We applied content analysis to examine the level of disclosure of 160 sustainable development reports and annual reports of 32 companies from 2018 to 2022. The results presented in Figure 1 reveal that the GRI standards, including Materials (301), Energy (302), Water and Effluents (303), and Effluents and Waste (306), were most

disclosed by the selected Vietnamese companies in their corporate reports. Publishing according to these standards demonstrates that companies pay significant attention to their impact on the environment, aiming for sustainable development because the above standards are most directly related to the disclosure of this information, especially the CE information (Gunarathne et al., 2021). Notably, most reports reviewed disclosed information about standard 307 with 140 reports. However, it is mainly announced that the company did not incur environmental fines during the year, rather than disclosing the specific number of fines as required by Disclosure 307-1 Environmental Fine.

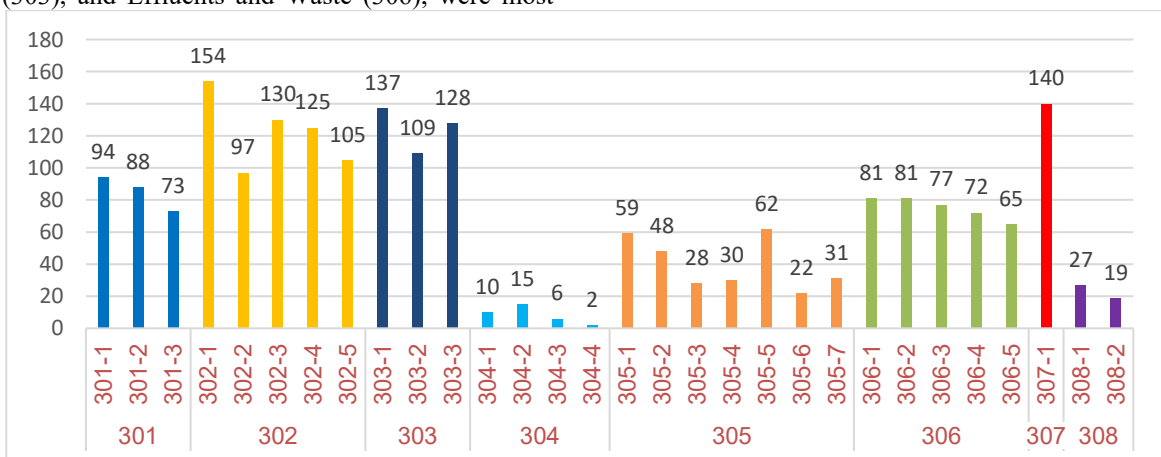


Figure 1. Number of reports on Environmental and Circular Economy disclosure by items

4.1.2. Environmental and circular economy reporting disclosure levels by firms

It can be seen that, although not required, most companies have voluntarily applied GRI standards in disclosing information related to the Environment and CE. Out of 32 examined companies, Vinamilk (VNM) and CNG Viet Nam JSC (CNG) lead in information disclosure according to GRI 300 with an average score of 21.2 and 20, respectively (Figure 2). In addition, the total greenhouse gas

emissions target (GRI305) was also audited by PwC. Companies including DHG, PAN, EVE, PLX, STK, TRA, SAB, and VIC followed by more than 50% of the GRI 300's published items (from 15.4 to 19 items). Most of the above companies are manufacturing companies in agriculture, dairy, pharmaceuticals, petroleum, etc. The remaining companies are interested in disclosing environmental information and CE, with an average annual publication rate of 4.4 to 14.8 items.

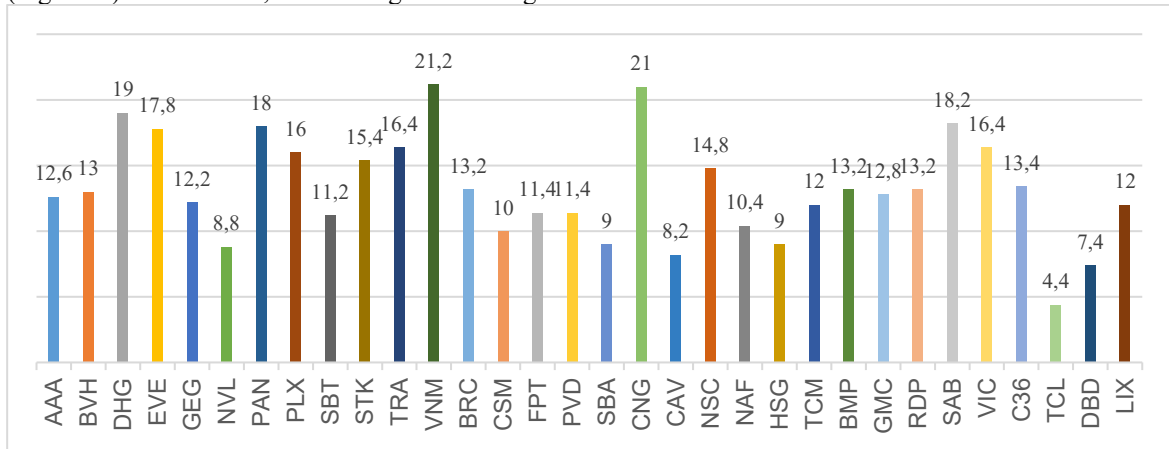


Figure 2. Average scores of disclosing circular economy information by company from 2018-2022

(Source: authors synthesized, 2023)

The application of these standards could be much higher. This can be explained by three reasons: (1) Currently, there are no specific guidelines or mandatory regulations on the disclosure of environmental information and CE; (2) in addition, publishing items according to international standards, such as GRI, requires a very large and costly database on materials, waste, wastewater, and an environmental impact measurement system. (3) most of these firms selectively apply each standard instead of applying all GRI standards for sustainable development reporting to disclose their information (Nguyen et al., 2022). Even so, this shows the great efforts of companies in providing information to stakeholders. The next section will examine the influence of factors on the level of environmental disclosure and CE.

4.2. Factors influence the environment and circular economy alignment level

4.2.1. Analysis of coefficient correlation

According to Gujarati (2022), if the correlation coefficient between variables surpasses 0.8, it is likely that the model will encounter significant multicollinearity issues. Consequently, the signs of the regression coefficients may be affected, resulting in skewed research findings. To test the correlation between the variables in the model, this study used the correlation matrix described in Table 3. The results showed that the absolute value of the correlation coefficients is less than 0.8. This means the model does not suffer from serious multicollinearity problems.

Table 3. Matrix of the correlation coefficient between variables

	ECEDI	IND	BIND	GO	FO	BIG4	FS
ECEDI	1.0000						
IND	-0.0182	1.0000					
BIND	0.0389	-0.0583	1.0000				
GO	0.1261	-0.2242	-0.1451	1.0000			
FO	0.1285	0.1243	0.0514	0.0090	1.0000		
BIG4	0.1527	-0.0407	0.1828	-0.0660	0.3135	1.0000	
FS	-0.0410	-0.3150	0.1998	0.1945	0.1039	0.4968	1.0000

(Source: Estimated from research data, 2023)

However, to increase credibility, the article continues to test through the Variance Inflation Factor (VIF). As shown in Table 4, all VIF

coefficients are less than 5, indicating no multi-collinearity in the research model.

Table 4. Variance Inflation Factor (VIF)

Variables	Fsize	Big4	IND	GO	FO	BIND
VIF	1,60	1,53	1,18	1,15	1,14	1,09
Mean VIF	1,28					

(Source: Estimated from research data, 2023)

4.2.2. Tests for selecting panel data regression models

To examine the factors affecting Environment and CE Disclosure, this study employed three regression methods, including the Pooled Ordinary Least Square Regression (Pooled OLS), the Fixed Effects Model (FEM), and the Random Effects Model (REM). In addition, the Feasible Generalized Least Square (FGLS) method is also used to control autocorrelation and heteroscedasticity.

However, the results confirm that the FEM model is appropriate.

The results from the Breusch-Pagan test in Table 6 show that the dependent variable (ECEDI) has P-value=0.0000, less than a significant level of 1%. That is, the error variance varies across the entities, and the REM model is appropriate.

Results from the F test in Table 6 show that the dependent variable (ECEDI) has a P-value=0.0000, less than a significant level of 1%. It means the Pooled OLS method is inappropriate because it does not reflect the impact of individual firm differences.

The Hausman test is presented in Table 5 to select the most suitable model between FEM and REM. The results show that the dependent variable has a statistically significant P-value (0.0006), less than a significant level of 1%. Therefore, it can be concluded that FEM regression would be more appropriate for the model.

Table 5. Regression determination tests

Tests		Prob>Chi ²	Selected Model
F-test	F (5,123) = 4.90	0.0000	Fixed Effect Model
The Breusch-Pagan test	Chibar ² (01) = 36.23	0.0000	Random Effect Model
Hausman test	Chi ² (5) = 21.78	0.0006	Fixed Effect Model

(Source: summary of processing results on Stata, 2023)

4.2.3. Model appropriation tests

To assess the appropriation of the research model, the article continually examines some of the model's

defects, including heteroscedasticity and autocorrelation, as presented in Table 6 below:

Table 6. Regression model appropriation tests

Tests		Prob>Chi ²	Results
Modified Wald test	chi ² (32) = 1.7e+06	0.0000	Heteroskedasticity
Wooldridge test	F (1, 31) = 0.517	0.4776	No autocorrelation

(Source: summary of processing results on Stata, 2023)

Modified Wald test result shows that the research models with the dependent variable of ECEDI have a P-value statistic value of $0.0000 < 1\%$, at a significant level of 1%. It proves that hypothesis H0 is rejected, and the model occurs in heteroscedasticity.

In addition, the Wooldridge results indicate the model has P-value = 0.4776, which is greater than a significant level of 1%. As a result, hypothesis H0 is accepted, and the model has no first-order autocorrelation. In summary, the results from the above tests show that estimation by the fixed-effects model of ECEDI violates the regression hypothesis, including heteroscedasticity. Consequently, the FGLS method is applied to solve the above problems (Tabak et al., 2011). This method is supposed to be useful to control heteroscedasticity (Wooldridge, 2002).

4.2.4. Feasible generalized least square result discussion and implications

Table 7 presents the FGLS results controlled for heteroscedasticity. Three variables in the model are statistically significant at the 1% significance level, including Government Ownership, Big4, and Firm size. The remaining three variables that are not statistically significant are Industry, Board Independence, and Foreign Ownership. Our results are in line with many other authors, such as Özcan (2020); Songini et al. (2020), Gerwanski (2020), except for the factor of firm size.

Table 7. Results from the FGLS method

Variables	ECEDI
Type of industry	-2.6630318
Board independence	.03523135
Government ownership	.15554015***
Foreign ownership	.00620451
Big4	10.86749***
Firm size	-3.5930869***
_cons	64.999811***
Observations	160
Wald chi ² (8)	63.91

Notes: ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

(Source: Estimated from research data, 2023)

Through the positive estimation coefficients of the Government Ownership (GO) variable of 0.15554015 and the Big4 variable of 10.86749 at a 1% significant level, it showed that if companies have state ownership in their equity and employ Big4 for auditing services, the company's

environment and CE disclosure will increase in the same direction with these estimated coefficients. These results are consistent with the legitimacy theory, stakeholder theory, Özcan (2020) studies, and Nguyen et al. (2022). Accordingly, firms with a higher percentage of government-held shares are likely to disclose more voluntary information to gain legitimacy from or maintain legitimacy with stakeholders or the public (Özcan, 2020). In addition, Nguyen et al. (2022) indicated that government ownership's positive influence on Integrated Reporting provides a framework for Environmental and CE disclosure. In addition to providing opinions on a business's financial statements, auditing firms can indirectly influence the reporting unit's information disclosure level in its sustainability report or annual report, relying on certain inputs from auditors, such as non-audit services. Furthermore, high-quality auditing firms also provide professional consulting or training services to facilitate the implementation of GRI by listed firms.

Contrary to expectations, firm size has a negative effect on EICEI based on the regression coefficient of -3.5930869. This result implies that the EICEI is lower for larger firms. This result is inconsistent with previous studies by Marrone & Oliva (2019) and Nguyen et al. (2022) on the relationship between company size and information disclosure level. In particular, Nguyen et al. (2022) indicated that large corporations have sought to implement the overseas reporting framework in order to engage more effectively with foreign investors and address their expectations for improved levels of disclosure. However, previous studies consider that company size positively affects the application level of integrated reporting, CSR, and ESG information disclosure. Meanwhile, this study examines the impact of scale on the level of circular economy information disclosure. This opposite result is considered a discovery about this relationship. This can be explained as follows: publishing CE information requires integrating information about environmental impacts, water, and waste data. Smaller-sized companies will often be able to adapt and transform faster regarding strategic change or applying international standards. Especially in the environment and CE, collecting data and publishing this information is often easier for small companies.

5. CONCLUSIONS

The research has addressed the following objectives: synthesizing information disclosure

frameworks (GRI, CDP, and IIRC) related to environment and CE information; evaluating the application extent of the GRI 300 category by 32 listed firms; and examining factors that influence disclosure levels of environment and CE information in 160 sustainable development and annual reports of listed companies. To our knowledge, this study is considered the first to use GRI 300 standards to analyze the level of environmental information and CE disclosure of companies in Vietnam. In addition, we provide empirical evidence that companies that are government-owned and employ audit services from the Big4 firms have a higher level of information disclosure. In comparison, larger companies have a lower disclosure level. Other factors (variables) for companies in the manufacturing sector, companies with foreign shares, and the independence of the Board of Directors do not affect the information disclosure level of the studied companies. With these empirical results and the proven benefits of environmental information transparency and the CE

analyzed above, listed companies with state ownership and audited by the Big4 improve the data related to the environment and CE collection system to increase information disclosure. In addition, small-scale companies, taking advantage of their advantages, can increase information disclosure to attract investment capital and enhance their position. Management agencies can apply international frameworks in promoting policies and regulations to improve voluntary disclosure of environmental information and CE.

With the limitation of small sample sizes and the accuracy of data relying heavily on disclosure in reports from companies rather than being collected from independent third parties (such as audit reports on sustainable development reports), further research could be conducted with a larger sample, testing differences in the information disclosure level between industries or countries that use the same frameworks of disclosing information, for example, GRI, IIRC, COP, etc.

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