

The Role of Environmental, Social, and Governance Disclosure in Moderating the Influence of Green Intellectual Capital on Company Value

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Abstract

This study aims to analyze the role of Environmental, Social, and Governance (ESG) disclosure in moderating the effect of Green Intellectual Capital (GIC) on company value. One of the ongoing problems faced by the mining sector is that while the mining industry plays a strategic role in the Indonesian economy, its operations have a significant environmental impact, such as pollution and environmental damage, which reduces the value of the company. This study uses a population of mining companies listed on the Indonesia Stock Exchange (IDX) for the period 2022-2024. A total of 19 samples were used. Data analysis techniques used Moderated Regression Analysis, using IIBM SPSS Statistics V.27. The results indicate that Green Relational Capital (GRC) has a significant positive impact on Firm Value. However, Green Human Capital (GHC) and Green Structural Capital (GSC) do not significantly influence Firm Value. Additionally, ESG disclosure strengthens the relationship between GRC and Firm Value but does not strengthen the relationship between GHC and GSC.

Keywords: *Green Intellectual Capital; Environmental Social Governance; Firm Value; Mining Companies; Price to Book Value.*

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INTRODUCTION

In a period of continuous economic growth, industries are undergoing fundamental transformations with significantly increased competition among business players. This situation forces every company not only to survive, but also to proactively adapt their business strategies to complex and unpredictable market dynamics. According to Josephine et al. (2020) although business activities can generate economic profits that improve global community welfare, such economic growth is often accompanied by negative impacts in the form of social inequality and environmental degradation, whether directly or indirectly related to organizational operations. In this context, corporate value becomes the main strategic orientation that reflects the effectiveness of management in allocating resources and creating sustainable growth (Dong & Li, 2021).

The mining industry plays a strategic role in Indonesia's economy, but it has a significant environmental impact. According to the Carbon Majors Database (2016-2022), 57 coal, cement, oil, and gas companies are responsible for 80% of global carbon emissions from fossil fuels. Various cases reflect the urgency of this issue: air pollution in the Morowali nickel industrial area with SO₂ concentrations reaching 288.497 µg/m³ (almost double the safe limit), pollution of rivers and agricultural land in Ketapang by PT CITA, fines of Rp47 billion for two mining companies due to environmental damage covering an area of 2.8 hectares, and the suspension of operational permits for 190 mines by the Ministry of Energy and Mineral

Resources for failing to provide reclamation guarantees worth Rp35 trillion (Dunia Energi, 2025). This phenomenon shows that mining companies face critical challenges in balancing profit with environmental responsibility.

Company value is a crucial indicator that reflects an organization's ability to balance two fundamental interests, namely sustainable economic growth and environmental responsibility (Tonay & Murwaningsari, 2022). According to Gantino et al. (2023), company value reflects investor confidence in corporate performance, which is expressed through stock value. Based on calculations using Price to Book Value (PBV), which compares the book value of shares to their market price, several mining companies in the 2022-2024 period show alarming conditions: PT Indika Energy Tbk (INDY) fell from 0.6355 to 0.3442, PT Indo Tambangraya Megah Tbk (ITMG) fell from 1.3539 to 0.9342, PT Mitrabahera Segara Sejati Tbk (MBSS) fell from 0.6729 to 0.5032, PT Medco Energi Internasional Tbk (MEDC) fell from 0.8742 to 0.7042, and PT Lionmesh Prima Tbk (LMSH) fell from 0.5292 to 0.3921. These declines indicate a loss of investor confidence and raise critical questions about how companies can increase or maintain their value.

Green Intellectual Capital is a development of the Green concept combined with Intellectual Capital where intellectual capital is defined as the total reserve of information, knowledge, learning, experience, intellectual property rights, organizational capabilities, brands, customer relationships, and team communication systems that form value for an organization (Chen, 2008; Widyastuti et al., 2021). Green Intellectual Capital (GIC) refers to a company's intangible assets, which include knowledge, strategic policies, practical experience, and sustainable innovation in the field of environmental conservation (Anggriani & Dewi, 2022). GIC emphasizes the crucial role of environmental conservation strategies in enhancing an organization's competitiveness through three components, namely the commitment and insight of the workforce to green innovation (Green Human Capital), corporate infrastructure and systems to promote environmental protection (Green Structural Capital), and the ability to build strategic relationships with stakeholders in the context of environmental management (Green Relational Capital) (Chen, 2008; Kusumaningrum & Astuti, 2024).

Environmental, Social, and Governance (ESG) are non-financial variables that measure aspects of environmental sustainability, social responsibility, and corporate governance (Putu et al., 2024). ESG (environmental, social, and governance) is an approach that emphasizes sustainable development, investment, and business practices by considering three main aspects. This concept covers various issues related to the environment, such as climate change, social aspects, such as respecting the human rights of every individual, and organizational governance (Dwi Jayanti et al., 2024). Environmental, Social, and Governance (ESG) serves as a comprehensive measurement instrument that combines non-financial data related to environmental, social, and governance for the purpose of assessing a company's operational capabilities and as a communication platform to show investors the tangible form of the company's responsibility and potential in its efforts to improve sustainable business performance (Dwijayanti & Jayanti, 2024; Putri Salma Difa & Yuniar Larasati, 2024). Signaling theory explains that quality ESG disclosure will generate positive signals that increase the company's value in the eyes of the market by increasing the visibility and credibility of GIC as a strategic asset of the company (Kurniawan & Nugroho, 2025; Maysari & Endri, 2025). The Financial Services Authority (OJK) through POJK Number 51/POJK.03/2017 requires every public organization to submit and develop its sustainability report annually (Lisdionon & Putri, 2025). ESG has the potential to moderate the correlation between company value and GIC because it serves as a formal and standardized means of communicating the company's internal capabilities, including GIC, to external parties. With increasing public and stakeholder awareness of the importance of social responsibility and government regulatory support, ESG has become an important mechanism in translating corporate sustainability initiatives into higher value perceptions (Nadeem et al., 2020; Rehman et al., 2021; Ayu Septhiani & Marinda Machdar, 2022).

Although the significance of GIC and ESG has been recognized in the literature, studies analyzing the relationship between the three still face critical limitations with inconsistent results. Some studies find that GIC has a significant positive effect on company value, arguing that companies that invest in green intellectual capital gain a better reputation and increase investor confidence (Ericho & Amin, 2024). However, other studies show that GIC has a negative effect on company value in the mining industry, arguing that companies still do not sufficiently disclose items from the green intellectual capital variable, or because moderating factors such as company size weaken the effect of GIC (Fini & Astuti, 2024). This inconsistency in results indicates the need for further research to understand how ESG can moderate the relationship between GIC and company value, particularly in the context of the Indonesian mining industry.

This study aims to analyze the role of Environmental, Social, and Governance disclosure as a moderator of the impact of Green Intellectual Capital on company value in the mining sector listed on the Indonesia Stock Exchange from 2022 to 2024, with reference to the research gap and the above phenomenon. It is hoped that this study will contribute theoretically to the integration of green intellectual capital and the implementation of ESG in increasing company value, as well as practically to corporate management in the mining sector in optimizing its sustainability strategy. This study is expected to serve as a reference and additional source for future studies on similar topics in the context of the Indonesian mining industry.

METHODOLOGY

This study applies a quantitative study type that uses an associative and descriptive approach to test the role of Environmental, Social, Governance Disclosure (ESG) in moderating the influence of Green Intellectual Capital (GIC) on company value in mining companies listed on the Indonesia Stock Exchange from 2022 to 2024. Therefore, it applies secondary data using information and various data sourced from corporate sustainability reports and annual reports of the mining sector listed on the IDX from 2012 to 2024.

This definition takes the population, namely mining sector corporations listed on the IDX during the period 2022 to 2024, totaling 56 companies. The research sample was taken using non-probability sampling techniques with the following sample selection criteria: mining corporations listed on the IDX during the period 2022 to 2024, companies that consistently published sustainability reports for the period 2022 to 2024, and companies that used the 2021 GRI standard index. The research sample obtained in accordance with the above qualifications consisted of 19 companies with a total of 57 observations during the research period.

The data collection method in this study was carried out using documentation and literature study methods through data collection instruments that applied the GRI disclosure index to measure ESG variables consisting of 97 items covering GRI 300 environmental aspects, GRI 400 social aspects, and GRI 2 governance aspects, as well as calculation formulas to measure Green Human Capital (VAHU), Green Structural Capital (STVA), Green Relational Capital (VACE), and Company Value (PBV).

The data analysis techniques used in this study include descriptive statistics, classical assumption tests, multiple linear regression analysis, and regression analysis with MRA (Moderated Regression Analysis). Data processing in this study was performed using IBM SPSS Statistics V.27 software.

RESULTS AND DISCUSSION

Tabel 1. Descriptive Statistic Results

N	Minimum	Maximum	Mean	Std. Deviation
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Firm Value		57	.162	5.661	1.14551	1.036148
Green Relational Capital		57	.007	1.373	.24632	.292366
Green Human Capital		57	.245	54.384	6.79519	9.871406
Green Structural Capital		57	-3.082	.982	.51140	.736087
ESG Disclosure		57	.100	1.000	.74667	.239787
Valid N (listwise)		57				

Source: SPSS 27 Output Results, 2025

The results show that company values range from 0.162 to 5.661, with an average value of 1.14551 and a standard deviation of 1.03615, indicating a relatively wide spread of company values among the companies observed. The standard deviation, which is slightly lower than the average, indicates moderate variability in market valuation among companies.

Further results show that green relational capital scores vary between 0.007 and 1.373, with an average of 0.24632 and a standard deviation of 0.29237. This indicates that the spread of green relational capital practices among companies is relatively limited, although the standard deviation exceeding the average indicates an uneven level of adoption across the sample.

In addition, the Green Human Capital value ranges from 0.245 to 54.384, with an average value of 6.79519 and a standard deviation of 9.87141. The high standard deviation relative to the mean reflects significant variability in corporate investment in environmentally oriented human capital, indicating that only a small proportion of companies have strongly internalized green human resource practices.

Meanwhile, the green structural capital score ranges from -3.082 to 0.982, with an average value of 0.51140 and a standard deviation of 0.73609. These results indicate moderate dispersion and highlight differences in the extent to which companies have integrated environmental values into their organizational systems, routines, and processes.

Finally, ESG disclosure scores ranged from 0.100 to 1.000, with an average score of 0.74667 and a standard deviation of 0.23979, indicating that the standard deviation remained below the average. These findings suggest relatively consistent ESG disclosure practices among companies, although there is still variation in the level of transparency.

Table 2. Classical Assumption Test Results

No.	Classical Assumption Test	Output	Detail
1	Data Normality Test	Asymp. Sig. (2-tailed) value 0.200	Normally distributed
2	Multicollinearity Test	Tolerance values; Green Relational Capital = 0.452 Green Human Capital = 0.895 Green Structural Capital = 0.569 ESG Disclosure = 0.344 VIF values; Green Relational Capital = 2.215 Green Human Capital = 1.118 Green Structural Capital = 1.758 ESG Disclosure = 2.910	From the obtained results, Tolerance > 0.1 also VIF < 10, indicating multicollinearity does not occur
3	Heteroscedasticity Test	Significance value (Glejser test) Green Relational = 0.040 Green Human Capital = 0.208 Green Structural Capital = 0.083	Based on the results obtained, significance Glejser test is > 0.05, no

	ESG Disclosure = 0.886	indication of heteroscedasticity
4	Durbin-Watson Value = 2.056 $dU < Dw < 4 - dU$ $1.7253 < 2.056 < 4 - 1.7253$ $1.7253 < 2.056 < 2.275$	No. Autocorrelation

Source: SPSS 27 Output Results, 2025

The results of the classical assumption testing show that this regression model meets all the basic requirements of regression analysis. The normality test of this analysis indicates that all data are normally distributed, as evidenced by an Asymp. Sig. value of 0.200, which exceeds 0.05. Furthermore, the multicollinearity test conducted explains that the independent variables as a whole have a tolerance value exceeding 0.1 and a VIF value of less than 10, so that no multicollinearity is found in the model.

The results of heteroscedasticity testing using the Glejser technique indicate that the significance level of most variables exceeds 0.05, which means that there is no indication of heteroscedasticity. Finally, the autocorrelation test using the Durbin-Watson technique yielded a result of 2.056, which falls between the limits of dU and $(4 - dU)$, leading to the conclusion that the model does not exhibit autocorrelation.

Tabel 3. Coefficient of Determination Analysis Results

R	R ²	Adjusted R ²	Standar Error of Estimate
.429 ^a	.184	.086	.990524

The R-Square value is recorded at 18.4% or 0.184. This indicates that indicators such as GSC, GHC, GRC, and ESG used in this analysis can explain 18.4% of the variance in each dependent variable. Meanwhile, the remaining 81.6% is explained by various other indicators that were not used in this study or by unidentified factors outside the scope of this research.

Tabel 4. T Statistical Test Results

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	1.146	.129		8.896	.000
Green Relational Capital	.388	.132	.368	2.934	.005
Green Human Capital	.107	.141	.101	.754	.454
Green Structural Capital	.107	.141	.102	.759	.451
ESG Disclosure * Nilai Perusahaan	.355	.136	.332	2.611	.012
Green Relational Capital * ESG Disclosure	.407	.162	.298	2.513	.015
Green Human Capital * ESG Disclosure	-.271	.169	-.244	-1.602	.115
Green Structural Capital * ESG Disclosure	-.288	.159	-.260	-1.818	.075

Source: Researcher, 2025

The Effect of Green Relational Capital (GRC) on Company Value

Table 4 shows statistical results indicating that Green Relational Capital (GSC) has a positive and significant effect on company value, as evidenced by the values $B = 0.388$, $t = 2.934$, and $\text{sig} = 0.005$. Since the significance value is less than 0.05, namely 0.005, this indicates that GRC has a significant impact on company value. Thus, H1 is accepted. These results suggest that stronger relationships with stakeholders such as customers, suppliers, communities, regulators, and investors who are oriented towards environmental and sustainability values can increase market trust and corporate reputation, which in turn supports higher company value.

The Effect of Green Human Capital (GHC) on Company Value

Table 4 shows statistical results indicating that Green Human Capital (GHC) has a positive effect on company value, as evidenced by the values $B = 0.107$, $t = 0.754$, and $\text{sig} = 0.454$. Since the significance value exceeds 0.05, namely 0.454, this indicates that GHC does not have a significant impact on company value. Thus, H2 is rejected. These results suggest that an increase in GHC, although positive in direction, has not been statistically proven to directly increase company value in this study. In terms of measurement, the GHC proxy (VAHU) tends to capture the efficiency of value added relative to HR costs rather than the quality of 'green' competencies themselves, so the GHC signal captured by investors becomes less strong.

The Effect of Green Structural Capital (GSC) on Company Value

Table 4 shows statistical results indicating that Green Structural Capital (GSC) has a positive effect on company value, as evidenced by the values $B = 0.107$, $t = 0.759$, and $\text{sig} = 0.451$. Since the significance value exceeds 0.05, namely 0.451, this indicates that GSC does not have a significant impact on company value. Thus, H3 is rejected. These results show that the company's internal green structure, systems, procedures, or organizational support related to sustainability have not been statistically proven to increase company value in this model. Furthermore, in the mining industry, green structural capital (SOPs, environmental management systems, documentation, impact control technology) is often perceived as a compliance necessity, i.e., mandatory to reduce licensing or operational risks. Therefore, the market does not always provide a valuation premium in the short term because the benefits are more in the form of risk prevention than instant profit increases.

The Effect of ESG Disclosure on Company Value

Table 4 explains the statistical results of the research analysis, which shows that ESG disclosure has a significant and positive impact on company value, as evidenced by the values $B = 0.355$, $t = 2.611$, and significance 0.012. Since the significance level is less than 0.05, namely 0.012, the results indicate that ESG disclosure significantly determines company value. Therefore, H4 is accepted, meaning that when companies disclose ESG information more transparently, they can reduce information asymmetry, increase investor confidence, and strengthen corporate legitimacy, thereby having an impact on greater company value.

The Role of ESG Disclosure Moderation on the Relationship between GRC and Company Value

Based on the statistical results in Table 4, the interaction term Green Relational Capital \times ESG Disclosure (GRC \times ESG) has a positive and significant coefficient with $B = 0.407$, $t = 2.513$, and $\text{Sig.} = 0.015$. Since the significance level is less than 0.05, namely 0.015, this indicates that ESG disclosure significantly moderates the relationship between GRC and company value. Therefore, H5 is accepted. These results confirm that ESG disclosure acts as a reinforcing factor: when a company's ESG disclosure is higher, the positive impact of GRC on company

value becomes stronger. In practice, environmentally oriented stakeholder relationships generate higher company value when supported by strong and transparent ESG reporting.

The Moderating Role of ESG Disclosure on the Relationship between GHC and Firm Value

Based on the statistical results in Table 4, the interaction term Green Human Capital \times ESG Disclosure (GHC \times ESG) has a negative coefficient with $B = -0.271$, $t = -1.602$, and $\text{Sig.} = 0.115$. Because the significance value exceeds 0.05, namely 0.115, the interaction effect is insignificant. Thus, H6 is rejected, which means that ESG disclosure does not add to the strength of GHC on the value of an organization. In addition, the negative interaction coefficient ($B = -0.271$) indicates a tendency to weaken the relationship, but because it is not significant, this moderation pattern cannot be statistically confirmed. The negative direction of the coefficient may also indicate a trade-off in market perception, where high ESG disclosure may lead investors to anticipate additional costs (training, compliance, process changes) that offset the short-term benefits of GHC, thereby weakening the relationship between GHC and PBV.

The Role of ESG Disclosure Moderation on the Relationship between GSC and Company Value

Based on the statistical results in Table 4, the interaction term Green Structural Capital \times ESG Disclosure (GSC \times ESG) has a negative coefficient with $B = -0.288$, $t = -1.818$, and $\text{Sig.} = 0.075$. Since the significance value exceeds 0.05, namely 0.075, this indicates that the moderating effect is not significant at the 5% level; therefore, H7 is rejected. In addition, the negative coefficient ($B = -0.288$) shows a tendency to weaken rather than strengthen the influence of GSC on company value. It should also be noted that $\text{Sig.} = 0.075$ is close to the significance threshold; if this study used a significance level of 10%, the interaction could be considered statistically significant, but the negative coefficient still indicates a moderating effect that weakens (rather than strengthens) the relationship. A significance value close to 0.05 indicates a pattern tendency, but the negative direction of the coefficient implies that when companies increase ESG reporting, the market may highlight the cost consequences of strengthening green structures (e.g., system investment, auditing, documentation, compliance with standards), so that the benefits of GSC on PBV do not increase and even tend to weaken in the short term.

CONSLUSION

This study concludes that Green Relational Capital (GRC) has a significant positive impact on Firm Value ($B = 0.388$; $t = 2.934$; $\text{Sig.} = 0.005$), indicating that stronger stakeholder relationships aligned with environmental and sustainability values contribute significantly to the creation of firm value. The findings also show that ESG Disclosure has a significant positive impact on Firm Value ($B = 0.355$; $t = 2.611$; $\text{Sig.} = 0.012$), suggesting that transparent ESG reporting can reduce information asymmetry, increase investor confidence, and strengthen corporate legitimacy, which ultimately supports higher firm value. However, the results show that Green Human Capital (GHC) does not significantly affect Firm Value ($B = 0.107$; $t = 0.754$; $\text{Sig.} = 0.454$) and Green Structural Capital (GSC) does not significantly affect Firm Value ($B = 0.107$; $t = 0.759$; $\text{Sig.} = 0.451$). This means that, in the context of this study, improvements in employee environmental friendliness and internal structures that support sustainability have not been statistically proven to directly increase company value at a 5% significance level. In terms of moderation, this study found that ESG disclosure strengthens the relationship between GRC and Company Value, as evidenced by a significant positive interaction term ($B = 0.407$; $t = 2.513$; $\text{Sig.} = 0.015$). This means that the positive contribution of GRC to company value becomes stronger when ESG disclosure is higher. On the other hand, ESG disclosure does not strengthen the correlation between GHC and company value because it is insignificant and negative ($B = -0.271$; $t = -1.602$; $\text{Sig.} = 0.115$). Similarly, ESG disclosure does

not strengthen the relationship between GSC and company value at the 5% significance level ($B = -0.288$; $t = -1.818$; $\text{Sig.} = 0.075$).

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