



MEDIA EXPOSURE AS A GAME CHANGER: PANEL DATA ANALYSIS OF SUSTAINABILITY IMPACT ON FIRM VALUATION

PAPARAN MEDIA SEBAGAI FAKTOR PENENTU PERUBAHAN: ANALISIS DATA PANEL TENTANG DAMPAK KELESTARIAN TERHADAP PENILAIAN NILAI PERUSAHAAN

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ARTICLE INFO	ABSTRACT
<i>Article history: Tanggal Masuk</i> 3 Juli 2025 <i>Revisi Diterima</i> 19 Agustus 2025 <i>Tanggal Diterima</i> 19 September 2025 <i>Tersedia Online</i> 30 September 2025 Keywords: Carbon Emission Disclosure, Carbon Performance, Green Intellectual Capital, Media Exposure, Firm Value	This study analyzes the impact of Carbon Emission Disclosure (CED), Carbon Performance (CP), and Green Intellectual Capital (GIC) on firm value, with Media Exposure (ME) acting as a moderating variable. The research focuses on energy companies listed on the Indonesia Stock Exchange (IDX) during the 2021-2024 period. Using panel data analysis, the Random Effect Model (REM) was identified as the most appropriate model after conducting Chow, Hausman, and Lagrange Multiplier tests, as well as classical assumption tests (normality, multicollinearity, heteroscedasticity, and autocorrelation). The findings indicate that CED, CP, and GIC significantly influence firm value. However, Moderated Regression Analysis (MRA) revealed that ME only moderates the relationship between GIC and firm value, failing to moderate the effects of CED and CP. This suggests that media coverage concerning a company's green innovations and sustainability practices effectively enhances investor visibility and understanding of intangible assets, thereby contributing to positive perception and increased confidence.
Kata Kunci: Pengungkapan Emisi Karbon, Kinerja Karbon, Modal Intelektual Hijau, Paparan Media, Nilai Perusahaan	ABSTRAK Penelitian ini menganalisis pengaruh Carbon Emission Disclosure (CED), Carbon Performance (CP), dan Green Intellectual Capital (GIC) terhadap nilai perusahaan, dengan Media Exposure (ME) sebagai variabel moderasi. Studi ini berfokus pada perusahaan energi yang terdaftar di Bursa Efek Indonesia (BEI) periode 2021-2024. Menggunakan analisis data panel, Random Effect Model (REM)

teridentifikasi sebagai model paling tepat setelah melewati uji Chow, Hausman, dan Lagrange Multiplier, serta uji asumsi klasik (normalitas, multikolinearitas, heteroskedastisitas, dan autokorelasi). Hasil penelitian menunjukkan bahwa CED, CP, dan GIC berpengaruh signifikan terhadap nilai perusahaan. Namun, Moderated Regression Analysis (MRA) membuktikan ME hanya memoderasi hubungan GIC terhadap nilai perusahaan, gagal memoderasi pengaruh CED dan CP. Hal ini menunjukkan bahwa pemberitaan media mengenai inovasi hijau dan praktik keberlanjutan perusahaan secara efektif meningkatkan visibilitas dan pemahaman investor terhadap aset tak berwujud, sehingga berkontribusi pada persepsi positif dan peningkatan kepercayaan.

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1. Introduction

The advancement of human civilization correlates with increased industrial activity, which has led to rising emission levels. Anthropogenic changes resulting from industrial operations constitute one of the primary factors contributing to environmental degradation. Global warming is predominantly driven by carbon emissions (Hakki et al., 2024). The depletion of the ozone layer is exacerbated by excessive carbon dioxide (CO₂) concentrations, a major contributor to greenhouse gas (GHG) emissions.

Global warming has emerged as a pressing issue that dominates public discourse and features prominently in discussions across international organizational forums. The United Nations addressed this phenomenon through the 1997 Kyoto Protocol. Indonesia stands among the nations that ratified this landmark agreement. The Kyoto Protocol's primary objectives are to regulate the reduction of anthropogenic greenhouse gas emissions while simultaneously curbing excessive environmental exploitation.

COP 21, held in Paris on December 12, 2015, resulted in a new agreement called the Paris Agreement, initiated to replace the Kyoto Protocol. The Paris Agreement aims to limit the global average temperature increase to below 2°C above pre-industrial levels while pursuing efforts to further reduce it to 1.5°C. The Indonesian government responded to environmental issues related to carbon emissions by issuing Presidential Regulation (Perpres) No. 98 of 2021, which addresses corporate contributions to carbon emission decarbonization efforts as part of national greenhouse gas (GHG) emission control in national development (Anggraeni, 2024).

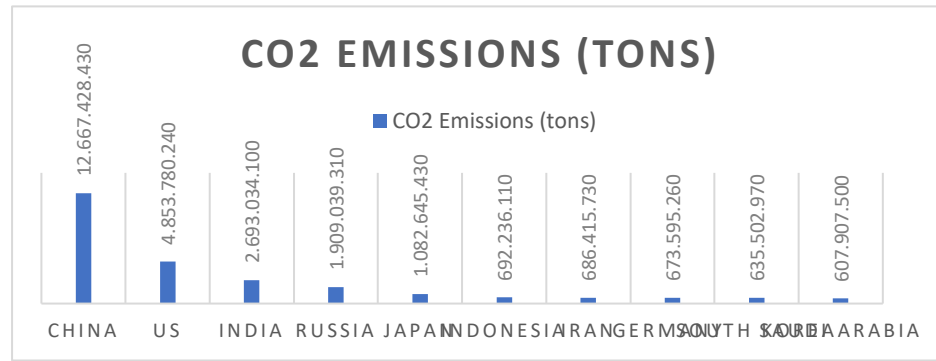


Figure 1 Top 10 Countries with the Highest Carbon Emissions Worldwide 2022

Sources: (Worldometer, 2022)

Figure 1 indicates that Indonesia ranks as the 6th largest carbon-emitting country globally. The impacts of climate change and global warming have raised concerns among stakeholders regarding corporate sustainability (Trimuliani & Febrianto, 2023). Environmental awareness and commitment across all corporate elements can enhance investor appeal, positively influence firm value, and ultimately support business continuity (Astuti dkk., 2022). The discussion on carbon emission reporting is important, considering that a company's environmental responsibility is not only internal. Companies that produce large amounts of carbon are obliged to participate in efforts to address global warming (Hanifah & Gunaningrat, 2022).

The observed phenomenon aligns with stakeholder theory, signaling theory, and resource-based theory. Stakeholder theory describes the relationship between internal and external organizations and explains how this relationship influences business activities, encompassing policies and practices related to stakeholders, organizational values, legal compliance, respect for society and the environment, as well as the business sector's commitment to sustainable development (Solihin et al., 2023). Signaling theory clarifies that high-quality financial and non-financial information serves as a signal indicating effective corporate operations (Anggreni dkk., 2022). Meanwhile, resource-based theory provides a strategic management framework emphasizing internal resources and capabilities as key drivers of competitive advantage (Sanjaya & Arsja, 2023).

Carbon Emission Disclosure represents a form of corporate accountability regarding climate change impacts. Companies willing to disclose their carbon emissions are perceived as genuinely committed to environmental preservation and mindful of the operational consequences they generate (Simamora et al., 2022). Such disclosure encompasses carbon emission intensity, energy consumption, corporate governance, climate change strategies, emission reduction performance, along with climate-related risks and opportunities (Kelvin et al., 2017). Research by Trimuliani & Febrianto (2023) and Lee & Cho (2021) demonstrates that carbon emission disclosure significantly influences firm value. However, these findings contradict studies by

Gayatri & Yuniarta (2024) and Gunawan & Berliyanda (2024), which found no statistically significant relationship between carbon emission disclosure and corporate valuation.

Carbon emission disclosure reflects good corporate governance, and superior carbon performance can enhance firm value. Carbon performance is defined as quantitative greenhouse gas emissions that contribute to climate change, representing the company's measures and processes for emission reduction. Positive market response serves as one of the company's sustainability strategies. Firms with strong carbon performance send positive signals to the market (Benkraiem et al., 2022). Corporate carbon disclosure and carbon performance can generate value appreciation for companies (Yan et al., 2020). Research by Trimuliani & Febrianto (2023) and Benkraiem et al. (2022) demonstrates that carbon performance significantly influences firm value. However, findings by Anggraeni (2024) indicate that carbon performance does not affect firm value.

The growing corporate awareness of environmental protection importance led Chen to introduce the concept of Green Intellectual Capital in 2008. Green Intellectual Capital represents a crucial strategy for preventing environmental damage, encompassing all intangible assets such as environmental-related skills, knowledge, and networks (Chen, 2008). The connection between Green Intellectual Capital and firm value materializes when companies can demonstrate employee excellence in knowledge, experience, wisdom, technological advancement, and eco-friendliness. Research by Ericho & Amin (2024) and Tonay & Murwaningsih (2022) reveals that green intellectual capital has a significant positive impact on firm value. However, studies by Nurulhaliza & Murtanto (2024) and Ana dkk. (2021) indicate that green intellectual capital does not influence firm value.

Companies bear responsibilities that extend beyond investors and shareholders to society and natural resources. These obligations take the form of corporate accountability reports. A company's media communications can significantly influence investor perceptions (Sari, 2023). Media coverage plays a crucial role as environmental and social issues related to corporate operations serve as monitoring tools for stakeholders (Muliawati & Hariyati, 2021). Media can provide negative coverage when companies engage in environmentally harmful practices, potentially damaging corporate reputation. Conversely, positive recognition may be granted when firms demonstrate environmental stewardship.

The identified phenomenon gap, theoretical gap, and research gap serve as the foundation for empirically examining the influence of carbon emission disclosure, carbon performance, and green intellectual capital index on firm value, with media exposure as a moderating variable.

2. Literature Review

2.1 Stakeholder Theory

The term "stakeholder" was first introduced by the Stanford Research Institute in 1963, defined as groups capable of supporting an organization's existence (Wartabone et al., 2023). Stakeholder theory relates to how corporate focus extends beyond profit generation to prioritize benefits for stakeholders affected by business activities (Rankin et al., 2012). This theory posits that organizations are not entities operating solely for individual interests but bear responsibility for delivering value to stakeholders. The better the relationship a company builds with its stakeholders, the more guaranteed its future sustainability will be (Hanifah & Meikhati, 2024).

2.2 Signalling Theory

Signaling Theory, introduced by Spence in 1973, posits that company owners (the senders) convey signals containing information about the firm's condition to assist shareholders (the receivers) in decision-making (Spence, 1973). Information disclosure is considered informative if it generates market reactions (Gantino et al., 2023). Investors require complete and accurate information to utilize it as an analytical tool for decision-making. Through corporate disclosures, investors can assess whether a company manages its environmental responsibilities appropriately.

2.3 Resource-Based View Theory

The Resource-Based View (RBV) Theory, first proposed by Wernerfelt in 1984, presents a framework where companies possessing superior, unique, rare, and non-substitutable resources can enhance operational performance (Wernerfelt, 1982). RBV theory explains that ownership of capabilities and resources – both tangible and intangible – determines a firm's success in generating economic profits and competitive advantage (Kusumaningrum & Astuti, 2024). The business world's dependence on natural resources ultimately drives companies to continuously develop knowledge and innovations for more environmentally sustainable business practices (Kurniawati & Widiyana, 2024).

2.4 The Effect of Carbon Emission Disclosure on Firm Value

Carbon emission disclosure is a voluntary action undertaken by a company to disclose, record, and convey information regarding the total carbon emissions generated by the company's operations (Yuliandhari et al., 2023). Stakeholder theory states that a company has responsibilities not only to shareholders but also to various stakeholders, and through carbon emission disclosure, the company demonstrates its commitment to environmental concern.

Companies that disclose carbon emissions more extensively can increase their firm value in the eyes of investors. The more comprehensive the carbon emission disclosure information provided by the company, the greater its influence on firm value. The hypothesis formulated based on the above explanation is:

H₁: Carbon emission disclosure affects firm value.

2.5 The Effect of Carbon Performance on Firm Value

Carbon performance refers to a company's effectiveness in managing and reducing greenhouse gas emissions generated from its business operations. Carbon performance not only focuses on emission reduction but also includes transparency in emission reporting and environmental impact, as well as engagement with stakeholders to enhance awareness and environmental responsibility. Stakeholder theory states that companies are required to be responsive to the expectations of stakeholders. Good carbon performance can enhance a company's reputation, attract the interest of investors and customers who are concerned with environmental issues (Luo et al., 2015).

Companies that are driven to maintain and inform the public about improvements made regarding their carbon profile tend to disclose emissions more objectively and credibly, making it difficult to be imitated by companies that have not implemented such strategies (Selviana & Ratmono, 2019). The hypothesis formulated based on the above explanation is:

H₂: Carbon performance affects firm value.

2.6 The Effect of Green Intellectual Capital on Firm Value

Green intellectual capital is the management of resources that includes a company's knowledge and capabilities in realizing green innovation (Dewi dkk., 2021). GIC consists of three main components: Green Human Capital, Green Structural Capital, and Green Relational Capital (Zalfa & Novita, 2021). Green intellectual capital serves as a solution for companies in addressing environmental issues (Yusoff et al., 2019). Resource-based theory states that GIC is considered a strategic resource that is rare, valuable, and difficult for competitors to imitate. The development of GIC by a company can create capabilities that support sustainable competitive advantage (Kangdra & Afriyenti, 2023). The hypothesis formulated based on the above explanation is:

H₃: Green intellectual capital affects firm value.

2.7 Media Exposure Moderates the Effect of Carbon Emission Disclosure on Firm Value

Media exposure is defined as promotion and/or publicity. Signaling theory explains that the tendency to disclose corporate social responsibility reports is seen from the use of media as a promotional tool to the public. Companies can build positive perceptions and formulate appropriate actions (Oktaviandita & Yuliandhar, 2022). Media helps companies convey information to the public regarding the business activities carried out by the company.

Transparent disclosure of information regarding carbon emissions can enhance a company's reputation (Dhaliwal et al., 2014). The effectiveness of disclosure is greatly influenced by the extent and positivity of the information disseminated through the media. The hypothesis formulated based on the above explanation is:

H₄: Media exposure is able to moderate the effect of carbon emission disclosure on firm value.

2.8 Media Exposure Moderates the Effect of Carbon Performance on Firm Value

Carbon performance encompasses a company's efforts to reduce carbon emissions and improve energy efficiency (Eccles et al., 2014). Companies that demonstrate good performance in sustainability can enhance their reputation and investor confidence. Media exposure plays an important role in strengthening the signals sent by the company to stakeholders.

Signaling theory explains that companies use relevant information to send signals to the market regarding their quality and performance (Spence, 1973). Companies with good carbon performance need to communicate these achievements through the media. Media exposure functions as a moderating variable that strengthens the relationship between carbon performance and firm value. The hypothesis formulated based on the above explanation is:

H₅: Media exposure is able to moderate the effect of carbon performance on firm value.

2.9 Media Exposure Moderates the Effect of Green Intellectual Capital on Firm Value

GIC can provide significant competitive advantages and contribute to increasing firm value (Iqbal et al., 2023). The positive impact of GIC on firm value makes it important for companies to communicate and promote their green capabilities to stakeholders. Companies use media exposure to reduce information asymmetry between management and external stakeholders (Purnomo, 2022).

Companies that are able to effectively utilize media exposure can have a positive impact on the effect of GIC on firm value, as stakeholders will better understand and appreciate the sustainability efforts undertaken by the company. The hypothesis formulated based on the above explanation is:

H₆: Media exposure is able to moderate the effect of green intellectual capital on firm value.

3. Research Method

3.1 Population and Sample

The research population consists of energy sector companies listed on the Indonesia Stock Exchange from 2021 to 2024. The research sample uses a purposive sampling technique determined based on the following criteria:

1. Energy sector companies listed on the Indonesia Stock Exchange.
2. Energy sector companies that conducted an Initial Public Offering (IPO) during 2021-2024.
3. Companies that publish annual reports and sustainability reports.
4. Companies that report financial statements using the Indonesian rupiah currency.
5. Companies that do not consistently disclose the amount of carbon emissions.

Table 1.
Sample Selection

Criteria	Number of Companies
Energy sector companies listed on IDX in 2021-2024	80
Companies that conducted Initial Public Offering (IPO) in 2021	(19)
Companies using Indonesian rupiah currency	(17)
Companies that do not publish annual reports and sustainability reports	(11)
Companies that do not consistently disclose carbon emissions	(15)
Number of samples per year	18
Total number of samples over 4 years (2021-2024)	72

Source: Processed data, 2025

3.2 Variabel Definition and Measurement

3.2.1 Firm Value

Firm value represents a company's performance reflected in its stock price, which is formed by supply and demand since the company was established (Kusumaningrum & Astuti, 2024). The measurement of Tobin's Q illustrates the extent to which investors assess and are interested in investing in the company (Zurriah, 2021).

$$Tobin's\ Q = \frac{MVE + TL}{TA}$$

3.2.2 Carbon Emission Disclosure

Carbon emission disclosure is a form of a company's commitment to maintaining environmental sustainability (Arifah & Haryono, 2021). The basis for preparing carbon disclosure in Indonesia is the Global Reporting Initiative (GRI) Standard 305 (2016) on emissions (Muhammad & Aryani, 2021). The assessment of carbon emission disclosure assigns a score of 1 when carbon-related information or data is disclosed, whereas if no relevant information is provided, the carbon disclosure score is given a 0. Table 2 explains the carbon emission disclosure index.

Table 2.
Carbon Emission Disclosure Checklist

Category	Item
CC/Climate Change	CC-1: Assessment/Description of Risks (specific or general regulations) related to climate change and actions taken to manage those risks.
	CC-2: Current (and future) assessment/description of financial, business, and opportunity implications of climate change.
GHG/Green House Gas	GHG-1: Description of methodology used to calculate greenhouse gas emissions (e.g., GHG protocol or ISO)
	GHG-2: Existence of external verification of GHG emission quantities by whom and based on what
	GHG-3: Total greenhouse gas emissions (metric tons CO ₂ -e) produced
	GHG-4: Disclosure of scope 1 and 2, or 3 direct GHG emissions
	GHG-5: Disclosure of GHG emissions by origin or source (e.g., coal, electricity, etc.)
	GHG-6: Disclosure of GHG emissions by facility or segment level
	GHG-7: Comparison of GHG emissions with previous years
EC/Energy Consumption	EC-1: Amount of energy consumed (e.g., tera-joules or PETA-joules)
	EC-2: Quantification of energy used from renewable resources

	EC-3: Disclosure by type, facility, or segment
RC/ <i>Reduction and Cost</i>	RC-1: Details of plans or strategies to reduce GHG emissions
	RC-2: Specifications of target levels and years for GHG emission reductions
	RC-3: Emission reductions and costs or savings currently achieved as a result of carbon emission reduction plans
	RC-4: Future emission costs accounted for in capital expenditure planning.
AEC/ <i>Accountability of Emission Carbon</i>	AEC-1: Indication of where the board committee (or other executive body) holds responsibility for actions related to climate change.
	AEC-2: Description of the mechanism by which the board (or other executive body) reviews the company's progress on climate change.

Source: (Choi et al., 2013)

$$CED = \frac{\text{Number of disclosed items}}{\text{Total disclosure items}}$$

3.2.3 Carbon Performance

Carbon performance refers to operations related to controlling dioxide emissions. Carbon performance is the action taken by companies to reduce greenhouse gas (GHG) emissions that impact the environment (Velte et al., 2020). Carbon performance is measured based on the Carbon Emission Initiative (CEI) (Luo, 2019). CEI is calculated as the natural logarithm of the ratio of total Scope 1 and Scope 2 GHG emissions to the total sales of a company, reflecting production process efficiency.

$$CP = \ln \left(\frac{\text{Total GHG Emissions Scope 1 + Scope 2}}{\text{Total Sales}} \right)$$

3.2.4 Green Intellectual Capital

Green intellectual capital is the management of resources that includes knowledge and capabilities in realizing green innovation or corporate environmental protection (Dewi dkk., 2021). Green intellectual capital is classified into three components, namely Green Human Capital, Green Structural Capital, and Green Relational Capital (Chen, 2008).

Table 3.
Criteria of Green Intellectual Capital Items

Green Human Capital
1. Employees in this company are engaged in positive productivity and contribute to environmental protection. 2. Employees in this company possess adequate competence regarding environmental protection. 3. Employees of this company provide high-quality products and services related to environmental protection. 4. A high level of cooperative teamwork regarding environmental protection is practiced within this company. 5. Managers are fully able to support their employees in accomplishing their environmental protection tasks.
Green Structural Capital
1. This company has an excellent environmental protection management system. 2. This company has a high ratio of employees in environmental management to its total workforce. 3. This company makes adequate investments in environmental protection facilities. 4. The entire operational process toward environmental protection in this company operates efficiently. 5. The knowledge management system in this company supports the accumulation and sharing of knowledge about environmental management. 6. This company has established a committee to address critical issues in environmental protection. 7. This company has set detailed rules and regulations for environmental protection. 8. This company has established a reward system for the completion of environmental tasks.
Green Relational Capital

1. This company designs its products or services according to the environmental preferences of its customers.
2. Customers are satisfied with the environmental protection efforts of this company.
3. The cooperative relationship between this company and its suppliers regarding environmental protection is well established.
4. The cooperative relationship between this company and its clients regarding environmental protection is stable.
5. The cooperative relationship between this company and its strategic partners in environmental protection is well maintained.

Source: (Chen, 2008)

$$GIC = \frac{n}{k}$$

3.2.6 Media Exposure

The role of media is important for companies as a communication tool and means of disseminating information to the public. A company website can facilitate interaction to receive feedback, reduce communication costs, and make it easier for the public to understand the company's activities (Mashuri & Ermaya, 2020). Media exposure is measured using a dummy variable, by assigning a score of 1 if the company discloses information regarding carbon emissions and green intellectual capital in the sustainability report available on the company's website, and a score of 0 if the company does not disclose information regarding carbon emissions and green intellectual capital in the sustainability report available on the company's website.

3.3 Data Analysis Method

Panel data regression is a combination of cross-sectional data and time series data, where the same cross-sectional units are measured at different points in time. Panel data consists of observations from several identical individuals (or entities) observed over a specific period. The panel data regression equation is as follows:

- 1) $Y_{it} = \alpha + \beta_1.X1_{it} + \beta_2.X2_{it} + \beta_3.X3_{it} + \varepsilon_{it}$
- 2) $Y_{it} = \alpha + \beta_1.X1_{it} + \beta_2.X2_{it} + \beta_3.X3_{it} + \beta_4.M + \varepsilon_{it}$
- 3) $Y_{it} = \alpha + \beta_1.X1_{it} + \beta_2.X2_{it} + \beta_3.X3_{it} + \beta_4.M + \beta_5(X1_{it}.M) + \beta_6(X2_{it}.M) + \beta_7(X3_{it}.M) + \varepsilon_{it}$

Information:

- Y = Firm Value (Tobin's Q)
i = Cross-sectional data (company data)
t = Time series data (time period data)
 α = Constant
 $\beta_1 - \beta_7$ = Regression coefficients of the independent variables
X1 = Carbon Emission Disclosure (CED)
X2 = Carbon Performance (CP)
X3 = Green Intellectual Capital (GICI)
M = Media Exposure (M)
X1_{it}.M = Interaction between carbon emission disclosure and media exposure
X2_{it}.M = Interaction between carbon performance and media exposure
X3_{it}.M = Interaction between green intellectual capital index and media exposure
 ε = Error

4. Results and Discussion

4.1 Result

4.1.1 Descriptive Statistics

Descriptive analysis is a statistical tool used to provide an overview or summary of the variables used in the research. The results of the descriptive statistical test conducted are as follows:

Table 4.
Descriptive Statistics

	Y	C	X1	X2	X3	M
Mean	19161.81	1.000000	0.695988	1.73E-08	0.644290	0.902778
Median	7906.324	1.000000	0.666667	7.85E-09	0.638889	1.000000
Maximum	192588.0	1.000000	1.000000	1.03E-07	1.000000	1.000000
Minimum	0.659746	1.000000	0.333333	2.19E-13	0.277778	0.000000
Std. Dev.	37908.32	0.000000	0.166006	2.38E-08	0.189413	0.298339
Observations	72	72	72	72	72	72

Source: EViews 10 (Processed Data, 2025)

Table 4 presents the results of descriptive statistical analysis based on 72 data observations, with the following findings:

- The variable X1 – Carbon Emission Disclosure shows a mean value of 0.695988, a median of 0.666667, a maximum of 1.000000, a minimum of 0.333333, and a standard deviation of 0.166006. These results indicate that Carbon Emission Disclosure had a relatively low representativeness during the research period.
- The variable X2 – Carbon Performance has a mean value of 1.73E-08, a median of 7.85E-09, a maximum of 1.03E-07, a minimum of 2.19E-13, and a standard deviation of 2.38E-08. These values suggest that Carbon Performance had a high representativeness during the research period.
- The variable X3 – Green Intellectual Capital Index (GICI) has a mean of 0.644290, a median of 0.638889, a maximum of 1.000000, a minimum of 0.277778, and a standard deviation of 0.189413. This implies that the Green Intellectual Capital Index was relatively low in representativeness throughout the research years.
- The dependent variable Y – Firm Value (Tobin's Q) has a mean of 19,161.81, a median of 7,906.324, a maximum of 192,588.0, a minimum of 0.659746, and a standard deviation of 37,908.32. These results indicate that Firm Value had a high level of representativeness during the observation period.
- The moderating variable M – Media Exposure recorded a mean value of 0.902778, a median of 1.000000, a maximum of 1.000000, a minimum of 0.000000, and a standard deviation of 0.298339. These results suggest that Media Exposure showed low representativeness during the study period.

Data characteristics, examination, as well as findings and interpretation are all included in this section. The results analysis is succinctly and clearly reported in accordance with the research objectives, theory, and previous research. Tables and/or figures are used to explain the results. Explain the results in the first section (using subheadings) and followed by discussion with the different subheadings.

4.1.2 Panel Data Regression Model Selection

The selection of the panel data regression estimation model is based on statistical testing to obtain the most appropriate and accurate estimation. The estimation model selection includes Chow Test, Hausman Test, and Lagrange Multiplier (LM) Test. The results of these tests are presented as follows:

Chow Test

Table 5.
Chow Test Estimation

Effects Test	Statistic	d.f.	Prob.
Cross-section F	63.841462	(17,50)	0.0000
Cross-section Chi-square	224.829611	17	0.0000

Source: EViews 10 (Processed Data, 2025)

Based on Table 5, it can be seen that the probability value of the cross-section Chi-square is 0.0000, which means that the Chi-square probability value is smaller than the significance level of 0.05. Therefore, based on the Chow test criteria, it can be concluded that the appropriate estimation model is the Fixed Effect Model (FEM).

Hausman Test

Table 6.
Hausman Test Estimation

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.791883	4	0.9395

Source: EViews 10 (Processed Data, 2025)

Based on Table 6, it can be seen that the probability value of the cross-section Random is 0.9395. Since the probability value is greater than the significance level of 0.05, it can be concluded that the estimation model selected according to the Hausman test is the Random Effect Model (REM).

Lagrange Multiplier Test

Based on Table 7, it can be seen that the cross-section Breusch-Pagan value is 0.0000, which means the value is smaller than the significance level of 0.05. Therefore, it can be concluded that the better estimation model according to the LM test is the Random Effect Model (REM).

Table 7.
Lagrange Multiplier Test Estimation

Null (no rand. effect) Alternative	Cross-section One-sided	Period One-sided	Both
Breusch-Pagan	93.61391 (0.0000)	1.456305 (0.2275)	95.07022 (0.0000)
Honda	9.675428 (0.0000)	-1.206775 (0.8862)	5.988242 (0.0000)
King-Wu	9.675428 (0.0000)	-1.206775 (0.8862)	2.634686 (0.0042)
GHM	-- --	-- --	93.61391 (0.0000)

Source: EViews 10 (Processed Data, 2025)

The model estimation selection conducted through the Chow test, Hausman test, and Lagrange Multiplier test leads to the conclusion that the appropriate approach to use in panel data regression is the Random Effect Model.

4.1.3 Significance Test of Panel Data Regression Parameters

The simultaneous test results show an F-statistic probability value of 0.000000, which is less than the significance level of 0.05. Therefore, it can be concluded that the independent variables—carbon emission disclosure, carbon performance, and green intellectual capital index—simultaneously affect the dependent variable, which is firm value. The results of the t-test are presented as follows:

Table 8.
Partial test results of Equation 1

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	63058.73	20663.26	3.051732	0.0032
LOGX1_CED	-107400.0	28312.16	-3.793425	0.0003
X2_CP	-4.04E+11	1.79E+11	-2.251343	0.0276
LOGX3_GIC	58714.33	24004.63	2.445959	0.0170

Source: EViews 10 (Processed Data, 2025)

Explanation of Table 8 is as follows:

- 1) The significance value obtained is 0.0003, which is less than 0.05. Therefore, the first hypothesis in this study, stating that carbon emission disclosure affects firm value, is accepted.
- 2) The significance value obtained is 0.0276, which is less than 0.05. Therefore, the second hypothesis in this study, stating that carbon performance affects firm value, is accepted.
- 3) The significance value obtained is 0.0170, which is less than 0.05. Therefore, the third hypothesis in this study, stating that the green intellectual capital index affects firm value, is accepted.

Table 9.
Partial test results of Equation 2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	63559.28	21784.84	2.917592	0.0048
LOG_X1	-107449.9	28528.54	-3.766400	0.0004
X2	-4.04E+11	1.81E+11	-2.236182	0.0287
LOG_X3	59786.91	27826.09	2.148591	0.0353
M	-1272.676	16334.94	-0.077911	0.9381

Source: EViews 10 (Processed Data, 2025)

Explanation of Table 9 is as follows:

- 1) The significance value obtained is 0.9381, which is greater than 0.05. Therefore, fourth hypothesis in this study, stating that media exposure affects firm value, is rejected.

Table 10.
Partial test results of Equation 3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.911714	8.323598	0.109534	0.9131
LOGX1_CED	-0.549153	1.779876	-0.308534	0.7586
X2_CP	50624616	34910451	1.450128	0.1518
LOGX3_GIC	-5.941610	1.320408	-4.499828	0.0000
M_ME	-8.876195	7.099786	-1.250206	0.2158
CED_ME	-0.734803	2.805788	-0.261888	0.7942
CP_ME	-50602424	35520694	-1.424590	0.1590
GIC_ME	9.491483	2.987111	3.177479	0.0023

Source: EViews 10 (Processed Data, 2025)

Explanation of Table 11 is as follows:

- 1) The interaction between carbon emission disclosure and media exposure, based on test results, yielded a significance value of 0.7942, which is greater than 0.05. The hypothesis proposed in this study, stating that media exposure is able to moderate carbon emission disclosure on firm value, is rejected.
- 2) The interaction between carbon performance and media exposure, based on test results, yielded a significance value of 0.1590, which is greater than 0.05. The hypothesis proposed in this study, stating that media exposure is able to moderate carbon performance on firm value, is rejected.
- 3) The interaction between green intellectual capital and media exposure, based on test results, yielded a significance value of 0.0023, which is less than 0.05. The hypothesis proposed in this study, stating that media exposure moderates green intellectual capital on firm value, is accepted.

4.2 Discussion

4.2.1 The Effect of Carbon Emission Disclosure on Firm Value

The test results are consistent with the initial hypothesis, which states that carbon emission disclosure influences firm value. Companies that are transparent about their carbon emissions can demonstrate that they are responsible and committed to sustainable business. Good carbon emission disclosure can attract greater investor support, which in turn can enhance firm value (Probosari & Kawedar, 2019).

The findings align with stakeholder theory, which posits that a company is responsible not only to its shareholders but also to various other stakeholders. Carbon emission disclosure is a method for companies to demonstrate their contribution and concern for environmental issues, including global warming (Bahriansyah & Ginting, 2022). Investors require carbon emission information to assess climate-related risks and the quality of governance, which can enhance market valuation. Companies with good carbon emission disclosure tend to receive higher valuations in the capital market. Carbon emission disclosure reflects a company's preparedness in facing increasingly stringent environmental regulations.

These findings are supported by research conducted by Trimuliani & Febrianto (2023), Noor & Ginting (2022), Azhari & Hasibuan (2023), Alfayerds & Setiawan (2021), Hadiani & Mulyani (2023), and Nazwa & Fitri (2022). However, the results contradict studies by Gayatri & Yuniarta (2024) and Gunawan & Berliyanda (2024), which state that carbon emission disclosure does not have a significant effect on firm value.

4.2.2 The Effect of Carbon Performance on Firm Value

The test results support the initial hypothesis stating that carbon performance affects firm value. Companies with superior carbon performance are valued more highly by the market because investors perceive them as more sustainable businesses. The better the carbon emission management, the greater the trust given by investors and stakeholders (Darmawan & Firmansyah, 2025).

The findings align with stakeholder theory. Stakeholder theory states that a company's sustainability depends on its ability to meet the expectations of various parties. Stakeholder theory can explain that stakeholder satisfaction with environmentally friendly practices can increase firm value and strengthen long-term reputation. Carbon performance functions as a crucial business strategy for maintaining a corporate image that meets the expectations of various interested parties (Ziping & Genzhu, 2018). Companies with strong emission management tend to adopt more efficient production technologies and optimized business processes, which not only reduce environmental impact but also lower operational costs. The shift toward low-carbon practices positions carbon performance as a key indicator in assessing a company's growth prospects and sustainability, especially during the energy transition era.

The idea that carbon performance influences firm value is consistent with research by Trimuliani & Febrianto (2023), Benkraiem et al. (2022), Ganda (2022), Mas'udiyah dkk (2024), and Amalia & Aji (2025). However, the results contradict the study conducted by Anggraeni (2024), which suggests that carbon performance does not have a significant effect on firm value.

4.2.3 *The Effect of Green Intellectual Capital Index on Firm Value*

The test results support the initial hypothesis, which states that Green Intellectual Capital (GIC) affects firm value. Green intellectual capital refers to a company's stock of knowledge, innovations, and systems dedicated to creating sustainable business solutions. Companies that invest their resources in building green intellectual capital not only contribute to environmental preservation but also create a competitive advantage, which is reflected in a higher market value.

The research findings align with the Resource-Based View (RBV) theory. The Resource-Based View (RBV) theory reveals that green intellectual capital is considered a strategic resource that is rare, valuable, and difficult for competitors to imitate. Green intellectual capital, which encompasses knowledge, innovation, and intangible assets related to sustainability, meets all the criteria in the dynamics of the modern, environmentally-oriented economy (Augustine & Dwianika, 2019). Resource-based theory explains that companies with strong green intellectual capital will be able to create product differentiation, process efficiency, and sustainable innovation that is not easily replicated by competitors. Environmentally-sound intellectual capital adds value to the company and attracts investor interest, thereby increasing firm value. Companies with strong GIC tend to develop more resource-efficient production processes, leading to reductions in both energy and material costs. Green intellectual capital becomes a strategic resource that can drive financial performance in an era where consumers and investors increasingly value environmentally friendly business practices (Imaningati & Vestari, 2016).

These results are consistent with the findings of Martínez-Falcó et al. (2025), Kusumaningrum & Astuti (2024), Ericho & Amin (2024), Tonay & Murwaningsari (2022), and Asiaei et al. (2023). However, the results contradict the research conducted by Adelisa & Mayangsari (2025), which found no significant influence of green intellectual capital on firm value.

4.2.4 *The Effect of Media Exposure on Firm Value*

This study does not support the assumption that the more frequently a company is covered by the media, the more its value will increase. Media exposure does not affect how investors perceive company performance, especially if the news presented is not supported by accurate financial data. The role of media exposure is limited to attracting initial attention, while investment decisions are based on a more in-depth analysis of the company's fundamental value.

The research findings show a misalignment with signaling theory. Signaling theory proposes that companies that proactively send signals to the market to reduce information asymmetry can increase firm value. The results indicate that signals conveyed through media

exposure are not considered credible enough by investors to affect firm value. The research findings are supported by the essence of stakeholder theory. Stakeholder theory states that a company's long-term value is determined not only by its relationship with shareholders but also by effective relationship management with all stakeholders. Media exposure functions more as a tool to maintain good relations with various stakeholders rather than as a driver of firm value.

The test results are consistent with research conducted by Kurniansyah et al. (2021), Julekhah & Rahmawati (2019), Alkebsee & Habib (2021), Dang et al. (2022), and Zou et al. (2020).

4.2.5 Media Exposure Moderates the Effect of Carbon Emission Disclosure on Firm Value

The results of the Moderated Regression Analysis (MRA) in this study indicate that media exposure, which refers to how frequently a company is covered in media publications, is unable to moderate (weaken) the effect of carbon emission disclosure on firm value. This finding suggests that the media does not serve as a primary benchmark for investors (Zaniarti & Novita, 2017). The level of media exposure does not significantly trigger fluctuations in firm value, particularly concerning carbon emission disclosure, because firm value is predominantly influenced by fundamental factors that investors assess directly.

These research findings are not aligned with signaling theory. Signaling theory posits that information conveyed through the media should function as a signal that enhances a company's visibility and credibility in the eyes of investors (Spence, 1973). The results of this study indicate that the signaling mechanism through the media has not been effective in this research context. The findings are more strongly supported by stakeholder theory. The inability of media exposure to moderate the relationship between carbon emission disclosure and firm value demonstrates that, even though media exposure does not directly increase market value, companies still disclose carbon emissions to meet the expectations and demands of various stakeholders.

These test results are consistent with research conducted by Silaban et al. (2020), Bahriansyah & Ginting (2022), Shintia & Merina (2023), Elviana et al. (2024), and Situmorang & Yanti (2020), which state that media exposure is unable to moderate the influence of carbon emission disclosure on firm value because corporate news regarding carbon emissions does not directly exert pressure or encourage companies to improve information disclosure to stakeholders.

4.2.6 Media Exposure Moderates the Effect of Carbon Performance on Firm Value

The results of the Moderated Regression Analysis (MRA) indicate that media exposure is unable to moderate (weaken) the influence of carbon performance on firm value. The insignificance of the moderating effect demonstrates that changes in the level of media exposure do not substantially trigger fluctuations in firm value. Professional investors require a deep

understanding of metrics to accurately assess a company's performance and sustainability commitment (Pratama et al., 2020). Gaps in information delivery by the media lead investors to not use it as a primary benchmark, but instead rely on more structured specific reports and industry standards (Zaniarti & Novita, 2017).

These research findings do not align with the initial assumption of signaling theory. Signaling theory posits that companies can proactively send signals to the market to reduce information asymmetry, which can ultimately increase firm value. The research results are consistent with the essence of stakeholder theory. Carbon performance and media exposure function more as tools to meet accountability demands from various stakeholders and to maintain reputation. Good carbon performance when covered by the media plays a greater role in the realm of corporate social responsibility and reputation management with various stakeholders (Majid et al., 2021).

These findings are supported by studies conducted by Majid et al. (2021), Jarboui & Moalla (2022), Shintia & Merina (2023), Elviana et al. (2024), and Situmorang & Yanti (2020), which demonstrate that these results align with the current study, indicating the ineffectiveness of media exposure in moderating the relationship between carbon performance and firm value.

4.2.7 Media Exposure Moderates the Effect of Green Intellectual Capital on Firm Value

The results of the Moderated Regression Analysis show that media exposure is able to moderate (strengthen) the relationship between green intellectual capital and firm value. Media coverage related to a company's innovation and sustainability practices increases investor visibility and understanding of intangible assets. These findings indicate that the more the media highlights the green aspects of a company's green intellectual capital, the stronger its impact on the value perceived by the market (Majumdar & Bose, 2019). News about eco-friendly technologies or successful innovative recycling programs covered by the media can increase investor awareness and convince investors about the company's future growth potential. The media's focus on innovation and sustainability practices, which are part of green intellectual capital, can create positive perception and enhance investor confidence.

The research findings revealing that media exposure can moderate the relationship between green intellectual capital and firm value demonstrate strong consistency with the basic assumptions of signaling theory. The role of media exposure as a moderator aligns with the proposition of signaling theory which states that media functions as a channel that strengthens the transmission of signals to the market. Extensive media coverage of green innovations, sustainability expertise, or a company's eco-friendly brand acts as a credible signal that convinces investors of the company's future business prospects (Nasution et al., 2025).

The research results are consistent with studies conducted by Sari et al. (2019), Gama et al. (2022), Gao & Zhang (2025), Gao et al. (2020), and Cai et al. (2024).

5. Conclusions

Based on the research findings, media exposure plays a nuanced role in influencing firm value, particularly when it comes to environmental disclosures. While it does not effectively moderate the relationship between carbon emission disclosure or carbon performance and firm value—suggesting that investors prioritize fundamental financial data and more structured environmental reports over general media coverage—it significantly strengthens the impact of green intellectual capital on firm value. This indicates that media attention on a company's green innovations, sustainable practices, and overall environmental knowledge effectively enhances investor perception and confidence in its intangible assets. Ultimately, the study highlights that for media coverage to be truly impactful on firm value in the context of sustainability, it needs to go beyond superficial reporting and effectively translate complex environmental initiatives into credible and understandable information for investors.

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