



Green Accounting and Environmental Performance on Financial Performance: Strategic Insights from the Mining Industry in Indonesia

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Abstract. *The increasing degradation of the environment and growing demand for sustainability have shifted the paradigm in assessing corporate performance. Sustainability has three dimensions beyond profit, called the triple bottom line. The mining sector has critical strategic significance for economic growth, although entwined with high environmental hazards. Using EViews tool, this study explores green accounting and environmental performance's impact on financial performance of the business. Despite being based on data from financial statements, annual and corporate sustainability reports, the results are of paramount importance and read like this. These studies show that environmental performance has a strong and positive impact on financial performance, confirming the financial relevance of sustainability initiatives. In contrast, green accounting methods have no significant effects on financial results, indicating a disconnect between conventional accounting scopes and viable eco-initiatives. Collectively, these factors have a material impact on corporate performance. The research sectoral focus and sample confines its generalisability. Future studies need to explore intervening or moderating models and incorporate further variables in order to deepen understanding and broaden applicability. Our study adds to the existing literature debates about how environmental sustainability can be reconciled with corporate financial performance.*

Keywords: *Green accounting, financial performance, environmental performance, mining sector, triple bottom line*

1. Introduction

In this day and age, where there is an increasing understanding of issues related to sustainability, corporate strategies now extend beyond financial profit (1). Business sustainability practices, such as Green accounting and environmental excellence, should become a part of the company's operation (2,3). This understanding means a rejection of conventional economic models in favor of the triple-bottom-line approach, which involves economic, social, and environmental factors (4). Thus, the fundamental Indonesian industries of agriculture and mining transformed in the sense of this approach. According to the calculations of Statistics Indonesia, the mining sector brought to GDP about 11.8 percent of the Indonesian GDP in 2022, which signifies its strategic character (5,6).

The export of three major goods, coal, nickel, and gold, gave more than 45 billion USD, showing the economic importance of this sector (7). Nevertheless, this industry is associated with severe ecological decline, such as deforestation, biodiversity loss, and

pollution. For example, according to data from the Ministry of Environment and Forestry, mining gave 15 percent of Indonesia's deforestation from 2015 to 2020 (8). In addition, the extraction processes usually are accompanied by soil, air, and water pollution, which affects the well-being of humans and other ecosystems. However, at the level of regional development, the mining industry plays a significant positive role, as it creates local jobs and promotes infrastructure development (9). In places with huge mineral deposits, the mining sector stimulates socio-economic development projects that lead to access to better education, health systems, and utilities (10). Thus, investments in regions where coal extraction is significant greatly influences the regional infrastructure and social benefits, as in Kalimantan (11). Since each benefit is related to a certain environment loss, it is essential for technological companies to embrace sustainability (12).

It adds to existing literature on Stakeholder Theory and Legitimacy Theory (13). (14) Stakeholder Theory argues that the interests of customers, creditors, governments and communities all must also be part of a company's responsibility. Firms should create value for all stakeholders by integrating social and environmental factors in their business (15). In the same vein with Lindblom's idea of Legitimacy Theory, (16) came with the idea that companies gain legitimacy through their values alignment with the society in which they operate. Transparency in environmental indicators (e.g. AA 1000 standards) helps in building trust and favorable response from the society (17,18).

Green accounting provides the path to transparency through the inclusion of environmental costs in financial statements and effective decision-making (19,20). While studies like (21) argue for a relationship between green accounting and corporate reputation, the nature of the impact on financial performance is still debated (22). In contrast, environmental performance, such as that which is measured through Indonesia's PROPER program, has displayed a steady positive relationship with profitability (23). Between 2018 and 2022, businesses with a PROPER gold rating recorded an average ROA growth of 5%, while businesses with lower levels of ratings reported lower growth (25). This kind of evidence underscores how prioritizing environmental compliance and taking proactive sustainability steps can provide financial benefits (24).

This study adds new knowledge to the current literature by emphasizing different effects of green accounting and environmental performance on financial performance in the mining industry. Being one of the most influential sectors, mining is crucial to explore how sustainability practices are transformed into financial performance. Moreover, this study attempts to provide insight into the Indonesian context, where the sustainability challenges are distinct and demand tailored solutions, unlike previous studies. It uses ROA as a financial performance dependent variable to test the following hypotheses:

H1: Financial performance is positively influenced by green accounting.

H2: Environmental performance has a positive impact on financial performance.

H3: Green Accounting in conjunction with Environmental Performance Influences Financial Performance Significantly.

The findings will offer strategic guidance for companies to adopt sustainable practices and for policymakers to develop enabling regulations that promote economic and environmental well-being in the long run.

2. Methods

This research uses quantitative research methods with a descriptive and verification approach with the use of secondary data. This study aims to determine the effects of green accounting practices and environmental performance on financial performance, both separately and as joint effects. The sample criteria used in this study can be seen in Table 1:

Table 1. Sampling criteria

No	Sampling Criteria	Total Remaining
1	Total mining companies listed on the Indonesia Stock Exchange (IDX) 2020-2023	65
2	Companies delisted from IDX during the 2020-2023 period	(7)
3	Companies without complete financial, sustainability, or annual reports	(20)
4	Companies not participating in PROPER during the 2020-2023 period	(15)
5	Final sample size	23

Source: Data processed by the author (2024)

This study was conducted using a sample of 23 mining companies that are listed on the Indonesia Stock Exchange (IDX) between 2020 and 2023. Using a purposive sampling technique, 92 financial statements, sustainability reports, and annual reports were analyzed.

2.1. Measurement of Variables

- 1. Green Accounting** was measured by a dummy variable if environmental-related costs were disclosed in the companies' annual or sustainability reports. The scoring was as follows:
 - ✓ 0- No disclosure of environmental costs
 - ✓ 1: Some disclosure (e.g., waste and environmental R&D costs).
 - ✓ 2: Clear disclosure, with detailed data on environmental costs and sustainability programs.
- 2. Environmental Performance** Environmental performance was measured based on the level of PROPER rating assigned by Indonesia's Ministry of Environment and Forestry. The ratings are:
 - ✓ Gold: Outstanding environmental compliance and sustainability efforts.
 - ✓ Green: Offering more than regulatory compliance through proactive environmental efforts.
 - ✓ Blue: Minimum regulatory compliance with environmental laws.
 - ✓ Red: Violating environmental standards
 - ✓ Black: Serious violations of environmental rules.

The analysis converted the ratings into numerical scores:

Gold = 5 / Green = 4 / Blue = 3 / Red = 2 / Black = 1

- 3. Financial Performance** was assessed using the Return on Assets (ROA) ratio, who is computed as: This ratio describes the company's ability to generate profit from its total assets, acting as a sign of operational efficiency.

2.2. Data Analysis Method

The method used for analysis in this study is panel regression analysis, performed with EViews 13. This method allows for analyzing associations between green accounting, environmental and financial performance over time and across firm levels.

2.3. Descriptive Statistics

The lowest minimum value for green accounting variable is to be found at 1.00, with the highest maximum value of 2.00 found in the sample company of ADRO, ANTM, BIPI, BSSR, BYAN, HRUM, INCO, MBAP, PSAB, PTBA, TOBA and ITMG. The mean score is 1.92 with 12 firms above mean and one below. Because there is a low standard deviation (0.26), there is little variability in the data.

The highest score of 5.00 in environmental performance is achieved by ADRO, ANTM, BSSR, MBAP, and PTBA, while the lowest score in this aspect is 3.00. That gives an average score of 3.67, with five companies exceeding the mean and eight falling short. A standard deviation of 0.70 indicates moderate variation.

The minimum value for financial performance as measured by Return on Assets (ROA) is 0.002 (PSAB), and the maximum is 0.67 (INCO). The mean ROA equals 0.15, with eight firms above and six below. (The 0.149 standard deviation shows moderate variability of financial performance.

Thus, the analysis of the relationship between green accounting, environmental performance and financial performance of mining companies in Indonesia will be rigorous.

2.4. Classical Assumption Tests

Normality Test: The result of Jarque-Bera is 0.081209 which is more than 0.05 threshold ($0.081209 > 0.05$). It can be seen in Figure 1 below, which shows that the data follows a normal distribution and satisfies normality assumption.

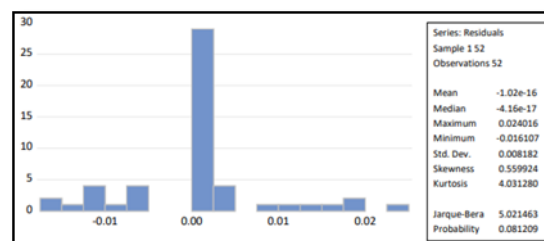


Figure 1. Normality test

Source: Output eviews (2024)

Multicollinearity Test: The variance inflation factor for green accounting and environmental performance (VIF) is 1.001557. It can be seen in Figure 2 below, Because these values are less than 10 the model is multicollinearity free.

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	0.000745	34.63061	NA
X1	7.35E-05	29.24792	1.001557
X2	2.79E-05	5.497227	1.001557

Figure 2. Multicollinearity test

Source: Output eviews (2024)

Heteroscedasticity Test: It is a chi-squared probability value for the heteroscedasticity test which is 0.9707, indicating that the model does not include heteroscedasticity, it can be seen in Figure 3 below.

Heteroskedasticity Test: ARCH			
F-statistic	0.001293	Prob. F(1,49)	0.9715
Obs*R-squared	0.001346	Prob. Chi-Square(1)	0.9707

Figure 3. Heteroscedasticity test

Source: Output eviews (2024)

Autocorrelation Test: The Durbin-Watson statistic of 1.636237 shows that there is no indication of autocorrelation in the research model, it can be seen in Figure 4 below.

R-squared	0.190129	Mean dependent var	0.085638
Adjusted R-squared	0.157073	S.D. dependent var	0.030918
S.E. of regression	0.028386	Sum squared resid	0.039484
F-statistic	5.751733	Durbin-Watson stat	1.636237
Prob(F-statistic)	0.005704		

Figure 4. Autocorrelation test

Source: Output eviews (2024)

2.5. Tests for Choosing a Regression Model

Chow Test: The outcome of the Chow test indicates Cross-Section Chi-Square probability of 0.00 (0.05), therefore H_0 was accepted and H_1 was rejected. We can say that the random effects model is appropriate for the panel data, it can be seen in Figure 5 below.

Redundant Fixed Effects Tests			
Equation: Untitled			
Test cross-section fixed effects			
Effects Test	Statistic	d.f.	Prob.
Cross-section F	3.351851	(12,38)	0.0022
Cross-section Chi-square	37.542310	12	0.0002

Figure 5. Chow test

Source: Output eviews (2024)

Hausman Test: The result of the Hausman test shows a Cross-Section Random probability value of 0.87 (> 0.05), hence accept H_0 or reject H_1 . It indicates that the random effects model is appropriate for the panel data, it can be seen in Figure 6 below.

Correlated Random Effects - Hausman Test Equation: Untitled Test cross-section random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.025279	1	0.8737

Figure 6. Hausman test
Source: Output eviews (2024)

Lagrange Multiplier (LM): Test The result from LM test indicates a probability value of 0.00 (< 0.05) for Both, meaning rejection of H_0 and acceptance of H_1 . This suggests that the panel data is suitable for using the random effects model, it can be seen in Figure 7 below.

Correlated Random Effects - Hausman Test Equation: Untitled Test cross-section random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.025279	1	0.8737

Figure 7. LM test
Source: Output eviews (2024)

Data Panel Regression: Analysis The random effects model is found to be the best fit for interpreting panel data regression in this study based on the test results it can be seen in Figure 8 below.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.188445	0.038211	4.931712	0.0000
X1	-0.024945	0.012427	-2.007355	0.0502
X2	0.015150	0.005758	2.631045	0.0113
Effects Specification				
			S.D.	Rho
Cross-section random			0.019564	0.3177
Idiosyncratic random			0.028673	0.6823
Weighted Statistics				
R-squared	0.190129	Mean dependent var	0.085638	
Adjusted R-squared	0.157073	S.D. dependent var	0.030918	
S.E. of regression	0.028386	Sum squared resid	0.039484	
F-statistic	5.751733	Durbin-Watson stat	1.636237	
Prob(F-statistic)	0.005704			
Unweighted Statistics				
R-squared	0.255639	Mean dependent var	0.144885	
Sum squared resid	0.054820	Durbin-Watson stat	1.178488	

Figure 8. Data panel regression test
Source: Output eviews (2024)

THIS IS THE EQUATION OF THE REGRESSION

$$Y = 0.188445 - 0.024945 (X1) + 0.015150 (X2)$$

2.6. Interpretation of Results

Constant (0.188445): The constant shows that if green accounting (X1) and environmental performance (X2) are zero, then the financial performance (Y) is 0.188445. This is indicative of a generally positive baseline relationship between independent and dependent variables.

2.7. Hypothesis Testing

Partial Test (t-test): The green accounting variable (X1) has a t-statistic value of -2.007355, which is less than the critical value of 2.009575. The p-value is 0.0502 (> 0.05), indicating that the hypothesis for X1 is rejected. Thus, it can be concluded that green accounting does not significantly affect financial performance.

The environmental performance variable (X2) has a t-statistic value of 2.631045, which is greater than the critical value of 2.009575. The p-value is 0.0113 (< 0.05), indicating that the hypothesis for X2 is accepted. This implies that environmental performance significantly affects financial performance. Since the t-statistic value of the green accounting variable is 2.007355 and less than t-table value 2.009575, the p-value 0.0502 (> 0.05), the hypothesis for X1 is rejected. Thus, it can be concluded that green accounting has no significant effect on financial performance, it can be seen in Figure 9 below.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.188445	0.038211	4.931712	0.0000
X1	-0.024945	0.012427	-2.007355	0.0502
X2	0.015150	0.005758	2.631045	0.0113

Figure 9. Partial test

Source: Output eviews (2024)

Simultaneous Test (F-test): The F-test results show an F-statistic value of 5.751733, which is greater than the critical value of 2.838745. The p-value is 0.005704 (< 0.05). This indicates that the hypothesis is accepted, and it can be concluded that green accounting and environmental performance together significantly affect financial performance, it can be seen in Figure 10 below.

R-squared	0.190129	Mean dependent var	0.085638
Adjusted R-squared	0.157073	S.D. dependent var	0.030918
S.E. of regression	0.028386	Sum squared resid	0.039484
F-statistic	5.751733	Durbin-Watson stat	1.636237
Prob(F-statistic)	0.005704		

Figure 10. Simultaneous test

Source: Output eviews (2024)

2.8. Coefficients Correlation

The correlation between financial performance and green accounting is -0.372912 showing a low negative relationship. While correlation between financial performance and environmental accounting is positive showing 0.356065; it is still low. It can be seen in Figure 11 below.

	Y	X1	X2
Y	1.000000	-0.372912	0.356065
X1	-0.372912	1.000000	-0.039427
X2	0.356065	-0.039427	1.000000

Figure 11. Coefficients correlation

Source: Output eviews (2024)

2.9. Coefficient of Determination

Green Accounting: The adjusted R-squared value of X1 is 0.055916, which means that green accounting explains 5.5% of the variation in financial performance, and more other factors explain the remaining 94.5%, it can be seen in Figure 12 below.

R-squared	0.074427	Mean dependent var	0.086470
Adjusted R-squared	0.055916	S.D. dependent var	0.031001
S.E. of regression	0.030122	Sum squared resid	0.045366
F-statistic	4.020606	Durbin-Watson stat	1.667711
Prob(F-statistic)	0.050376		

Figure 12. Coefficients determination of green accounting

Source: Output eviews (2024)

Environmental Performance : The adjusted R-squared produce value of 0.103749, the X2 explains 10.3% of the variation in financial performance, and more other factors explain the remaining 89.7%, it can be seen in Figure 13 below.

R-squared	0.121323	Mean dependent var	0.075777
Adjusted R-squared	0.103749	S.D. dependent var	0.029984
S.E. of regression	0.028386	Sum squared resid	0.040289
F-statistic	6.903733	Durbin-Watson stat	1.603473
Prob(F-statistic)	0.011391		

Figure 13. Coefficients determination of environmental performance

Source: Output eviews (2024)

Simultaneous Effect: The adjusted R-squared value is 0.157073, so green accounting and environmental performance together explain 15.7% of the variation in financial performance and other factors 84.3%, it can be seen in Figure 14 below.

R-squared	0.190129	Mean dependent var	0.085638
Adjusted R-squared	0.157073	S.D. dependent var	0.030918
S.E. of regression	0.028386	Sum squared resid	0.039484
F-statistic	5.751733	Durbin-Watson stat	1.636237
Prob(F-statistic)	0.005704		

Figure 14. Coefficients determination of simultaneous effect

Source: Output eviews (2024)

3. Results and Discussion

3.1. The Influence of Green Accounting on Financial Performance

This research proves that green accounting does not significantly affect financial performance in mining companies listed on the Indonesia Stock Exchange in 2020-2023. With t-value -2,007355 below the critical value of 2.009575 and significance level of 0,0502 ($>0,05$), green accounting cannot ensure good discipline in financial results. Green accounting as a dummy variable can be seen as a burden, especially given the huge investment it requires. Any environmental expenditure is usually classified as an operating cost, so it impacts profitability as well. All stakeholders, both investors and consumers, are more interested in ways to increase profits than investing in the quality of green accounting

disclosures. Even companies such as PT Baramulti Suksessarana Tbk and PT Harum Energy Tbk that disclosed green accounting had showed worsened performance.

3.1.1. Alignment with Theoretical Perspectives

All in all, this evidence contradicts the Stakeholder Theory, from which it seemed that green accounting should enhance stakeholder trust and result in better financial performance. Also, it opposes the Legitimacy Theory: since green accounting disclosures have insignificant impact on society, companies cannot achieve higher legitimization.

3.1.2. Comparison with Previous Studies

These results are consistent with (20,26), claiming unimportant influence of green accounting on financial performance, and oppositely to (27), who recorded a positive impact once again. Overall, this makes green accounting useless without integrating it into the financial performance strategic plans and gaining public support.

3.2. The Influence of Environmental Performance on Financial Performance

According to the study, $t\text{-value } 2.631045 > 2.009575$ is showing that environmental performance (X2) has a significant influence on financial performance (Y) with significant level of 0.0113 (< 0.05). Financial performance is usually better for companies who actively participated in the PROPER program.

PROPER ratings promote real environmental performance, which allows companies to continue their sustainability practices, thus gaining a good perception from stakeholders. For example, PT Adaro Energy Tbk (ADRO) and PT Aneka Tambang Tbk (ANTM) were able to realize a better financial performance while still obtaining PROPER rating colors green and gold as an assessment of environmental responsibility.

3.2.1. Alignment with Theoretical Perspectives

These findings are also consistent with Stakeholder Theory, as companies create value not just for their shareholders, but for all their stakeholders, including when implementing environmental projects, which in turn contributes to their investment trust and financial performance. These findings are also supported by Legitimacy Theory, which postulates that environmentally responsible behavior enhances acceptance in society and corporate legitimacy.

3.2.2. Comparison with Previous Studies

These results are consistent with (28,29), which found that environmental performance has a positive effect on financial performance. In contrast however, (30) revealed no significant impact. These findings highlight the significance of embracing environmental sustainability in corporate strategies, positively impacting stakeholder trust and profitability.

3.3. The Simultaneous Influence of Green Accounting and Environmental Performance

This study uses the F (test) to test jointly the influence of green accounting (X1) and environmental performance (X2) on financial performance (Y). Hence, the F-statistic obtained is 5.751733 is greater than the critical value of 2.838745 at the significance level of

0.005704 (< 0.05). It shows that environmental practices or green accounting that combines reduces the financial performance, this implies integrating corporate activities with the concerns of stakeholders and the triple bottom line and addresses those issues leads to improved financial performance.

3.3.1. Alignment with Theoretical Perspectives

The results provide evidence for Stakeholder Theory in that environmental issue responsiveness promotes stakeholder trust and financial performance. According to Legitimation theory, something that is following the rules of society, for example, sustainability will increase corporate legitimacy and acceptance of the corporation.

3.3.2. Comparison with Previous Studies

The simultaneous effect in this study is consistent with (31) who find that the influence of green accounting and environmental performance is better when studied simultaneously. On the other hand, it differs from the studies of (32,33), which find few effects. These results underscore the importance of integrated environmental and financial strategies in achieving corporate success.

Conclusions

The research emphasis on the effect of green accounting and environmental performance on financial performance in mining companies listed on the Indonesia stock exchange from 2020 to 2023. The results show that financial performance is unaffected by green accounting, operationalized as a dummy variable, indicating that simply disclosing environmental costs is not enough to improve profitability. On the other hand, environmental performance proxied by PROPER ratings affects financial performance significantly, where companies with better sustainability ratings have more trust and benefit from the stakeholders. At the same time, green accounting and environmental performance combined show a joint effect on financial performance, highlighting the need for integrated sustainability drivers. Still, this research is constrained by its focus on mining companies, use of simplified proxies and a relatively limited time frame. Future research might close these gaps by studying multiple industries, integrating more complex metrics, including carbon emissions or cost of environmental damages ratios, and by employing longitudinal analyses to capture long-term trends. Furthermore, understanding how emerging technology like blockchain and AI can strengthen green accounting transparency and stakeholder behavior. Although this research highlights the role of sustainability in the corporate domain, the lack of application of green accounting demonstrates the need for retaining stronger utilization and communication with stakeholders. This global reality will require companies to increasingly align with emerging sustainability standards through holistic solutions that can deliver benefits for the economy, society and long-term profit.

It also reveals a more nuanced picture in the mining sector of the interplay between green accounting, environmental performance, and financial performance. Specific to this study, the research highlights the potential strategic benefits of environmental performance for this resource-intensive industry while explaining the limited direct financial benefits of environmental accounting practice. These insights contribute to the existing literature by forcing the dialogue on sustainability challenges in developing global contexts, and set the

stage for continued investigation into the unique dynamics of sustainability within these distinct sectors.

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Conflicts of Interest

The authors declare no conflict of interest.

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