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Article

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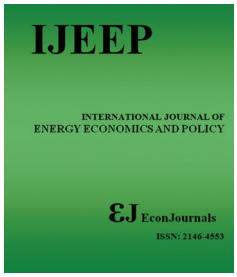

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Influence of ESG on Sustainability Reporting: Mediation Rule of Green Innovation and Investor Sentiment

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ABSTRACT

This study aims to investigate if the quality of sustainability reporting is particularly influenced by a company's commitment and approach to relevant environmental, social, and governmental (ESG) factors. Companies that seriously implement good sustainability reporting are likely to produce more detailed, relevant, and measurable ESG practices. The sample criteria were non-financial sector companies that had completed sustainability reports. This study collected 430 pieces of data from 215 companies. Data were collected from the 2021-2022 sustainability reports. The results show that ESG has a positive and significant effect on green innovation, investor sentiment, and sustainability reporting, and green innovation has a significant effect on sustainability reporting. However, investor sentiment does not significantly mediate the relationship between ESG and sustainability reporting. This study can help companies understand the factors that contribute to sustainability reporting. The limitation of this study is the development of theoretical models to anticipate the controversial debate behind the effect of ESG. Future research can combine and develop theoretical models on ESG and environmental uncertainty, which refers to the different, unpredictable, and constantly changing nature of the environment in which organizations operate. Environmental uncertainty can pose risks to organizations, including risks associated with supply chain disruptions and regulatory changes.

Keywords: Environmental; Social; and Governance, Sustainability Reporting, Green Innovation, Investor Sentiment
JEL Classifications: O35, Q01, Q56

1. INTRODUCTION

Sustainability reporting has grown in prevalence over recent years. Large and reputable companies have begun to realize the importance of social and environmental responsibility in their operations and adopt sustainable business practices. In 2019, the Financial Services Authority (OJK) passed a new regulation requiring public companies to include information about sustainability practices in their financial reports. This regulation was enacted to ensure that companies in Indonesia provide transparent and accurate information about their performance, particularly regarding sustainability.

However, despite the guidelines and regulations available for companies, sustainable business practices are still inconsistently adopted across industries in Indonesia. Some companies still regard social and environmental responsibility only as a moral responsibility rather than an integral part of operations (Bichta, 2003). The environmental uncertainty gap refers to the difference between the potential risks associated with environmental uncertainty and the level of action taken to address this uncertainty (Hu et al., 2023), whereas environmental uncertainty refers to unpredictable and constant changes in the environment in which an organization operates. This uncertainty can pose risks to organizations (Wang et al., 2023), including risks associated with supply chain disruptions, regulatory changes (Aydin et al., 2023), and natural disasters. Environmental uncertainty represents a lower level of uncertainty, whereas novelty represents a higher level of uncertainty (Cheng et al., n.d.). Organizations operating in an environment of high novelty must be agile, flexible, and innovative so they can adapt quickly to new situations (Hu et al., 2023).

The green washing phenomenon refers to excessive or false claims about performance, environment, or social issues aimed at increasing a certain party's reputation or attracting investors (Lee and Raschke, 2023; Zhang et al., 2023). One of the largest risks associated with investors' interest in reporting continuity is that potential companies are involved in green-washing (Hu et al., 2023), which occurs when companies make misleading or excessive claims about performance, the environment, or socially interesting investments (Zhang et al., 2023). This can damage the credibility of reporting sustainability and prevent investors from differentiating a genuinely committed company from one that only uses continuity as a tool for marketing ("S-OIL Bolsters Commitment to ESG Management, Completing Eco-Friendly Facilities One-by-One," 2022).

Green innovation will influence cost (Zhao et al., 2023). The development and implementation of technology and green innovation can complicate business and consumer adoption (Shahzad et al., 2022). Moreover, green innovation is not always available or widely accessible, especially in developing countries (Aydin et al., 2023). However, technology is complex and requires special knowledge and expertise to develop and implement; such a condition can limit its adoption (Shahzad et al., 2022). Furthermore, green innovation requires special and extinct materials or power sources and a complicated supply chain for production or factors which affect food security in the Gulf Cooperation Council countries (Wang et al., 2023). However, sustainability reporting challenges organizations because it requires complex stages to measure and track social and environmental impacts and has less consistent and measurable standards. For these reasons, organizations should develop a framework for reporting good sustainability and becoming dependable; as a result, they can create accurate and useful reports that serve all stakeholders' interests.

Green innovation is the development of products, services, and technologies that have a low impact on the environment or can repair it (Flores and Jansson, 2022). In sustainability reporting, green innovation enables a company to significantly reduce its adverse impact on the environment and improve the environment quality (Zheng et al., 2022). Meanwhile, investor sentiment refers to investors' views and opinions about the company and performance continuity (Dhasmana et al., 2023). Green innovation and investor sentiment in sustainability reporting are expected to improve companies' images (Cuomo et al., 2020). Green innovation can also help companies build a positive image among investors and other stakeholders (Wen and Song, 2017). This image can increase the company's power to attract potential investors and repair investor sentiment.

Companies that can develop green innovation can gain a competitive advantage in a market increasingly concerned about the environment (Alnaim et al., 2022). This strategy can increase a company's value for its investors (Octaviani and Harahap, 2022). Furthermore, implementing green innovation can help companies reduce environmental risks that may affect financial performance in the future (Albaity et al., 2023; Baumgartner, 2014). This implementation can strengthen investor sentiment toward the company. Sustainability reporting, which includes information about green innovation and a company's sustainability performance, can increase a company's transparency and provide the information required by investors to make wise investment decisions (Malini, 2021).

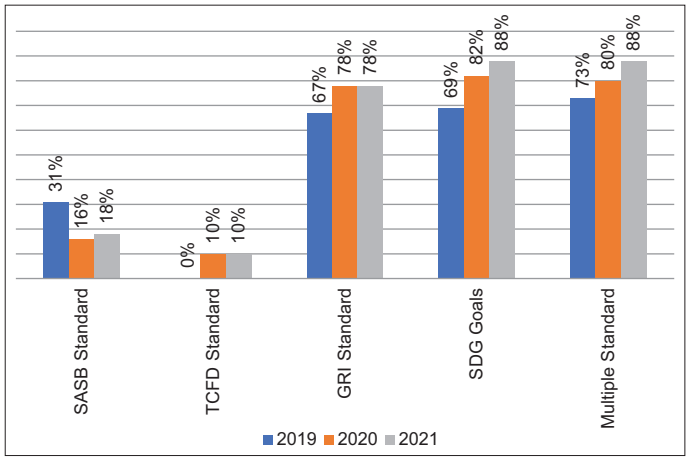
Investor sentiment can affect market volatility, liquidity, and overall investment performance. Positive sentiment can create strong market trends and provide an additional boost to assets, whereas negative sentiment can lead to heavy selling and downward pressure; in addition, the tendency of managers to withhold bad news from investors can exacerbate the risk to the company (Maryam and Kaouther, 2022; Nyakurukwa and Seetharam, 2023).

Several empirical studies have shown that environmental, social, and governance (ESG) factors affect green innovation. For example, Aydin et al. (2023) found that green patents can reduce ecological footprints, and it is preferable that decision-makers support the process of green innovation sustainability (Aydin et al., 2023). According to Dhasmana et al. (2023), ESG influences investor sentiment because investor sentiment weakens ESG's performance. Meanwhile, it has been found that the risk of climate change influences green innovation because implementing the risk assets of climate change results in financial risk.

Figure 1 shows that from 2019 to 2021, awareness of the importance of sustainability reports in Indonesia increased. Although Indonesia was affected by the COVID-19 pandemic in 2020, this global health crisis raised awareness of social issues such as equity in health and employment, which prompted more companies to pay attention to social aspects of ESG. Investors also began to intensify pressure on companies to disclose how these firms manage ESG risks, especially regarding climate change (Pozzoli et al., 2022; Xu et al., 2023).

Furthermore, Ahmed et al. (2023) conclude that green innovation positively affects sustainability reporting. Moreover, Ahmed et al. (2023) recommend that policymakers apply green innovation practices to increase organizations' performance and improve the environment. O'Dwyer and Owen (2005) opine that climate

Figure 1: Sustainability reporting in Indonesia



Source: International federation accountant, 2023

change challenges the realization of sustainability reporting, for example regarding the development of practice analysis and the standard framework patterns of the Tasks for Climate Financial Disclosure (O'Dwyer and Unerman, 2020). Empirical studies have evidenced that ESG assists companies in managing the environmental impacts and mitigating climate change in Indicator 13 of the SDGs. The goal is to address social, economic, and environmental challenges in addition to issues faced by the world today such as poverty, hunger, climate change, and gender disparities. The novelty of this study lies in impact-based reporting, which focuses on measuring and reporting the actual social, environmental, and economic impacts of a company's sustainability initiatives. A new economic model aims to eliminate waste and promote the efficient use of resources.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Stakeholder theory assumes that an organization is not only responsible to its owners but also to the various parties who have an interest in it. These stakeholders include employees, customers, suppliers, communities, and governments. This theory postulates that organizations must consider all stakeholders' interests and needs when making decisions and conducting operations (Freeman et al., 2010). Moreover, organizations should build good relationships with stakeholders; manage conflicts of interest; create long-term values for all involved parties; and face social, environmental, and ethical challenges. Stakeholder theory has developed from the initial early concept to an important framework in modern business management. The basic concepts of stakeholder theory include stakeholder identification, stakeholder analysis, and communication with stakeholders.

Furthermore, stakeholder theory focuses on the concept of sustainability, which requires organizations to act responsibly towards the environment and the surrounding communities to ensure that the organization can operate in the long term. In recent decades, stakeholder theory has become the basis for implementing sustainability reporting activities, and promotes the idea that organizations are responsible for social and environmental impacts. Research on sustainability reporting has investigated the factors influencing conceptualizations and examined the relationship between ESG and green innovation. However, this research is still relatively new.

The process of creating green innovation and its relationship with ESG have attracted numerous studies. Various characteristics of the relationship between ESG and green innovation have been outlined by Fang et al. (2022), Jun et al. (2022), Khemir (2019), Li et al. (2022), Nyakurukwa and Seetharam (2023), and Zhang et al. (2020). The materiality assessment aims to determine the most important ESG issues and their effect on a company's performance. A materiality assessment can be carried out in various ways, such as stakeholder surveys, industry analysis, and risk evaluation. When the most influential material ESG issues are determined, the company can develop policies and practices to address those issues.

The ESG policy can cover various aspects, including reducing greenhouse gas emissions, protecting human rights, and improving corporate governance. After developing the ESG policy, the policy is implemented into the company's daily business practices. Implementing ESG involves changes in business behavior and practices, and may require investment in infrastructure and technology. The final stage is ESG reporting, in which the company provides information on ESG performance to stakeholders. ESG reporting can be done through various methods such as sustainability reports, integrated financial reports, and company annual reports. Companies can utilize existing frameworks, such as the Global Reporting Initiative (GRI), the Sustainability Accounting Standards Board (SASB), and the SDGs to implement ESG as well as guide and measure ESG performance.

The findings of this study offer a perspective on how ESG adversely affects green innovation. Environmental information affects stock values. The influence of ESG interaction on green innovation is substantial and gradually weakens a company. This indicates that ESG integration in business strategy can help companies build a strong reputation and win the trust of customers and other stakeholders (Al Shaar et al., 2022). Green innovation can lead to a company developing more environmentally sustainable products and services, and reducing long-term operating costs, providing companies with a competitive advantage in an increasingly environmentally conscious market.

Companies can incur additional costs or make operational adjustments that may affect the value of the ESG program. However, in the long term, investment and efforts in ESG and green innovation can generate benefits that can increase a company's value. Liu and Lyu (2022) investigated whether ESG could stimulate green innovation. They found that ESG shareholders' different views on the interests positively affect green innovation because an ESG rating significantly encourages it. Environmental completeness enables organizational redundancy to strengthen ESG, leading to green innovation.

Environmental completeness refers to various and diverse environmental aspects considered in ESG and green innovation practices (Zheng et al., 2022). Environmental completeness may consider greenhouse gas emissions, waste management, energy conservation, the use of environmentally friendly raw materials, the sustainability of natural resources, the protection of biodiversity, and efforts to mitigate climate change. A comprehensive approach to the environment allows companies to identify broader green innovation opportunities and adopt ESG practices.

Organizational redundancy, meanwhile, refers to communication channels, a flexible organizational structure, and the involvement of various departments or divisions in the decision-making process. Using organizational redundancy (Somjai et al., 2020), multiple parts of the organization can collaborate in developing and implementing green innovation. This enables a broader exchange of knowledge, ideas, and thoughts between different parts of the organization, including the environmental research and development, marketing, and operations departments. Cross-departmental collaboration can synergize and integrate

ESG and green innovation in addition to increasing its effective implementation.

Wang et al. (2023) tested how an ESG rating can increase green innovation against a background of a conflict of interest where someone deliberately does not wish to get involved with green innovation due to the greater cost impact it will have. Wang et al., (2023) conducted a study in China to investigate green finance using a sample of 301 companies. It revealed that ESG positively affects green innovation because it can help shareholders monitor the environment effectively. This result indicates that green innovation encourages companies to adopt more sustainable and environmentally friendly business practices, including using more environmentally friendly raw materials, reducing greenhouse gas emissions, improving energy efficiency, and improving waste management.

Implementing green innovation enables companies to increase the transparency and accountability levels of their environmental impacts. Shareholders can better monitor and assess a company's environmental performance because the information is more detailed and measurable. Furthermore, green innovation helps shareholders monitor the environment effectively by providing greater transparency, more quantifiable information, and better risk assessment in addition to building a sustainable corporate reputation. Thus, shareholders can make more informed investment decisions and choose companies that strongly commit to addressing environmental issues. Sun et al. (2018) conducted a study on the impact of investor sentiment on ESG activities, namely corporate social responsibility (CSR). Moreover, Sun et al. (2018) explored how managers adapt their approach to ESG activities to meet investor sentiment, observing 12,488 companies listed on A-Shares and located in China during periods of low sentiment. The result shows that managers will be more inclined to issue ESG reports and the report quality will be higher. This result indicates a negative correlation between ESG and investor sentiment.

This study aims to show that the quality of ESG reports is more influenced by the company's commitment and approach to the relevant environmental, social, and governance factors (Chebbi et al., 2020). Companies that seriously implement good ESG practices are likely to produce more detailed, relevant, and measurable ESG reports. The quality of ESG reports can also be affected by companies' reporting standards, such as the GRI or the SASB. Low sentiment towards companies can motivate managers to increase company transparency and accountability by issuing more comprehensive ESG reports. In this situation, managers can attempt to improve the company's image by providing more complete information about its ESG practices and social and environmental performance. However, this does not automatically guarantee a higher quality of ESG reports.

Wang et al. (2023) analyzed the direct impact of environmental uncertainty on environmental performance by mediating investor sentiment. The study was conducted at the Shanghai and Shenzhen Stock Exchanges of China from 2011 to 2021 and involved a sample of 557 companies. The results reveal the effects of environmental uncertainty as mediated by investor sentiment (emotional) and green innovation (rational). Green innovation has a direct impact, whereas investor sentiment has no direct impact. Investor sentiment refers to investors' emotional attitudes, perceptions, and preferences for a company or industry. It can be influenced by several factors, such as news, public perception, market trends, or specific issues related to the company. Negative investor sentiment can lead to a decline in share prices or an investment withdrawal. If investors have strong environmental or social concerns, they tend to look for companies that implement good ESG practices and have green innovations.

This strategy can create a higher demand for eco-friendly products and services, prompting companies to increase green innovation. Meanwhile, green innovation is a rational and fact-based approach to developing more environmentally sustainable products, services, or business processes to reduce negative environmental impacts and produce better benefits for the environment and society. If a company successfully implements green innovation and achieves positive results for environmental performance and sustainability, it can increase investor confidence and positive sentiment. Successful green innovation can reflect a company's commitment to good ESG practices, which can have a positive impact on investor sentiment.

Nyakurukwa and Seetharam (2023) examined the application of ESG to investor sentiment reactions in South Africa from 2015 to 2021, involving 140 industry companies. The results indicate that ESG influences investor sentiment reactions, and investors will react positively to ESG news. These findings show that investors are increasingly aware of the importance of ESG aspects for measuring company performance. Investors with strong ESG preferences tend to pay more attention to companies that adopt good ESG practices. Therefore, positive news about a company's ESG practices can change investors' preferences and encourage them to invest in or maintain investments in the company.

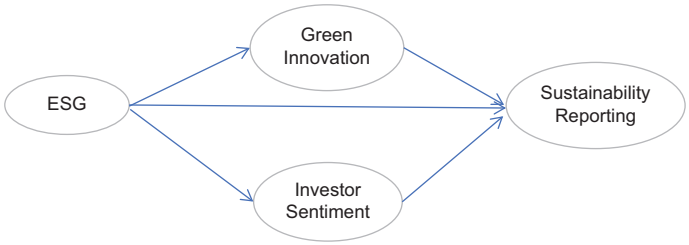
Furthermore, the sustainable and ESG-based investment market continues to grow rapidly. Institutional investors, pension funds, and asset managers are increasingly considering ESG factors in investment decision-making. Therefore, positive news regarding a company's ESG practices can attract ESG-focused investors' attention and increase demands on the company. Based on the aforementioned, this study formulates the following hypotheses.

H1: ESG has a positive effect on green innovation.
H2: ESG has a positive effect on investor sentiment.
H3: ESG has a positive effect on sustainability reporting.
H4: Green innovation has a positive effect on sustainability reporting.
H5: Investor sentiment has a positive influence on sustainability reporting.

Based on the research questions and hypotheses above, a research model can be described as follows:

Figure 2 shows that there is a research model that connects the influence of ESG on sustainability reporting mediated by green innovation and investor sentiment, with the existence of this research model is expected to answer the question of the relationship between the influence of ESG on sustainability reporting.

Figure 2: Research model



3. METHODOLOGY

3.1. Research Design and Data Collection

This study examined the effect of ESG on sustainability reporting and the strategies of green innovation and investor sentiment on the Indonesian Stock Exchange (IDX) from 2021 to 2022, mediated by ESG. The sample criteria were: (i) companies listed on the IDX, (ii) non-financial sector companies (Banking), and (iii) companies who have completed sustainability reports. Based on the research criteria, 430 samples were collected. Therefore, this study was conducted empirically using secondary data samples and sustainability reports. Sampling was done using purposive sampling, namely a set of samples with certain criteria, such as company registration, serving of information, sustainability reporting, and enterprise impacts (Ma and Qin, 2022).

The IDX was chosen as the research object because it plays an important role in economic and financial development. Therefore, the IDX should consider sustainable operations, including sustainability reporting. Research on the sustainability reporting of companies listed on the IDX can provide useful information for the government and regulators to improve sustainable economic and financial development in Indonesia. Indonesia has various industrial sectors, including manufacturing, agriculture, and mining. Selecting companies listed in Indonesia as the focus of sustainability reporting research enables different industry sectors to be covered and provides a broader description of sustainability reporting practices in Indonesia.

3.2. Data Analysis Method

This research employed structural equation modelling (SEM) to analyze the data. Moreover, a statistical method was used to analyze complex connections between variables in the model. The PLS approach has a number of benefits, especially when the model has certain characteristics. SEM is an analytical approach that offers statistically superiorities (Sukhov et al., 2023). One of the main advantages of SEM is its extraordinary flexibility, enabling complex connections between mutually exclusive variables to be revealed. Moreover, SEM is a possible analysis performed on a variety of data types, including data that do not follow a normal distribution and data from a small and limited sample.

SEM can overcome models with latent variables (constructs) measured by only a few indicators. This becomes offers a solution to when limitations in data collection preclude the use of more complex models. SEM also perfectly balances between the theory development and accurate predictions (Cheah et al., 2023). Consequently, researchers can build flexible and adaptable models to change while keeping the focus on predictive goals.

3.3. Research Variables and Measurement Definition

This study uses ESG to measure scores in the level of disclosure information, examining three aspects, namely measuring the level of ESG: The range of scores used is 1-9; green innovation using the natural logarithm measurement of 1 summed with green patents owned by the company; investor sentiment using the market-to-book ratio; and sustainability reporting using GRI G4, namely the number of items reported divided by the number of GRI G4 items.

This study was motivated by the standard stemming from the Task Force on Climate-Related Financial Disclosures (TCFD) and academics' contributions using the TCFD disclosure approach, consisting of board oversight of risks and opportunities, top strategy for climate risks and opportunities, and management. The TCFD implements a preparation forum to report on the oil and gas sector, electric utility, and chemical materials in addition to inviting company leaders to discuss accounting and disclosure practices.

The TCFD focuses on the oil and gas sector, utilities, and chemical materials because these sectors significantly impact house gas emissions and climate change. The rise in global temperature, the increase in the intensity of weather extremes, and changes in climate have general and significant implications for operations and business models. In these sectors, companies frequently consider high risk and high finances due to climate change. For example, the oil and gas sector may face asset devaluation if global demand falls due to climate change and should therefore make a transition to renewable energy. Electric utility and chemical materials also potentially face similar risks to those in regulation, demand changes, and operational challenges. Cheng et al. (2023) investigated the methods of directing environmental conditions using certain models. The results show that environmental conditions and uncertainties must be handled by a system.

Various models identify threats and uncertainty and measure uncertainty in an environment. Report continuity is focused on relevant sustainability issues, such as environmental protection, basic human rights protection, community engagement, management risk, innovation sustainability, and socioeconomic impacts (Bergamini Junior, 2021; Graafland and Smid, 2019; Plastun et al., 2022). This study covered information about the companies' efforts to manage environmental risk, promote ethical business practices, improve the environment, manage supply chains responsibly, and create sustainable development. In this variable, sustainability reporting was measured using the GRI G4 number of items to report on a shared number of GRI G4 items.

ESG is a framework used by investors, stakeholders, and companies to assess and monitor companies' sustainability in various relevant aspects, including ESG factors. The ESG concept acknowledges that non-financial factors can significantly impact a company's performance and values in reaching sustainable development (Finger and Rosenboim, 2022). Environmental dimensions cover the company's environmental impacts and strategies for managing a source of natural power, reducing house

gas emissions glass, minimizing waste, and applying sustainable practices. Environmental dimensions also cover issues of climate change, energy use, water management, waste management, biodiversity protection, and impacts on ecosystems.

Meanwhile, social dimensions concern the method used by companies to interact with stakeholders' interest in addition to external and internal parties, including employees, consumers, society, local people, and the community. Social dimensions involve issues of diversity, inclusion, basic human conditions, fair and safe work, compliance with social norms, support for the community, management chains of responsibility for supply, and social responsibility for the company.

Governance dimensions refer to a company's focus on structure and practice management. They cover how companies manage risk, business integrity, transparency, accountability, the quality of the supervisory board of directors, compliance with regulations and laws, the disclosure of clear and accurate information, and the avoidance of conflicts of interest (Finger and Rosenboim, 2022).

Green innovation refers to the development and use of environmentally friendly, sustainable, and low-carbon technology, products, services, and processes. Innovation is driven by the need to overcome challenges, such as climate change and environmental degradation, and the need to improve the sourcing of power and demand to reflect the fact that consumers care more about the environment (Soewarno et al., 2019). The green innovation moment focuses on developing and deploying renewable energy sources, such as solar energy, wind energy, hydro energy, and biomass energy. The goals are to reduce dependency on energy sources such as fossil fuels, which contribute to greenhouse gas emissions, and to increase efficiency by using sources of power such as water, energy, and raw materials. Green innovation entails the development of waste-reducing technologies and processes, extends the life of products, and improves the efficiency of power sources. The current era is marked by progress in technology, information, and digitalization that delivers new opportunities for green innovation. For example, the Internet of Things, data analytics, and artificial intelligence are used to optimize energy use, manage waste, and monitor the impact of the environment in real-time (Richardson and Xu, 2020).

According to Dhasmana et al. (2023), investor sentiment involves subjective judgments and perceptions that investors have market situations and prospects. This sentiment can range from high optimism and confidence to deep pessimism and worry. Investor sentiment can be influenced by several factors, such as economic news, political events, company performance, market trends, market temperature, risk perception, and psychological factors. Positive sentiment tends to drive demand and increase asset prices. Meanwhile, negative sentiment can reduce selling and prices.

Investor perceptions and sentiments are not always based on fundamental analysis or objective data because they can also be influenced by psychological aspects and collective thinking habits. When many investors feel optimistic, they may make bolder investment decisions. Conversely, when negative sentiment dominates, investors tend to stay away from risks and reduce exposure to the market (Nyakurukwa and Seetharam, 2023). Investor sentiment can have a tangible impact on market volatility, liquidity, and overall investment performance. Positive sentiment can create strong market trends and provide additional impetus to assets, whereas negative sentiment can lead to heavy selling and downside pressure (Nyakurukwa and Seetharam, 2023).

According to Wang et al. (2023), emotional sentiment refers to investors' responses and reactions which are influenced by emotions and subjective feelings. Factors such as fear, greed, optimism, anxiety, satisfaction, or disappointment can influence investors' emotional sentiment. Sentiment is rationally related to judgments and perceptions that are more objective and based on fundamental analysis or available market data. Investors with rational sentiment tend to consider several factors, such as financial companies' performance, economic growth, financial reports, industry trends, and other fundamental factors of investment decision-making.

4. RESULTS

4.1. Imperial Findings Analysis

Descriptive statistical analysis was used to describe the data, consisting of maximum values, minimum values, average values (mean), standard deviation values of ESG, green innovation, investor sentiment, and sustainability reporting variables.

Table 1 shows that there is a known ESG disclosure of 0.6667, with a maximum value of 1.0000. The average ESG is 0.9297, with a standard deviation of 0.0828. This is demonstrated by the context of implementation in Indonesia, with ESG referring to the criteria used by companies to evaluate their impact on the environment, community, and corporate governance. The Indonesian government has begun producing regulations and guidelines for ESG reporting. This shows Indonesia's serious commitment to ESG reporting, although there is still a challenge to push all companies to adopt sustainable ESG practices. The average value of green innovation is 10.6129, with a standard deviation of 16.2265; the average value of investor sentiment is 0.0515, with a standard deviation of 0.4725; and the average value of sustainability reporting is 0.6112, with a standard deviation of 0.0872. This study focused on the company sectors that impact their products and involved business processes characterized by the coexistence of negative and positive externalities, which led to effective accountability for stakeholders' objectives (Imperiale et al., 2023).

Table 1: Descriptive statistics

Constructs	Minimum	Maximum	Mean	Std. deviation
ESG	0.6667	1.0000	0.9297	0.0828
Green innovation	0.0000	147.0000	10.6129	16.2265
Investor sentiments	0.0000	8.6075	0.0515	0.4725
Sustainability reporting	0.2637	0.8242	0.6112	0.0872

4.2. Outer Model Evaluation (Measurement Model)

Convergent validity and reliability testing refers to what extent indicators used to measure a construct accurately and consistently reflect that construct. In other words, convergent validity assesses whether the indicators truly reflect the intended construct. This process was conducted by measuring several aspects, such as (1) the correlation between indicators and latent variables; (2) factor loading values, which indicate how well indicators measure latent variables; and (3) internal reliability values (Cronbach's alpha [CA] or composite reliability), which indicate internal consistency. The sustainability reporting analysis involved steps designed to ensure that the employed indicators measure various aspects of sustainability (ESG) and can accurately reflect the construct being measured (Cheah et al., 2023). Convergent validity in sustainability reporting is crucial to ensure that the analyzed data reflect the company's sustainability commitment and performance.

According to table 2 based on testing validity, outer loading is a whole mark outer loading of >0. This indicates that the loading fulfils the validity based on a loading value. Furthermore, validity testing was done based on the mark average variance extracted (Shiu et al., 2011). If the whole outer loading value of measuring indicators and variables that affect sustainability reporting is more than 0.7, then validity convergence in ESG's relationship to sustainability occurs and is mediated by green innovation and investor sentiment (Table 2).

The recommended Cronbach's Alpha value is above 0.7 and has a whole mark of Cronbach's Alpha > 0.7. Table 3 scores indicate that the recommended Cronbach's Alpha value fulfills the condition of reliability based on Cronbach's Alpha. Furthermore, discriminant validity testing was conducted using the Fornell–Larcker approach.

The discriminant validity testing was conducted using the Fornell–Larcker method, an important step to evaluating the connection between ESG, sustainability reporting, green innovation, and investor sentiment (Shiu et al., 2011). This method aims to ensure that variables in the analysis model have sufficient discriminant validity so that the resulting analysis can be reliable and properly interpreted. Table 4 shows that the interpreted results are accurate and provide a solid foundation for understanding the influence of ESG on sustainability reporting as mediated by green innovation and investor sentiment.

4.3. Significant Influence Testing (Bootstrapping), Hypothesis Testing, and Inner Model

The analysis stage is the most crucial step in exploring the complex connection between ESG, sustainability reporting, green innovation, and deep sentiment investors in the SEM framework. The direct influence of ESG on sustainability reporting can be measured. At the analysis stage, the line connects direct ESG to sustainability reporting. This stage reveals how ESG directly influences sustainability reporting without considering effect mediation.

According to table 5, ESG has a significant effect on green innovation, with a p-value of 0.000 < 0.05. This score indicates

Table 2: Testing validity based on outer loading

Constructs	ESG	Green innovation	Investor sentiments	Sustainability reporting
M1		1.000		
M2			1.000	
X1	1.000			
Y				1.000

Table 3: Testing reliability based on Cronbach's Alpha

Constructs	Cronbach's Alpha
ESG	1.000
Green innovation	1.000
Investor sentiments	1.000
Sustainability reporting	1.000

Table 4: Discriminant validity testing using Fornell–Larcker

Constructs	ESG	Green innovation	Investor sentiments	Sustainability reporting
ESG	(1.000)			
Green innovation	0.277	(1.000)		
Investor sentiments	0.060	0.026	(1.000)	
Sustainability reporting	0.131	−0.039	0.010	(1.000)

that hypothesis 1 is accepted. The analysis results show that the ESG factor significantly influences green innovation. This finding is confirmed by a P = 0.000, which is much smaller than the generally used significance threshold of 0.05. This small P-value indicates that the effect of ESG on green innovation cannot be a coincidence. Based on the analysis results, the hypothesis that ESG has a positive effect on green innovation is accepted. The ESG factors covered by the ESG encourage and support sustainable innovation, reflected in green innovation (Wang et al., 2023). In other words, companies with good ESG commitment and performance are more likely to produce innovations that support environmentally friendly practices.

These results have important implications for companies and practitioners wishing to design business strategies that focus on sustainability. By strengthening ESG factors, companies can encourage green innovation that is beneficial for the environment and potentially provides a competitive advantage and long-term value (Rau and Yu, 2023). This analysis provides a strong empirical foundation for taking steps based on ESG principles that can stimulate innovation, with a positive impact on the environment and society.

ESG has a significant effect on sustainability reporting, with a P = 0.001 < 0.05. This score indicates that hypothesis 2 is accepted. The analysis shows that ESG factors have a significant influence on sustainability reporting. This result is corroborated by the P = 0.001, which is clearly smaller than the normally used significance level of 0.05. A very low P-value indicates a strong basis for accepting the proposed hypothesis. This P-value indicates that companies that focus on ESG factors tend to have a higher

Table 5: Path coefficients and significance test on direct influence

Constructs	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P-values
ESG -> Green innovation	0.276	0.279	0.031	8.914	0.000
ESG -> Sustainability reporting	0.156	0.153	0.050	3.158	0.001
ESG -> Investor sentiments	0.060	0.058	0.030	2.016	0.022
Green innovation -> Sustainability reporting	−0.081	−0.081	0.056	1.432	0.076
Investor sentiments -> Sustainability reporting	0.003	−0.012	0.053	0.050	0.480

Table 6: R-squared

Constructs	R-squared
Green innovation	0.077
Investor sentiment	0.004
Sustainability reporting	0.026

level of sustainability reporting. In other words, commitment and good performance in ESG significantly encourage companies to prepare a more comprehensive and transparent sustainability report.

These results have important implications for corporate sustainability practices and businesses. Prioritizing ESG factors enables companies to strengthen social responsibility and provides stakeholders with more complete information about impacts on the environment and society (Imperiale et al., 2023). With a low P-value, this analysis provides strong empirical support for the importance of ESG factors in shaping the quality and positive impact of sustainability reporting practices (Liu and Lyu, 2022). These findings also encourage companies to continue to consider and increase their focus on ESG because it impacts the companies' internal sustainability, transparency, and accountability that is expected by external stakeholders.

ESG has a significant effect on investor sentiment, with a P = 0.022 < 0.05 (Hypothesis 3 Accepted). Through in-depth analysis, it appears that ESG factors have a significant influence on investor sentiment. This result is supported by the P = 0.022, which is smaller than the generally used significance level of 0.05. Thus, there is a strong basis for accepting the proposed hypothesis. This P-value concludes that companies performing good with ESG factors tend to get a more positive response from investors. Investor sentiment, which reflects investors' perceptions and views of sustainability practices and CSR, has a significant correlation with ESG factors (Nyakurukwa and Seetharam, 2023).

This finding has important implications for the relationship between firms and capital markets. Moreover, it demonstrates that companies that actively implement and report good ESG practices can influence investors' positive perceptions (Nyakurukwa and Seetharam, 2023). Thus, companies with good ESG performance may be more attractive to most investors. A low P-value indicates that this analysis provides strong empirical support for the importance of paying attention to ESG factors in planning business strategies and interacting with the capital market. Companies can leverage these findings to build a strong reputation and earn investors' trust by demonstrating a genuine commitment to sustainable and socially responsible practices. These findings also confirm that the relationship between ESG and investor sentiment is more than a causal one. This suggests that good ESG practices can contribute to creating a positive and supportive climate for investors and potentially influence the company's investment decisions and long-term perceptions (Dhasmana et al., 2023).

Green innovation has no significant effect on sustainability reporting, with a P = 0.076 > 0.05. This score indicates that hypothesis 4 is rejected. The analysis shows that green innovation does not have a significant effect on sustainability reporting. This result is reinforced by the P = 0.076, which is greater than the commonly used significance level of 0.05. Therefore, the proposed hypothesis is rejected.

This finding indicates there is no statistical evidence for the assertion that the level of green innovation directly affects sustainability reporting. This may suggest that, although continuous innovation has important value in the context of ESG practices, its direct impact on sustainability reporting may not always be apparent. Although the direct effect of green innovation on sustainability reporting is not proven in this analysis, it should be noted that the relationship between the two variables can be extremely complex and can vary in different contexts and companies. These findings may reflect particular characteristics of the sample or model used in this analysis.

In conclusion, the results of this analysis provide valuable insights into the relationship between green innovation and sustainability reporting within a specific framework (Poppe et al., 2023; Yuniarti et al., 2022). Although no significant direct effect has been found in this context, further research should more comprehensively understand the factors that may influence this relationship. This analysis continues to make an important contribution to understanding the dynamics between sustainable innovation and sustainability reporting and can help companies plan more effective ESG strategies in the future.

Investor sentiment has no significant effect on sustainability reporting, with a P = 0.480 > 0.05. This score indicates that hypothesis 5 is rejected. The analysis revealed that investor sentiment does not have a significant effect on sustainability reporting. This finding is reinforced by the P = 0.480, which is far greater than the commonly used significance threshold of 0.05. This high P-value is a strong basis for rejecting the proposed hypothesis. This finding shows that, within the chosen analytical framework, investor sentiment may not directly affect the level

Table 7: Mediation test

Constructs	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T-statistics (|O/STDEV|)	P-values
ESG -> Green innovation -> Sustainability reporting	−0.022	−0.022	0.015	1.512	0.047
ESG -> Investor sentiments -> Sustainability reporting	0.000	0.000	0.003	0.061	0.476

of sustainability reporting carried out by the company. In other words, investors' views and perceptions of sustainability aspects may not have a significant impact on a company's sustainability reporting practices.

Although these results suggest that the direct influence of investor sentiment on sustainability reporting is not proven in this context, the relationship between these variables can be influenced by various factors (Zharfpeykan and Askarany, 2023). For example, it is possible that other variables or external factors may also affect the relationship between investor sentiment and sustainability reporting. The results of this analysis provide important information about the dynamics between investor sentiment and sustainability reporting in a given context. Although the findings found no significant direct effect, the results of this study can serve as the basis for further analysis that considers additional variables or different contexts. This can help companies understand the impact of external factors on sustainability reporting practices and plan a more holistic sustainability strategy (Bernow et al., 2019; Mahmoudian et al., 2020).

Table 6 shows the results of the R squared value of green innovation is 0.077, meaning that ESG can explain or influence green innovation by 7.7%. The R-squared value of investor sentiment is 0.004, meaning that ESG can explain or influence investor sentiment by 0.4%. Scores between 7.7% and 0.4% of the changes or variations in green innovation and investor sentiment can be attributed to other variables in the analysis. The rest, approximately 92.3%, may be influenced by other factors outside the variables in the model. This percentage may seem relatively low. In social and economic analysis, various behaviors and phenomena are frequently influenced by many complex factors that are difficult to fully measure. Therefore, even though 7.7% is small, this r-squared value still indicates the relationship between the variables in the analysis.

The R-squared value of sustainability reporting is 0.026, which stands for ESG, green innovation, and investor sentiment. These variables can explain or influence sustainability reporting by 2.6%. The R-squared value for sustainability reporting is 0.026, which indicates that approximately 2.6% of the variation in sustainability reporting can be explained or influenced by the independent variables included in the model, namely ESG, green innovation, and investor sentiment. Although this number is low, complex analyses and variation in the dependent variable, such as sustainability reporting, are frequently influenced by many factors that are difficult to fully measure.

Mediation in this study is green innovation and investor sentiment, the test results in table 7 show that green innovation significantly mediates the influence of ESG on sustainability reporting, with a p-value of $0.047 < 0.05$. This score indicates that the mediation hypothesis is accepted. In this context, the findings show that green innovation mediates between ESG and sustainability reporting. In other words, ESG influences green innovation, which in turn affects the company's level of sustainability reporting. ESG influences sustainability reporting directly and through the intermediary effect played by green innovation.

These findings provide a more in-depth examination of how ESG factors can influence corporate sustainability reporting through continuous innovation. Understanding the mediating role of green innovation enables companies to take more targeted steps to plan and improve sustainability practices and ensure that sustainable innovation significantly facilitates the relationship between ESG and sustainability reporting (Buallay, 2019; Yeoh, 2021). This finding offers an essential contribution to sustainable businesses and provides a robust basis for companies to design effective ESG strategies and translate them into transparent and meaningful reporting (Ciciretti et al., 2019). With a supportive P-value, this finding also provides strong empirical support for the mediating role of green innovation in the relationship between ESG and sustainability reporting (Tóth et al., 2021).

Investor sentiment does not significantly mediate the relationship between ESG and sustainability reporting, with a $P = 0.476 > 0.05$. This score indicates that the mediation hypothesis is rejected. The findings indicate that investor sentiment does not have a significant mediating role in the relationship between ESG and sustainability reporting. This result is reinforced by the $P = 0.476$, which is far greater than the commonly used significance level of 0.05. This high P-value can be used as a strong basis for rejecting the proposed mediation hypothesis.

Furthermore, the findings reveal that investor sentiment does not significantly mediate the relationship between ESG and sustainability reporting. The influence of ESG on sustainability reporting may not occur through the mediation of investor sentiment. Although no significant mediating effect was found in this analysis, the relationship between these variables can be complex and can vary depending on various factors (Dhasmana et al., 2023; Nyakurukwa and Seetharam, 2023). It is possible that other factors not included in the model may influence this relationship or that this relationship may be more applicable in a different context. In conclusion, the results provide important insights about the role of investor sentiment in the relationship between ESG and sustainability reporting. Although the mediation hypothesis is not accepted in this analysis, it still significantly contributes to understanding the dynamics between these variables. This conclusion can help companies understand factors that contribute to the relationship between ESG and sustainability reporting, and the potential impact of investor sentiment.

5. DISCUSSION

Commitment and positive performance in the ESG aspect encourage companies to carry out green innovation which, in turn, contributes to a higher level of sustainability reporting. Green innovation is an important bridge that connects sustainability efforts that report sustainable practices to stakeholders. This allows the company to contribute to sustainability reporting.

The implementation of sustainability reporting is expected to encourage companies to more transparently communicate sustainable practices, environmental performance, social impacts, and corporate governance to stakeholders. This creates a higher level of transparency in company operations and its impacts. There are several important implications for companies and practitioners when designing business strategies that focus on sustainability. By strengthening ESG factors, companies can encourage green innovation; this is beneficial for the environment and potentially provides competitive advantages and long-term values (Rau and Yu, 2023). This analysis provides a strong empirical foundation for taking steps based on two elements. The first is ESG principles, which stimulate innovation that then positively impacts the environment and society. The second is investments that focus on companies with good ESG performance to significantly attract many investors.

6. CONCLUSION, LIMITATIONS AND FUTURE RESEARCH

The scientific debate concerning the relationship between ESG and sustainability reporting reflects the complex issue of sustainability. This study assessed and reported on companies' impacts on the environment and society. Academics, practitioners, and experts have proposed different approaches and perspectives on how ESG influences and is reflected in sustainability reporting practices (Balogh et al., 2022; Christensen et al., 2021; Gawęda, 2021; Tilba, 2022). Scientific contributions to understanding the relationship between ESG and sustainability reporting are crucial to forming a more informed and in-depth view and supporting sustainable decision-making. Scientific research has provided valuable insights into various aspects of the interaction between ESG and sustainability reporting practices. This study sought to answer the questions of whether ESG practices really encourage companies to report their impacts more transparently and whether any real causal effects exist. The results of this investigation help to avoid baseless assumptions and replace them with empirical evidence.

The area of sustainability is expected to develop meaningful metrics and indicators to measure and assess ESG practices and their impact on sustainability reporting (Hamdi et al., 2022; Yilmaz, 2022). This includes developing relevant and valid frameworks to measure sustainable performance, assist ESG issues globally, and respond to developments in increasingly stringent regulations related to sustainability reporting. This helps companies maintain appropriate practices at a global level and drive innovation in thinking and approaches for ESG and sustainability reporting. By providing recommendations supported by empirical evidence, scientists and researchers can assist companies in continuously improving and developing their sustainable practices.

Managerial contributions in the context of ESG and sustainability reporting is key to translate sustainable commitment and responsibility into concrete actions reflected in the company's sustainability report. Management has a central role in leading, designing, and managing ESG practices and integrating them into a sustainability reporting process. Management is responsible for designing and managing the relevant metrics and indicators to measure a company's ESG performance, reporting transparent and accurate ESG impacts in sustainability reports, identifying ESG factors-related risks, and designing strategies to reduce or manage these risks. ESG risk management includes understanding how these risks may affect business performance and how to take appropriate actions accordingly.

Policy implications for sustainability reporting provide a clear direction for companies to integrate social and environmental responsibilities. Good policies can drive positive changes in business practices, create more beneficial social and environmental impacts, offer a foundation for sustainable growth in the future, and provide special fiscal or financing incentives for companies to implement ESG practices and report them transparently (Crumpler, 2014). Policies that support sustainable practices and reports can create innovation across sectors; thus, companies may seek new solutions that allow them to reduce their environmental impacts or increase positive social impacts to meet policy requirements.

The main limitation of this study is the development of theoretical models to anticipate the controversy of opinions on the effect of ESG, which cannot provide sufficient legitimacy for environmental uncertainty and are less effective on financial performance due to the implementation of IRFS policies on sustainability reporting regulations and climate change. Future research should aim to combine and develop theoretical models on ESG and environmental uncertainty which refer to the different, unpredictable, and constantly changing nature of the environment in which organizations operate. Environmental uncertainty can pose risks to organizations, including risks associated with supply chain disruptions, regulatory changes, and natural disasters. ESG refers to environmental conditions driven by stakeholder demands and pressures in addition to organizational needs. To respond to these pressures, there is a need to report on and present the social and environmental impacts.

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