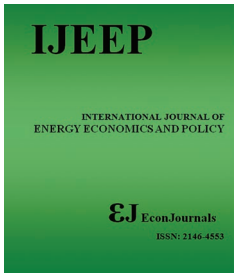

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ESG and Environmental Performance: Multiple Mediation Models of Green Accounting and CSR Disclosure

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ABSTRACT

Sustainability is a major theme in current academic research due to various issues such as the energy crisis, global warming, and environmental damage. This sustainability issue led to an increase in the role of environmental, social, and governance (ESG) in improving the quality of environmental management by companies. However, research on this topic is still limited with inconsistent findings. This study aims to examine the effect of ESG on environmental performance by using the mediating variables of green accounting and corporate social responsibility (CSR) disclosure. This study contributes by developing a multiple mediating model. The sample consisted of 114 firms-years observations of mining and manufacturing companies in Indonesia during the 2017-2022 period. The results show that ESG has a positive effect on the application of green accounting and CSR disclosure. Both mediation variables can improve environmental performance. In addition, ESG can also have a positive effect directly on environmental performance. These results provide empirical evidence of the importance of ESG implementation in the context of sustainability. The results of mediation testing show that CSR disclosure can act as a partial mediator so as to show support for signaling theory and the dominant role of impression management in environmental performance ranking.

Keywords: ESG, Green Accounting, CSR Disclosure, Environmental Performance, Sustainability
JEL Classifications: Q51, Q56, M41

1. INTRODUCTION

Various current problems such as the energy and food crisis, global warming, environmental damage, and so on have led to the popularity of the concept of environmental, social, and governance (ESG). The implementation of ESG is expected to ensure ethical and sustainable practices in company operations, so that it can achieve goals not only in terms of profit, but also people and planet (Alduais, 2023; Al Amosh and Khatib, 2021; Sadiq et al., 2020). In addition to ESG, these sustainability problems have encouraged the development of the concept of green accounting or also known as environmental accounting (Khan and Gupta, 2023a; Adegbie et al., 2020). Green accounting is expected to play a role in identifying and measuring environmental costs and liabilities in financial statements so that environmental performance management will be better so as to encourage stronger corporate social responsibility (Ratmono et al., 2024).

The implementation of ESG can ensure the creation of shareholder value through the improvement of financial performance, management quality and minimizing risks (Zumente and Bistrova, 2021) and can give a positive impression to creditors in making financing decisions and benefit the company in the capital market (Feng and Wu, 2021). With the amount of benefits caused by ESG disclosure, it is only natural for companies to have more attention to its application.

The development of the ESG concept has increased academic research interest in the relationship between ESG, green accounting, and environmental performance (For example, Li

et al., 2024; Chen et al., 2023). However, empirical evidence of previous research on the relationship between the three variables has not been fully consistent. Meanwhile, in terms of the gap phenomenon as described earlier, many companies have implemented ESG and green accounting but the problem of their effectiveness in improving environmental performance still requires further research (Ratmono et al., 2024). This study fills this gap by focusing on the problem of the role of ESG and green accounting in improving environmental performance and corporate social responsibility. This study is important and relevant in several ways. First, this study focuses on the Indonesian context, a developing country, while previous research generally focuses on ESG practices in developed countries. Environmental damage may cause more serious problems for developing countries as they generally have higher economic growth rates and excessive fossil fuel consumption. Research in the Indonesian context is important because the implementation of ESG is still not optimal as reported in the results of the national ESG survey in 2019 organized by the Center for Risk Management and Sustainability. Likewise, research findings by Loh and Thomas (2018) on *Sustainability Reporting in ASEAN Countries* showed that Indonesia had the lowest score of 40.6% compared to other countries.

Second, this study analyzes the mechanism or process of how the role of ESG in improving environmental performance with multiple mediation models. The issue has not been studied in previous ESG studies which generally only used one mediation model. Specifically, the study examine whether the implementation of ESG can improve the effectiveness of green accounting and disclosure of corporate social responsibility (CSR) which can ultimately improve environmental performance. This study is important by developing a multiple mediating model that green accounting and CSR disclosure are the mediating variables of the relationship between ESG and environmental performance.

2. LITERATURE REVIEW

2.1. Theory of Legitimacy

This study is based on the theory of legitimation and signaling to build a model of the relationship between ESG, green accounting, CSR disclosure, and environmental performance. Legitimacy theory argues that an organization or company or entity performs actions that are deemed to be in accordance with the desired system of norms, values, and beliefs (Suchman, 1995). Legitimacy gap can arise if the value carried by the company is different from the existing value. The theory of legitimacy bases that the company can reduce the legitimacy gap by applying corporate ESG (Amarna et al., 2024).

Based on the signaling theory, ESG disclosure is believed to be able to give positive signals to all stakeholders because the entity is not solely racing for profit, but in its operational activities prioritizes the values, norms, and social values that exist in the community where the company operates (Buallay and Hamdan, 2019). ESG disclosure is expected to be a social investment to satisfy stakeholders who will contribute to the value of the company. The purpose of ESG disclosure is to reassure outsiders about the performance or capabilities of a company that is different from other companies in an industry. The signal is given so that investors and analysts can give it an assessment based on the actual condition of the company and not as low as companies whose performances are poor because it can harm managers (Melinda and Wardhani, 2020). Investors can receive signals from companies through ESG disclosures that address concerns about environmental, social, and corporate governance practices. As a positive signal for stakeholders, the company will act as much as possible to inform its environmental management performance.

2.2. Research Model Development

The implementation of ESG is needed in order to ensure the use of renewable energy, waste, clean water use, environmentally friendly products, natural resource conservation, and policies related to the environment can be used by companies to evaluate support for sustainability issues. When stakeholders consider that the business has a high level of sustainability, this will also attract their attention so that it is expected to be transformed into financial performance, including increased product sales. The responsibility of corporate management in the implementation of ESG has encouraged the development of the concept of green accounting or also known as environmental accounting (Khan and Gupta, 2023a; Adegbie et al., 2020). Green accounting is expected to play a role in identifying and measuring environmental costs and liabilities in financial statements so that environmental performance management will be better so as to encourage stronger corporate social responsibility. The implementation of ESG can encourage the optimal implementation of green accounting so that it can improve company performance in environmental management with waste reduction, optimal resource utilization, and reduced utility usage (Solovida and Latan, 2017; Khan and Gupta, 2023b; Deb et al., 2023). Agyemang et al. (2021) provide empirical evidence that the application of *green accounting* and environmental performance have a positive and significant relationship. The implementation of green accounting in this case provides information related to the economics of the environmental sector in a disciplined manner so that it can produce a high score on environmental performance.

By using the theory of legitimacy, it can be argued that companies that implement ESG practices are able to build good performance and image in the eyes of the public. The company's commitment and seriousness towards various aspects of sustainability as demonstrated by ESG performance can be seen and assessed by stakeholders positively. The relationship between the company and stakeholders must be well maintained because the quality of this relationship reflects the level of quality of their sustainability performance (Ratmono et al., 2024). Corporate disclosures related to social and environmental responsibility will be widely known by various stakeholders such as customers and investors who have the potential to substantially improve financial performance (Al Amosh et al., 2023). The study by Wahyuni et al. (2019) measured the application of green accounting in several variables, namely the use of recycled materials, environmental cost allocation, and the use of renewable energy. The research found that the three variables (use of recycled materials, environmental cost allocation, and use of renewable energy) had a positive and significant effect on environmental performance.

Companies use new fossil fuels such as coal, petroleum, and natural gas as well as other fuels that produce carbon dioxide. Therefore, companies in these sectors seek to disclose carbon emissions as a way to fulfil the company's responsibility for the surrounding environment and also as a consideration for investors in the assessment of the company.

Signal theory explains that the information conveyed, including information related to environmental impact management, can be a clue and signal about the real situation and future prospects of the company (Mavlanova et al., 2012). Performance in environmental management as assessed by the competent authorities will encourage different levels of corporate social responsibility (CSR) disclosure. Disclosure of environmental information by companies with poor environmental performance results in lower CSR disclosure compared to companies with good environmental performance (Guthrie and Parker, 1990; Khan and Gupta, 2023a). This happens because the company is under pressure from the government, society, the public, and other stakeholders. Empirical evidence by Burhany (2014), Al-Tuwaijri et al. (2004), and Kraus et al., (2020) show that CSR disclosure and environmental performance have a positive and significant relationship.

ESG disclosure is divided into three, namely environmental dimensions, social dimensions, and corporate governance dimensions. Each aspect has its own role and purpose. First, the environmental aspect of ESG which aims to provide an overview for external parties regarding the impact of the company's business operations and the company's concerns regarding the surrounding environment. Second, the social aspect of ESG offers information about the company's contribution in solving social problems and concern for social aspects outside or inside the company. Third, the governance aspect of ESG contains information on corporate governance as a form of corporate control in implementing good corporate governance (GCG) which is expected to minimize the occurrence of information asymmetry. Based on the legitimacy theory argument, the company will strive to provide information on environmental performance in conveying positive signals to investors that the company behaves as a good entity and does its best in matters related to environmental conservation (Jaggi et al., 2018). Managers strive to show a positive image in order to get a good perception from shareholders and stakeholders in order to ensure the company's performance runs optimally. Disclosure about the environmental care activities of entities such as in sustainability reporting is one of the means to obtain legitimacy (Ananzeh et al., 2023; Deb et al., 2023).

Green accounting is a method of measuring and reporting environmental impacts based on business activities that include the use of natural resources, emissions, and other impacts in which the available information can be used to formulate effective and relevant strategies, which can improve the company's credibility and reputation on the part of environmental sustainability (Gray, 2010). Burhany, (2014) Al-Tuwaijri et al., (2004), and Kraus et al., (2020) provide empirical evidence that CSR disclosure and environmental performance have a positive and significant influence. *Good news* containing information on reducing environmental risks and costs derived from environmental performance can be well received by investors.

Burhany (2014) provides empirical evidence that the implementation of environmental accounting has a positive and significant effect on the disclosure of environmental information. The implication is that it requires the implementation of expanded accounting by including environmental aspects in order to contribute to the environmental improvement and responsibility of the company. Green accounting provides information to internal and external parties of the company. The resulting information is the overall information from the company, starting from environmental strategy, environmental policy, risks and environmental profiles and financial aspects related to the environment. With this, green accounting can facilitate the disclosure of CSR in environmental aspects (Ratmono et al., 2024). Furthermore, the causality relationship between ESG, green accounting, and CSR disclosure will be able to improve environmental management performance. Based on theoretical arguments and previous research findings, this study develops models and hypotheses as shown in Figure 1.

3. METHODOLOGY

3.1. Population and Sample

The population used in this study were mining, energy, and manufacturing companies listed on the Indonesia Stock Exchange (IDX) and participating in an environmental performance assessment program in Indonesia called the Company Performance Rating Assessment Program in Environmental Management (PROPER) in 2017-2022. PROPER is a program held by the Ministry of Environment with the aim of encouraging the improvement of the company in managing the environment. Sample selection using purposive sampling method, with the following criteria:

1. Mining, energy, and manufacturing companies listed on IDX for the period 2017-2022; and
2. The Company publishes sustainability reports during the 2017-2021 period and can be accessed directly through the company's website during the 2017-2022 period and participates in the PROPER program for the 2017-2022 period.

Companies from the mining, energy, and manufacturing industries were selected as samples because their production activities have a direct impact on the environment. Based on the criteria that have been set, in total there are 114 firms-years used in data analysis.

3.2. Measurement of Variables

The independent/exogenous variable in this study is ESG implementation as measured by ESG Score from Bloomberg Databases. The first mediation variable is the adoption of green accounting by sample companies measured by three indicators, namely the use of recycled materials, green costs or allocation of operational costs for the environment, and renewable energy. While the second mediation variable in this study is the disclosure of CSR in the form of economic, environmental, and social aspects or known as the triple bottom line concept. Measurement of CSR disclosure using GRI index.

The dependent/endogenous variable is the environmental performance measured by the company's achievements in the program as assessed by the Ministry of Environment. PROPER ratings include compliance with water pollution control, air pollution, waste, environmental impact assessment, and marine pollution control.

3.3. Data Analysis

This study used the analysis technique of Partial Least Squares-Structural Equation Modeling (PLS-SEM) with the WarpPLS 8.0 software. PLS-SEM was used with several considerations of its advantages, including (Hair et al., 2022; Kock, 2020):

1. Able to provide several fit model indicators that can be useful for comparing the best model between different models, including: Average Path Coefficient (APC), Average R-Squared (ARS), Average Adjusted R-Squared (AARS), Average Block Variance Inflation Factor (AVIF), Average Full Collinearity VIF (AFVIF).
2. If there is a formative construct in the research model such as in this study, then only PLS-SEM can be used.

4. EMPIRICAL RESULTS

4.1. Descriptive Statistics

Table 1 presents descriptive statistics of variables in this study.

The ESG variable is measured by three indicators, namely environmental, social, and governance. With a maximum score of 100.00 as measured by Bloomberg, shown in Table 1 that the governance indicator has the highest mean of 77.10. While the other two indicators, namely environmental and social, are lower, even below 50.00. Compositely, the mean of the ESG variable is 52.41 out of a maximum score of 100.00. Mean ESG score shows that there is still no optimal implementation of ESG for a sample of companies in Indonesia. The adoption of green accounting was measured by three indicators, namely recycle material (RM), green cost (EC), and renewable energy (RE). The average use of RM is 894.248,02 with significant variations among the sample companies indicated by minimum, maximum, and standard deviation values. Likewise, GC and RE indicators also show considerable data variation. Environmental performance (EP) showed an average of 3.43 with a standard deviation of 0.58. This descriptive statistic shows the environmental performance of the company sample on the good criteria because this variable is measured on a scale of 1-5 as used in the PROPER assessment (1=very poor, 5=very good). The average CSR disclosure in Table 1 is 0.45 or 45% which shows the low CSR disclosure based on GRI criteria.

4.2. Hypothesis Testing Results

The stages of hypothesis testing in PLS-SEM analysis included outer model and inner model tests. In the outer model test stage, an evaluation was carried out to assess the feasibility of the latent variable indicators. This study used latent/unobserved ESG variables and green accounting that was measured using formative indicators. Analysis of the measurement model can be utilized from the feasibility of the formative indicator by looking at the significance value of weight and co-linearity (*variance inflation factor/VIF*). The result of measurement model using WarpPLS

Figure 1: Research model

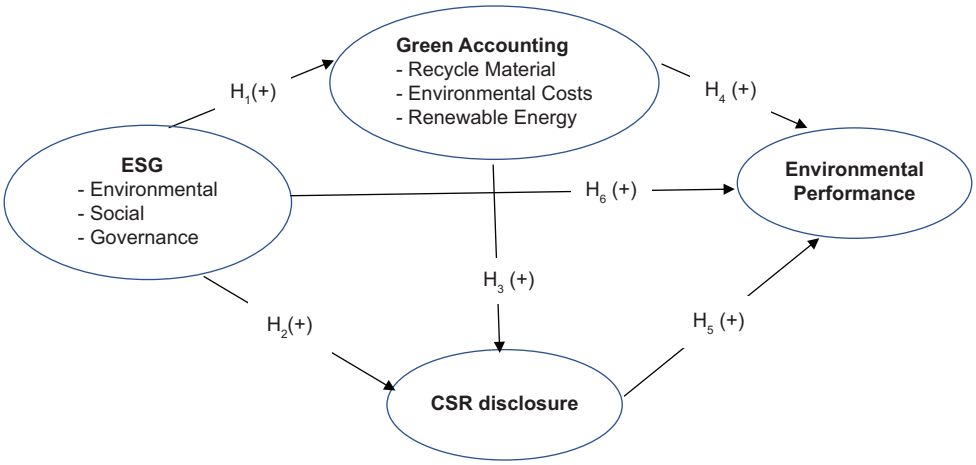

Table 1: Descriptive statistics

Variables/indicators	Minimum	Maximum	Mean	SD
ESG	27.63	73.87	52.41	9.18
Environmental score	2.11	80.40	41.87	17.97
Social score	14.00	58.62	35.79	9.13
Governance score	42.81	98.62	77.10	9.50
RM	0.20	26.475.597,00	849.284,02	3.234.536,08
GC	5.72	604.070.400	5.337.909	56.324.067
RE	0.00	33.663.176,00	954.686,08	4.290.627,77
CSR disclosure	0.10	0.97	0.45	0.20
Environmental performance	2.40	5.00	3.43	0.58

RE: Renewable energy, RM: Recycled material, GC: Green cost, ESG: Environmental, social, and governance, SD: Standard deviation

8.0 in Table 2 shows that P-value for weight significance of all indicators of formative variables <0.001 and co-linearity of all formative indicators shows VIF value <3.3. Thus, measurement model has fulfilled the criteria for formative constructs.

Table 3 presents the goodness of fit for the research model. The test results show that all goodness of fit criteria for PLS-SEM have been met. Therefore, the structural model data analysis can be continued with hypothesis testing.

Figure 2 presents the WarpPLS 8.0 output for the structural model test results.

Table 2: Results of outer model

Variables	Indicators	Weight	Type	P	VIF
ESG	Environmental	0.457	Formative	<0.001	1.225
	Social	0.531	Formative	<0.001	1.342
	Governance	0.372	Formative	<0.001	1.111
Green accounting	Recycled material	0.385	Formative	<0.001	1.060
	Green cost	0.482	Formative	<0.001	1.129
	Renewable energy	0.551	Formative	0.002	1.186

VIF: Variance inflation factor, ESG: Environmental, social, and governance

Table 3: Model fit and quality indices

Fit indicators	Results	P	Criteria
APC	0.244	0.002	P<0.05
ARS	0.180	0.012	P<0.05
AARS	0.165	0.017	P<0.05
AVIF	1.214		≤5.0
AFVIF	1.255		≤5.0
Tenenhaus GoF (GoF)	0.369		≥0.36 (large)
SPR	1.000		≥0.70
RSCR	1.000		≥0.90
SSR	1.000		≥0.70
Nonlinear bivariate causality direction ratio	0.833		≥0.70

APC: Average path coefficient, ARS: Average R-square, AARS: Average adjusted R-square, AVIF: Average block VIF, AFVIF: Average Full Collinearity VIF, SPR: Simpson's paradox ratio, RSCR: R-squared contribution ratio, SSR: Statistical suppression ratio

Table 4 presents a summary of the results of hypothesis testing. The test results provide empirical evidence that hypothesis 1, namely ESG has a positive effect on green accounting supported by a path coefficient of 0.455 and significant with a P < 0.001. Likewise, hypothesis 2, namely ESG has a positive effect on CSR disclosure supported by a path coefficient of 0.306 and significant with a P < 0.001. The PLS-SEM results in Table 4 also show support for the third hypothesis that green accounting has a positive effect on CSR disclosure (path coefficients=0.205, significant at alpha 5%). Furthermore, green accounting has a positive effect on environmental performance with a coefficient of 0.123 and significant at alpha 10%. Hypothesis 5 is also supported that CSR disclosure has a positive effect on environmental performance (path coefficients=0.138, significant at alpha 10%). ESG has a direct positive effect on environmental performance with path coefficients=0.240 and significant at alpha 1%.

The next stage is to test the mediation of green accounting and CSR disclosure variables in the relationship between ESG and environmental performance. The following procedures to test the mediation hypotheses are carried out according to the PLS-SEM literature (Nitzl et al., 2016; Hair et al., 2022):

1. Testing the indirect effect, $a \times b$ provides researchers with the information needed for testing mediation.
2. The strength of the indirect effect $a \times b$ determines the size of the mediation.
3. A bootstrap test is used to test the significance of the indirect effect $a \times b$.

The results of the mediation hypotheses testing are presented in Table 5.

Based on these procedures, the mediation analysis was based on the results of testing the significance of the standardized path coefficient (direct and indirect effect) with the PLS-SEM bootstrapping procedure (Hair et al., 2022). The test results presented in Table 5 show that the indirect effect of ESG on environmental performance through green accounting is statistically insignificant with an indirect effect path coefficient of 0.093 and a P = 0.143. Meanwhile, the indirect effect

Figure 2: Results of structural model

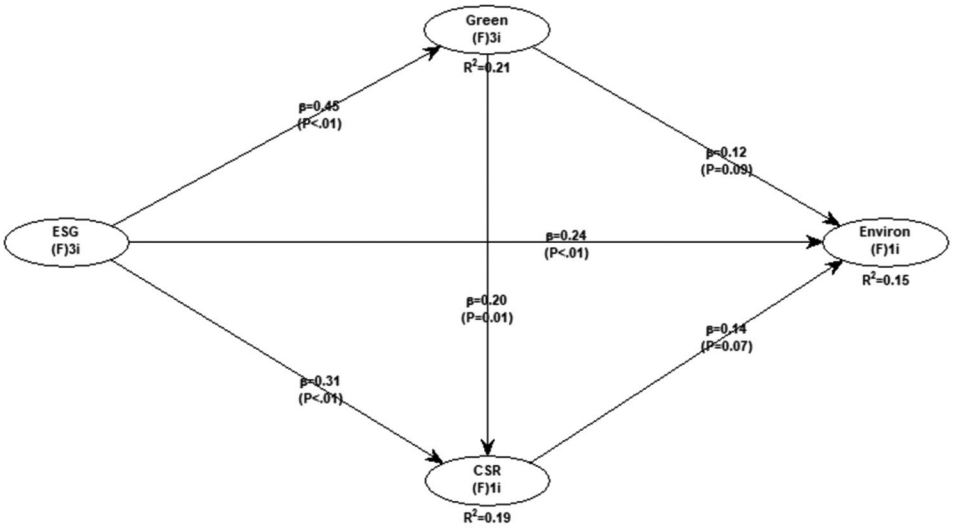

Table 4: Results of hypothesis testing

Structural/hypothesised paths	Coefficients (β)	t-statistics	P	Conclusion
ESG → Green accounting	0.455***	5.449	<0.001	Supported
ESG → CSR disclosure	0.306***	3.530	<0.001	Supported
Green accounting → CSR disclosure	0.205**	2.305	0.011	Supported
Green accounting → environmental performance	0.123*	1.357	0.089	Supported
CSR disclosure → environmental performance	0.138*	1.523	0.065	Supported
ESG → environmental performance	0.240***	2.723	0.004	Supported

*Significant at alpha 10%, **Significant at alpha 5%, ***Significant at alpha 1%. ESG: Environmental, social, and governance, CSR: Corporate social responsibility

Table 5: Results of the mediation effect test

Structural/hypothesized paths	Coefficient	P
Panel A: Indirect effectss		
ESG → Green accounting → environmental performance	0.093	0.143
ESG → CSR disclosure → environmental performance	0.098	0.076
ESG → Green accounting → CSR disclosure → environmental performance	0.028	0.334
Panel B: Direct effect		
ESG → Environmental performance	0.240	0.004

ESG: Environmental, social, and governance, CSR: Corporate social responsibility

of ESG on environmental performance through CSR disclosure is statistically significant with an indirect effect path coefficient of 0.098 and a P = 0.076 or significant at alpha 10%. The indirect effect of ESG on environmental performance through the two mediating variables at once, namely green accounting and CSR disclosure, is not significant with a P = 0.334. Meanwhile, the direct effect of ESG on environmental performance is significant with a path coefficient of 0.240 and a P = 0.004. The results of the multiple mediation analysis show that only CSR disclosure acts as a mediator in the positive influence of ESG on environmental performance. The results of this mediation test show that ESG can have a direct positive effect on environmental performance. CSR disclosure acts as a partial mediator which shows that the application of ESG followed by CSR disclosure will create a good image so that it provides good value in environmental performance. Meanwhile, the role of green accounting is still not optimal which is possible because it is still voluntary so it has not played a role as a mediating variable.

This study provides empirical evidence that supports the theory of legitimacy and signaling that the implementation of ESG can provide a good image for the company so that it obtains legitimacy from stakeholders and becomes a positive signal so that it gets a good environmental performance rating. The implementation of ESG provides an opportunity for companies to support sustainability, build a solid reputation, gain the trust of stakeholders, and contribute to addressing sustainable development issues at the national level (Chen et al., 2023). These findings support previous research on the positive effect of ESG application (Chen et al., 2023; Lu and Khan, 2023; Wu et al., 2022). This study also provides empirical evidence that ESG will encourage the application of adequate green accounting as a means to identify and measure environmental costs and liabilities into financial statements. The application of green accounting will lead to higher corporate social responsibility activities and better environmental performance. This empirical evidence supports the argument Eliwa et al. (2021) that companies need to provide something that can affect people's judgments to gain public recognition such as ESG disclosure.

The results of the PLS-SEM test show that the application of green accounting has a positive effect on the level of CSR disclosure and environmental performance. The better the implementation of green accounting, the more CSR activities the company reveals. In addition, the application of green accounting can improve environmental performance as the results of the assessment of the Ministry of Environment. The results of testing the first hypothesis in this study are in line with legitimacy theory. The application of green accounting is the recognition, measurement, reporting, and disclosure of environmental information related to social and the surrounding environment which is also expected that the information attached can improve management strategies in waste management, recycled materials, environmental costs, and renewable energy (Alsayegh, 2020; Khan and Gupta, 2023a). The empirical evidence of this study supports previous research, including Solovida and Latan (2017), Rounaghi (2019), Wahyuni et al. (2019), and Agyemang et al. (2021).

5. CONCLUSION

This study shows empirical evidence that shows support for the theory of legitimacy and signaling that ESG has a positive effect on the application of green accounting and CSR disclosure. Both mediation variables can improve environmental performance. In addition, ESG can also have a positive effect directly on environmental performance. These results provide empirical evidence of the importance of ESG implementation in companies in the current context where sustainability issues are a major issue due to environmental damage, the energy crisis, and global warming. The results of mediation testing show that CSR disclosure can act as a partial mediator so as to show support for signalling theory and the dominant role of impression management in environmental performance ranking.

Limitations of this study include the coefficient of determination test results showing that the environmental performance is only explained by 15.00% according to the adjusted R square results. This shows that there are other variables outside the research model that affect the disclosure of environmental performance. From the conclusions and limitations that have been stated, the researcher provides suggestions for future research, if the data is available, so that the number of samples of companies studied is increased and more varied in its industry to get more accurate results. Future research would be better if adding other variables that could influence the company's broad practice of ESG, green accounting and environmental management.

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