

CIRCULAR ECONOMY DISCLOSURE IN MINING COMPANIES : THE ROLE OF INSTITUTIONAL OWNERSHIP, AUDIT QUALITY, ENVIRONMENTAL MANAGEMENT SYSTEM (ISO 14001), AND ENVIRONMENTAL PERFORMANCE

Trisna Nasya Nurmalia Izzati¹, Dien Noviany Rahmatika², Irwan Prasetyo³, Yanti Pujiastutie⁴

¹⁻⁴ Faculty of Economic and Business, Tegal Pancasakti University, Indonesia

*Email corresponding author: trisanasyanurmaliaizzati@gmail.com

Article Information: Received --- June, 25 2026, Published --- August, 10 2026

Abstract

This study examines the effect of Institutional Ownership, Audit Quality, and Environmental Management System (ISO 14001) on the Transparency of Circular Economy Disclosure, with Environmental Performance as a moderating variable, in mining companies listed on the Indonesia Stock Exchange during 2021–2024. The study is motivated by growing environmental concerns arising from mining activities and the need for greater transparency in circular economy practices. This research is based on stakeholder theory, legitimacy theory, and signaling theory. A quantitative approach was employed using secondary data collected from annual reports, sustainability reports, company websites, and ISO 14001 certification data. The sample consists of 51 mining companies selected through purposive sampling from a population of 65 companies. Data were analyzed using multiple linear regression and Moderated Regression Analysis (MRA) with STATA 17. The results show that institutional ownership has a significant positive effect on the transparency of circular economy disclosure, indicating that higher institutional ownership encourages more transparent sustainability reporting. In contrast, audit quality and Environmental Management System (ISO 14001) have no significant effect on disclosure transparency. Furthermore, environmental performance does not significantly moderate the relationships between institutional ownership, audit quality, and ISO 14001 and the transparency of circular economy disclosure. These findings contribute to the sustainability accounting literature and provide insights for companies, investors, and regulators in improving sustainability disclosure transparency and environmental performance.

Keywords: Institutional Ownership, Audit Quality, Environmental Management System (ISO 14001), Environmental Performance, Circular Economy Disclosure.

INTRODUCTION

Environmental degradation caused by excessive exploitation of natural resources has become a major global issue, particularly in the mining sector which is closely associated with high environmental risks and waste generation (Vitolla et al., 2023). In Indonesia, the increasing number of environmental damage cases caused by mining activities indicates that environmental governance and sustainability practices have not been fully implemented effectively. The aforementioned circumstances compellingly underscore the necessity of embracing more sustainable methodologies through the adoption of circular economy principles, which prioritize resource efficiency, waste minimization, recycling initiatives, and broader environmental sustainability objectives (Albar & Sisdiyanto, 2024).

Transparency in circular economy disclosure has become increasingly important as a reflection of corporate commitment toward sustainability. Several factors are considered capable of influencing such transparency, including institutional ownership, audit quality, and

Environmental Management System (ISO 14001). Institutional ownership is projected to augment corporate monitoring capabilities while fostering expanded environmental transparency and disclosure (Eryadi et al., 2021). Meanwhile, superior audit quality has the potential to enhance the credibility of sustainability information disclosed by companies (Vellin et al., 2022). In addition, ISO 14001 certification is considered capable of encouraging more structured environmental management practices (Manurung et al., 2022). However, previous studies regarding the influence of these variables still show inconsistent findings, particularly within the mining sector (Oktarini et al., 2024; Wang et al., 2014; Seow, 2025; Kafel & Nowicki, 2022).

This study aims to examine the effect of institutional ownership, audit quality, and Environmental Management System (ISO 14001) on the transparency of circular economy disclosure, with environmental performance as a moderating variable in mining companies listed on the Indonesia Stock Exchange during 2021–2024. The scope of this research focuses on mining companies due to their significant environmental impact and increasing sustainability pressures.

The novelty of this research lies in the integration of institutional ownership, audit quality, and Environmental Management System (ISO 14001) in explaining the transparency of circular economy disclosure, while incorporating environmental performance as a moderating variable. Previous studies have generally examined the effect of institutional ownership on circular economy accounting information (Adam et al., 2025), audit quality on sustainability and environmental disclosure (Butar & Itan, 2025), and ISO 14001 on circular economy implementation and environmental disclosure (Hidayah & Anwar, 2023) separately. However, the existing literature has reported inconsistent findings, with some studies documenting positive effects, while others found insignificant or even negative relationships.

Furthermore, Harris et al. (2021) and Doan and Sassen (2020) investigated the relationship between environmental performance and environmental disclosure; however, they did not specifically examine the moderating role of environmental performance in the relationship between institutional ownership, audit quality, Environmental Management System, and circular economy disclosure transparency. Therefore, empirical studies that comprehensively investigate the combined effects of these variables on circular economy disclosure transparency, particularly in the Indonesian mining sector, remain underexplored. By addressing this gap, the present study is expected to enrich the sustainability accounting and corporate governance literature while providing a deeper understanding of the determinants of circular economy disclosure transparency.

This research extends the literature on circular economy disclosure by integrating institutional ownership, audit quality, and environmental management systems into a unified framework, while examining the moderating role of environmental performance. By focusing on the Indonesian mining sector, where studies on the determinants of circular economy disclosure transparency remain limited, this study addresses an important gap in the literature. Theoretically, it contributes to sustainability accounting, corporate governance, and environmental disclosure research by enhancing understanding of factors associated with circular economy disclosure transparency. Practically, the findings provide insights for companies, regulators, auditors, and investors in improving governance, environmental management, and sustainability reporting to support corporate accountability and sustainable development.

LITERATURE REVIEW AND HYPOTHESIS FORMULATION

Stakeholder Theory

Stakeholder theory posits that corporations bear responsibility not solely to their shareholders but also to all stakeholders influenced by corporate operations, encompassing societal actors, governmental bodies, investors, creditors, and environmental institutions (Freeman, 1984). Companies are expected to accommodate stakeholders' interests through transparent disclosures, particularly regarding sustainability and environmental responsibility. In the context of circular economy disclosure, stakeholder pressure encourages companies to provide

broader environmental information to maintain stakeholder trust and long-term relationships. Institutional ownership, audit quality, and Environmental Management System (EMS) implementation can function as monitoring and governance mechanisms that encourage companies to improve transparency related to circular economy practices. Moreover, environmental performance strengthens corporate accountability because companies with better environmental performance tend to disclose sustainability information more comprehensively.

Legitimacy Theory

Legitimacy theory states that companies seek legitimacy from society to ensure business continuity (Suchman, 1995). Organizations operate based on a social contract in which they are expected to align their activities with social values and environmental norms (Deegan, 2000). Environmental disclosure becomes an important mechanism for maintaining public legitimacy, particularly for mining companies whose operational activities potentially create environmental impacts. Circular economy disclosure serves as a legitimacy instrument because it demonstrates corporate commitment to waste reduction, resource efficiency, and environmental sustainability. Therefore, corporations endowed with more robust governance frameworks and comprehensive environmental management systems exhibit a greater propensity to disseminate circular economy information with transparency, thereby upholding social legitimacy and acceptance.

Signaling Theory

Signaling theory explains that companies provide signals to external parties to reduce information asymmetry and improve investor confidence (Spence, 1973). Sustainability-related disclosures, including circular economy disclosure, can be interpreted as positive signals regarding corporate commitment toward environmental responsibility and long-term sustainability. Institutional ownership, high audit quality, and ISO 14001 certification can be considered credible signals indicating that companies apply good governance and sustainable environmental management. Companies with superior environmental performance also tend to provide stronger sustainability signals through transparent disclosure practices.

Circular Economy Disclosure

Circular economy encompasses an economic paradigm predicated on waste minimization, resource utilization optimization, product refurbishment, and material recycling through closed-loop systems (Geng & Doberstein, 2008; Geissdoerfer et al., 2017). The concept aims to replace the traditional linear economy model characterized by “take-make-dispose” practices. Circular economy disclosure reflects the extent to which companies communicate information regarding resource efficiency, waste management, recycling, and sustainable operational practices. According to Dagiliene et al. (2020), circular economy practices not only reduce environmental impacts but also improve the quality of sustainability disclosure.

Institutional Ownership and Circular Economy Disclosure

Institutional ownership represents the proportion of shares owned by institutional investors such as banks, insurance companies, and investment institutions. Institutional investors generally possess stronger monitoring capabilities that encourage management to improve transparency and accountability (Yani & Suputra, 2020). From the stakeholder theory perspective, institutional investors demand broader sustainability information because they have long-term interests in corporate sustainability performance. Signaling theory also suggests that companies with high institutional ownership tend to disclose circular economy information to signal their commitment toward sustainable business practices. However, the influence of institutional ownership on sustainability disclosure remains inconclusive. Although institutional investors are expected to strengthen corporate transparency, they may also prioritize financial performance and shareholder value maximization, thereby reducing managerial incentives to provide extensive voluntary

environmental disclosures. Consistent with this argument, Oktarini et al. (2024) found that institutional ownership negatively affects sustainability-related disclosure. In contrast, previous studies by Wang et al. (2024) and Adam et al. (2025) found that institutional ownership positively influences circular economy disclosure. Therefore, the first hypothesis is formulated as follows:

H1: Institutional Ownership positively affects Circular Economy Disclosure.

Audit Quality and Circular Economy Disclosure

Audit quality reflects the auditor's ability to detect and report material misstatements independently and competently (DeAngelo, 1981). High-quality audits improve the credibility of both financial and non-financial disclosures, including sustainability reporting. Based on legitimacy theory, companies audited by high-quality auditors are more likely to gain public trust because their disclosures are perceived as more reliable. Prior studies by Faieq and Cek (2024), Imoniana et al. (2021), and Rukanova et al. (2021) indicate that audit quality positively contributes to circular economy implementation and sustainability transparency. However, the relationship between audit quality and sustainability-related disclosure remains inconclusive. Since Circular Economy Disclosure is largely voluntary and generally falls outside the primary scope of financial statement audits, high-quality auditors may not necessarily influence the extent of such disclosure. Consistent with this view, Seow (2025) found that audit quality does not have a significant effect on sustainability disclosure. Nevertheless, based on legitimacy theory and the expected role of auditors in enhancing disclosure credibility, audit quality is expected to positively affect Circular Economy Disclosure. Therefore, the second hypothesis is proposed as follows:

H2: Audit Quality positively affects Circular Economy Disclosure.

Environmental Management System (ISO 14001) and Circular Economy Disclosure

Environmental Management System (EMS) based on ISO 14001 is an internationally recognized environmental management framework that helps organizations systematically manage environmental risks and improve environmental performance (Wahdah & Jayanti, 2023). Stakeholder theory suggests that companies implementing ISO 14001 seek to fulfill stakeholder expectations regarding environmental responsibility. Legitimacy theory also explains that ISO 14001 certification enhances corporate legitimacy because it reflects formal environmental commitment. Furthermore, signaling theory views ISO 14001 as a positive signal regarding corporate sustainability orientation. Studies conducted by Kafel and Nowicki (2022), Jain et al. (2020), and Dorado et al. (2022) found that ISO 14001 positively supports circular economy implementation. However, the relationship between ISO 14001 certification and sustainability-related disclosure remains inconclusive.

Although ISO 14001 reflects a company's commitment to environmental management, certification alone does not necessarily guarantee broader environmental transparency or disclosure practices. In some cases, firms may adopt ISO 14001 primarily to comply with regulatory requirements, enhance corporate reputation, or maintain legitimacy without substantially increasing the extent of sustainability disclosure. Consistent with this view, Hidayah and Anwar (2023) found that Environmental Management System implementation has a significant negative effect on sustainability-related disclosure. Nevertheless, based on stakeholder theory, legitimacy theory, and signaling theory, companies with ISO 14001 certification are expected to demonstrate greater commitment to sustainability transparency. Therefore, the third hypothesis is formulated as follows:

H3: Environmental Management System (ISO 14001) positively affects Circular Economy Disclosure.

The Moderating Role of Environmental Performance on the Relationship between Institutional Ownership and Circular Economy Disclosure

Environmental performance reflects how effectively companies manage and reduce environmental impacts arising from operational activities. Institutional investors tend to encourage sustainability transparency more strongly when companies demonstrate good environmental performance. Under signaling theory, companies with strong environmental performance use circular economy disclosure as a strategic signal to demonstrate that institutional monitoring has successfully encouraged sustainable corporate governance. Strong environmental performance may increase the credibility of sustainability-related information and strengthen institutional investors' incentives to demand broader environmental disclosure. However, in certain circumstances, environmental performance may also reduce the need for additional disclosure if stakeholders already perceive the company as environmentally responsible based on its performance achievements. As a result, the influence of institutional ownership on disclosure practices may become less pronounced. Nevertheless, because strong environmental performance generally enhances the effectiveness of governance mechanisms in promoting sustainability transparency, environmental performance is expected to strengthen the influence of institutional ownership on circular economy disclosure. Thus, the fourth hypothesis is formulated as follows:

H4: Environmental Performance strengthens the effect of Institutional Ownership on Circular Economy Disclosure.

The Moderating Role of Environmental Performance on the Relationship between Audit Quality, Environmental Management System (ISO 14001) and Circular Economy Disclosure

Environmental performance reflects a company's actual environmental achievements and serves as a strong source of legitimacy and credibility for stakeholders. According to legitimacy and signaling theories, stakeholders tend to place greater value on tangible environmental outcomes than on external assurance or formal environmental management certifications. Consequently, when a company demonstrates high environmental performance, the importance of audit quality and ISO 14001 certification in encouraging circular economy disclosure may diminish, as stakeholders can directly assess the company's environmental commitment through its performance. Although audit quality and environmental management systems remain important governance mechanisms that support disclosure credibility, their role may become less prominent when companies are already able to demonstrate strong environmental performance.

On the other hand, strong environmental performance may also enhance the effectiveness of audit quality and environmental management systems by increasing stakeholder confidence in the credibility of sustainability-related information. Furthermore, when environmental performance, audit quality, and ISO 14001 certification provide overlapping signals regarding a company's environmental commitment, the moderating effect of environmental performance may become less apparent. Nevertheless, because stakeholders may prioritize actual environmental outcomes over supporting governance and certification mechanisms, environmental performance is expected to weaken the influence of both audit quality and environmental management systems (ISO 14001) on circular economy disclosure.

H5: Environmental Performance weakens the effect of Audit Quality on Circular Economy Disclosure.

H6: Environmental Performance weakens the effect of Environmental Management System (ISO 14001) on Circular Economy Disclosure.

RESEARCH METHODS

This study employed a quantitative research design based on the positivism paradigm. Quantitative research is used to examine relationships among variables through statistical analysis and hypothesis testing. The study aims to analyze the effect of Institutional Ownership, Audit Quality, and Environmental Management System (ISO 14001) on Circular Economy Disclosure, with Environmental Performance serving as a moderating variable. The research utilized secondary data

obtained from annual reports, sustainability reports, company websites, and ISO 14001 certification data of mining companies listed on the Indonesia Stock Exchange (IDX) during the 2021–2024 period.

The population of this study consisted of all mining sector companies listed on the Indonesia Stock Exchange (IDX) from 2021 to 2024, totaling 65 companies. The sampling technique used was purposive sampling, which selected samples based on specific criteria relevant to the research objectives. Of the 65 companies, 6 companies were excluded because they did not consistently publish audited annual reports during the 2021–2024 period, 4 companies were excluded due to the unavailability of sustainability reports, and 4 companies were excluded because they were delisted during the observation period. As a result, 51 companies met the sample criteria and were selected for the study. With four years of observation, the total number of observations amounted to 204 firm-year data. Data were collected using documentation methods to collect secondary data from company annual reports, sustainability reports, official company websites, and ISO 14001 certification records. The data were accessed primarily through the official website of the Indonesia Stock Exchange (IDX).

The research instrument was constructed utilizing variable measurement indicators derived from prior empirical studies and established sustainability reporting frameworks. Specifically, Circular Economy Disclosure was quantified through a disclosure index measuring the frequency of circular economy elements disclosed by the respective corporation. Institutional Ownership was operationalized by calculating the proportional ratio of institutional shareholdings relative to total outstanding shares. Audit Quality was measured employing a binary (dummy) variable framework, wherein firms audited by Big Four accounting firms were coded as 1, while those audited by non-Big Four firms were coded as 0. Similarly, Environmental Management System (ISO 14001) certification was measured using a dummy variable, where companies possessing ISO 14001 certification were assigned a value of 1, and those without such certification were assigned a value of 0. Environmental Performance was quantified utilizing the Global Reporting Initiative (GRI 300) environmental disclosure indicators as the measurement benchmark.

Table 1. Table of Variabel Measurement

Variabel	Measurement	Scale	Source
<i>Circular Economy Disclosure</i>	$CE = \frac{\sum \text{Circular Economy Items Reported}}{\text{Total Disclosure Items}}$	Ratio	(Gunady & Shanti, 2025)
<i>Institutional Ownership</i>	$IO = \frac{\text{Shared Owned by Institutional Ownership}}{\text{Total Outstanding Shares}}$	Ratio	(Sari et al., 2025)
<i>Audit Quality</i>	Dummy = 1 if audited by Big Four firms, while 0 if audited by Non-Big Four firms	Nominal	(Jonathan & Sinaga, 2022)
<i>Environmental Management System (ISO 14001)</i>	Dummy = 1 where companies possessing ISO 14001 certification; 0 while without certification	Nominal	(Puteri & Inawati, 2023)
<i>Environmental Performance</i>	$EP = \frac{\sum \text{Environmental Items Disclosed}}{\text{Total GRI 300 Indicators}}$	Ratio	(Handoyo, 2021)

The collected data were analyzed quantitatively using STATA version 17 software. The analysis techniques included descriptive statistical analysis to summarize the characteristics of research variables. Prior to hypothesis testing, the appropriate panel data model was determined

through the Chow test, Hausman test, and Lagrange Multiplier (LM) test to select the most suitable model among the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). Hypothesis testing was performed using multiple linear regression analysis and Moderated Regression Analysis (MRA) to examine the moderating role of environmental performance in the relationship between institutional ownership, audit quality, and environmental management system. The significance of the estimated coefficients was evaluated using three confidence levels, namely 10%, 5%, and 1%, to determine the robustness of the research findings. The regression models are specified as follows :

1. $CE = a + \beta_1 IO + \beta_2 AQ + \beta_3 EMS + \varepsilon$ (1)
2. $CE = a + \beta_1 IO + \beta_2 AQ + \beta_3 EMS + \beta_4 IO(EP) + \beta_5 AQ(EP) + \beta_6 EMS(EP) + \varepsilon$(2)

RESULTS AND DISCUSSION

Descriptive Statistic

Descriptive statistical analysis was performed to provide an overview of the characteristics and distributional properties of the research variables, based on a sample of 204 firm-year observations. The findings are presented in Table 2.

Table 2. Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Circular Economy (CE)	204	.624	.159	.25	.9
Institutional Ownership	204	.748	.277	0	1
Audit Quality	204	.294	.457	0	1
Environmental Management System	204	.652	.478	0	1
Environmental Performance	204	.766	.158	.4	1.167

Based on Table 2, the Circular Economy (CE) disclosure variable has a mean value of 0.624 with a standard deviation of 0.159, indicating a moderate level of variation among the sampled firms. Institutional Ownership records a mean of 0.748 and a standard deviation of 0.277, suggesting that institutional investors hold a substantial proportion of shares across the sample. The Audit Quality variable has an average value of 0.294 with a standard deviation of 0.457, implying that firms audited by high-quality auditors account for a relatively smaller proportion of the observations. Furthermore, Environmental Management System exhibits a mean value of 0.652 and a standard deviation of 0.478, indicating that a majority of the firms have adopted ISO 14001 certification. The Environmental Performance has a mean value of 0.766 and a standard deviation of 0.158, reflecting relatively consistent environmental performance across the sampled firms.

Panel Data Model Selection

To identify the most appropriate panel data regression model, a sequential series of model selection diagnostic tests was performed, encompassing the Chow Test, Lagrange Multiplier (LM) Test, and Hausman Test. The outcomes of these diagnostic procedures are delineated in Table 3.

Table 3. Panel Data Model Selection Results

Test	Statistic	Probability	Selected Model
Chow Test	F = 4.69	0.0000	FEM
LM Test	Chibar ² = 49.14	0.0000	REM
Hausman Test	Chi ² = 25.98	0.0005	FEM

Table 3 illustrates that the Chow test yielded a p-value of 0.0000, thereby indicating that the Fixed Effect Model (FEM) is statistically preferred over the Common Effect Model (CEM). Likewise, the LM test produced a p-value of 0.0000, suggesting that the Random Effect Model (REM)

demonstrates superior explanatory power compared to the CEM. To determine the appropriate selection between FEM and REM, the Hausman test was subsequently employed. The test generated a p-value of 0.0005, which is statistically significant at the 5% significance level. Accordingly, the null hypothesis was rejected, thereby Confirming that the FEM is more appropriate than the REM. Based on these diagnostic findings, the Fixed Effect Model (FEM) was adopted as the final estimation model and subsequently utilized for hypothesis testing and moderation analysis.

Multicollinearity Test

To assess the validity of the regression model, a multicollinearity diagnostic was conducted employing the Variance Inflation Factor (VIF) and Tolerance metrics. A VIF value below 10 and a Tolerance value above 0.10 are indicative of no significant multicollinearity among the independent variables. The results are presented in Table 4.

Table 4. Variance Inflation Factor

Variable	VIF	1/VIF
Environmental Management System	1.232	.812
Audit Quality	1.202	.832
Environmental Performance	1.141	.876
Institutional Ownership	1.083	.922
Mean VIF	1.164	.

Table 4 shows that all variables have VIF values ranging from 1.083 to 1.232 and Tolerance values ranging from 0.812 to 0.924. Since all VIF values are below 10 and all Tolerance values exceed 0.10, the model is free from multicollinearity problems. Therefore, the independent variables can be included in the regression analysis without concern for multicollinearity and appropriate for further analysis and hypothesis testing.

Autocorrelation Test

A diagnostic assessment for autocorrelation was conducted using the Wooldridge test to identify the presence of serial correlation in the panel data model. The null hypothesis states that there is no first-order autocorrelation. The result are presented below.

Wooldridge test for autocorrelation in panel data

H0: no first-order autocorrelation

F(1, 50) = 1.607

Prob > F = 0.2108

That result reports the Wooldridge test results with an F-statistic of 1.607 and a probability value (Prob > F) of 0.2108. Since the p-value is greater than 0.05, the null hypothesis cannot be rejected. Therefore, the model does not exhibit first-order autocorrelation, indicating that the regression model satisfies the autocorrelation assumption and is appropriate for further analysis and hypothesis testing.

Robust Standard Error Estimation

To address potential heteroscedasticity issues commonly encountered in panel data analysis, this study employed robust standard errors in the Fixed Effects Model estimation.

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: $\sigma(i)^2 = \sigma^2$ for all i

chi2 (51) = 5.3e+06
Prob>chi2 = 0.0000

The results of the Modified Wald Test revealed a Prob > chi² value of 0.0000 ($p < 0.05$), indicating the presence of heteroscedasticity across panel units. Therefore, robust standard errors were applied to mitigate potential bias in the estimation of standard errors caused by heteroscedasticity. This approach enhances the accuracy of standard error estimation and ensures more reliable hypothesis testing, even when the assumption of homoscedasticity is not satisfied.

Moderated Regression Analysis

To examine the direct effects of institutional ownership, audit quality, and environmental management systems on circular economy performance, as well as the moderating role of environmental performance, this study employs a Fixed-Effects panel regression model. The Fixed-Effects approach was selected to control for unobserved firm-specific characteristics that may influence circular economy performance. The regression results are presented in Table 6

Table 6. Regression result

Circular Economy (CE)	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Institutional Ownership (IO)	.531	.239	2.22	.031	.051	1.012	**
Audit Quality (AQ)	-.167	.139	-1.20	.236	-.447	.113	
Environmental Management System (EMS)	.255	.177	1.44	.156	-.101	.61	
Environmental Performance (EP)	1.283	.25	5.13	0	.78	1.786	***
IOxEP	-.544	.283	-1.92	.06	-1.113	.025	*
AQxEP	.16	.164	0.98	.333	-.169	.488	
EMSxEP	-.295	.227	-1.30	.198	-.751	.16	
Constant	-.441	.195	-2.26	.028	-.833	-.049	**
Mean dependent var		0.624	SD dependent var			0.159	
R-squared		0.504	Number of obs			204	
F-test		21.232	Prob > F			0.000	
Akaike crit. (AIC)		-418.193	Bayesian crit. (BIC)			-394.966	

*** $p < .01$, ** $p < .05$, * $p < .1$

Based on Table 6, the fixed-effects regression model is statistically significant, as indicated by an F-statistic of 21.232 and a probability value of 0.000. The within R² value of 0.504 suggests that approximately 50.4% of the variation in Circular Economy Disclosure can be explained by the independent, moderating, and interaction variables included in the model, while the remaining 49.6% is explained by other factors outside the model. The results show that Institutional Ownership has a significant positive effect on Circular Economy Disclosure ($\beta = 0.531$; $p = 0.031$), whereas Audit Quality ($\beta = -0.167$; $p = 0.236$) and Environmental Management System ($\beta = 0.255$; $p = 0.156$) do not have significant effects on Circular Economy Disclosure. Environmental Performance has a positive and statistically significant effect on Circular Economy Disclosure ($\beta = 1.283$; $p = 0.000$), indicating that companies with better environmental performance tend to provide more extensive Circular Economy Disclosure.

Regarding the moderating effects, the interaction between Institutional Ownership and Environmental Performance (IO × EP) has a negative coefficient and is marginally significant at the 10% significance level ($\beta = -0.544$; $p = 0.060$), suggesting that Environmental Performance weakens

the relationship between Institutional Ownership and Circular Economy Disclosure. Meanwhile, the interaction between Audit Quality and Environmental Performance (AQ $\times$ EP) is positive but not statistically significant ($\beta = 0.160$; $p = 0.333$), indicating that Environmental Performance does not moderate the relationship between Audit Quality and Circular Economy Disclosure. Similarly, the interaction between Environmental Management System and Environmental Performance (EMS $\times$ EP) is negative and statistically insignificant ($\beta = -0.295$; $p = 0.198$), suggesting that Environmental Performance does not moderate the relationship between Environmental Management System and Circular Economy Disclosure.

Hypothesis Testing

H1: Institutional Ownership positively affects Circular Economy Disclosure.

The results indicate that Institutional Ownership has a positive and statistically significant effect on Circular Economy Disclosure ($\beta = 0.531$, $p = 0.031$). This finding supports the prediction derived from Stakeholder Theory, which suggests that institutional investors play an important role in encouraging greater corporate transparency and accountability. Institutional investors generally possess stronger monitoring capabilities and greater access to information than individual investors, enabling them to exert pressure on management to disclose more comprehensive sustainability-related information. As major stakeholders with long-term investment interests, institutional investors tend to demand broader environmental and social disclosures to evaluate corporate sustainability performance and reduce information asymmetry. From the perspective of Signaling Theory, companies with higher institutional ownership may be more motivated to disclose circular economy information as a signal of their commitment to sustainable business practices and responsible resource management. Extensive Circular Economy Disclosure can enhance corporate credibility and strengthen investor confidence by demonstrating that the company actively integrates sustainability principles into its operations.

Consequently, stronger institutional ownership may encourage management to provide more transparent and comprehensive disclosure regarding circular economy initiatives. This finding is consistent with Wang et al. (2024) and Adam et al. (2025), who found that institutional ownership positively influences Circular Economy Disclosure. Their studies suggest that institutional investors can act as effective monitoring mechanisms that encourage companies to improve sustainability transparency and disclosure quality. Therefore, higher institutional ownership contributes to greater Circular Economy Disclosure, supporting the argument that institutional investors play a significant role in promoting corporate sustainability reporting. Accordingly, H1 is supported.

H2: Audit Quality positively affects Circular Economy Disclosure.

The results show that Audit Quality has a negative but statistically insignificant effect on Circular Economy Disclosure ($\beta = -0.167$; $p = 0.236$), indicating that companies audited by higher-quality auditors do not necessarily provide broader disclosure. This may occur because Circular Economy Disclosure is largely voluntary and falls outside the primary scope of financial statement audits, which focus on the fairness and reliability of financial reporting. In addition, the absence of specific auditing standards for evaluating Circular Economy Disclosure means that disclosure practices remain largely dependent on managerial discretion rather than audit quality.

These findings do not fully support Legitimacy Theory, as higher audit quality does not necessarily lead to greater sustainability transparency. Companies may instead seek legitimacy through environmental performance or regulatory compliance. The relatively low proportion of firms audited by Big Four auditors may also contribute to the insignificant relationship observed. Consistent with Seow (2025), the results suggest that while audit quality enhances financial reporting credibility, it has limited influence on voluntary Circular Economy Disclosure. Accordingly, H2 is not supported.

H3: Environmental Management System (ISO 14001) positively affects Circular Economy Disclosure.

The regression results reveal that Environmental Management System (ISO 14001) has a positive but statistically insignificant effect on Circular Economy Disclosure ($\beta = 0.255$; $p = 0.156$), indicating that ISO 14001 certification alone does not necessarily encourage broader disclosure of circular economy practices. Although ISO 14001 reflects a company's commitment to environmental management, the certification primarily emphasizes environmental management processes and continuous improvement rather than extensive disclosure requirements. Consequently, companies may implement ISO 14001 to comply with regulations, enhance reputation, or maintain legitimacy without substantially increasing sustainability-related disclosure.

This finding does not fully support the expectations of Legitimacy Theory and Signaling Theory, which suggest that ISO 14001 certification should motivate firms to communicate their environmental commitment more extensively. The result implies that certification itself may be perceived as sufficient evidence of environmental responsibility, reducing the incentive for additional disclosure. Furthermore, the limited adoption of ISO 14001 among sampled mining companies may explain its insignificant influence on Circular Economy Disclosure. This finding is consistent with Hidayah and Anwar (2023), who also found that environmental management systems do not necessarily lead to broader sustainability disclosure. Therefore, Environmental Management System (ISO 14001) appears to have limited influence on voluntary Circular Economy Disclosure practices. Accordingly, H3 is not supported.

H4: Environmental Performance strengthens the effect of Institutional Ownership on Circular Economy Disclosure.

The interaction between Institutional Ownership and Environmental Performance has a negative and statistically insignificant effect on Circular Economy Disclosure ($\beta = -0.544$, $p = 0.060$), indicating that Environmental Performance does not strengthen the relationship as hypothesized. Instead, the negative coefficient suggests that strong environmental performance may reduce the influence of institutional ownership on Circular Economy Disclosure. When companies achieve high environmental performance, stakeholders may already perceive them as environmentally responsible, reducing the need for additional sustainability disclosure encouraged by institutional investors. In this context, environmental performance itself acts as a credible signal of environmental commitment, diminishing the monitoring role of institutional ownership.

From the perspective of Signaling Theory, stakeholders may place greater emphasis on actual environmental outcomes than on governance mechanisms such as institutional ownership. As a result, companies with strong environmental performance may rely on their environmental achievements rather than expanding Circular Economy Disclosure to gain stakeholder trust. Furthermore, the insignificant moderating effect indicates that environmental performance does not meaningfully alter the relationship between institutional ownership and Circular Economy Disclosure. Therefore, Environmental Performance cannot be considered a significant moderating variable in the relationship between Institutional Ownership and Circular Economy Disclosure. Accordingly, H4 is not supported.

H5: Environmental Performance weakens the effect of Audit Quality on Circular Economy Disclosure.

The interaction term between Audit Quality and Environmental Performance is positive but statistically insignificant ($\beta = 0.160$, $p = 0.333$). Since the p-value exceeds 0.05, Environmental Performance does not significantly moderate the relationship between Audit Quality and Circular Economy Disclosure. Although the positive coefficient indicates a tendency toward a strengthening effect, the relationship is not statistically significant. Therefore, H5 is not supported.

This finding is consistent with the alternative argument proposed in the hypothesis development section, which suggests that Environmental Performance and Audit Quality may

provide overlapping signals regarding a company's commitment to sustainability. While strong environmental performance may enhance stakeholder confidence in sustainability-related information, it does not necessarily increase the influence of audit quality on Circular Economy Disclosure. As a result, the moderating role of Environmental Performance becomes less apparent, indicating that the relationship between Audit Quality and Circular Economy Disclosure remains relatively unchanged regardless of the level of environmental performance achieved by the company.

H6: Environmental Performance weakens the effect of Environmental Management System (ISO 14001) on Circular Economy Disclosure.

The interaction term between Environmental Management System and Environmental Performance has a negative but statistically insignificant coefficient ($\beta = -0.295$, $p = 0.198$). Since the p-value exceeds 0.05, Environmental Performance does not significantly moderate the relationship between Environmental Management System and Circular Economy Disclosure. Although the coefficient direction is consistent with the proposed weakening effect, the absence of statistical significance indicates that Environmental Performance does not meaningfully alter the influence of ISO 14001 certification on disclosure practices. Therefore, H6 is not supported.

This finding is consistent with the argument proposed in the hypothesis development section, which suggests that stakeholders may place greater emphasis on actual environmental achievements than on formal environmental management certifications. Consequently, when companies demonstrate strong environmental performance, the role of ISO 14001 certification in encouraging broader Circular Economy Disclosure may become less prominent. However, the insignificant moderating effect indicates that Environmental Performance is not strong enough to substantially weaken the relationship between Environmental Management System and Circular Economy Disclosure. This result also supports the alternative argument that Environmental Performance and ISO 14001 certification may provide overlapping signals regarding a company's environmental commitment, making the moderating influence of Environmental Performance less apparent.

CONCLUSION

This study examines the effect of Institutional Ownership, Audit Quality, and Environmental Management System (ISO 14001) on Circular Economy Disclosure (CED), with Environmental Performance acting as a moderating variable in mining companies listed on the Indonesia Stock Exchange. The results show that institutional ownership has a significant positive effect on circular economy disclosure, while audit quality and ISO 14001 do not significantly affect on circular economy disclosure transparency. Furthermore, environmental performance is found to strengthen the relationship between institutional ownership and circular economy disclosure, but it does not moderate the relationships between audit quality, ISO 14001, and circular economy disclosure. The findings also reveal that Environmental Performance has a significant positive effect on Circular Economy Disclosure. Furthermore, Environmental Performance does not significantly moderate the relationships between Institutional Ownership, Audit Quality, Environmental Management System (ISO 14001), and Circular Economy Disclosure. These results indicate that Environmental Performance contributes directly to Circular Economy Disclosure rather than altering the influence of the governance and environmental management mechanisms examined in this study.

Building upon these findings, this study provides several practical implications for companies and regulators. Mining companies are encouraged to improve both environmental performance and the quality of circular economy disclosure to strengthen stakeholder trust and demonstrate their commitment to sustainable business practices. Since Environmental Performance is found to directly influence Circular Economy Disclosure, companies should focus on achieving tangible environmental outcomes while communicating these achievements transparently to stakeholders.

In addition, regulators may consider developing more comprehensive reporting guidelines related to circular economy activities to improve the consistency and comparability of sustainability disclosures across companies.

However, this study is not without limitations. The research focuses only on mining companies listed on the Indonesia Stock Exchange during the 2021–2024 period and examines a limited number of explanatory variables, namely institutional ownership, audit quality, ISO 14001, and environmental performance. Therefore, future research is recommended to expand the scope of analysis by including other industrial sectors, extending the observation period, and incorporating additional variables such as corporate governance characteristics, profitability, firm size, stakeholder pressure, or ESG performance. Such efforts are expected to provide a more comprehensive understanding of the determinants of Circular Economy Disclosure and the mechanisms through which companies communicate their sustainability commitments.

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