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RESEARCH PAPER | Financial Accounting & Corporate Governance

Green Accounting Disclosure and Investor Valuation: The Moderating Role of Corporate Governance in Publicly Listed Coal Sectors

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ABSTRACT

This article examines whether green accounting disclosure is associated with investor valuation in publicly listed coal-sector companies and whether corporate governance strengthens that relationship. Coal companies face a distinctive valuation problem: environmental information may help investors assess future liabilities, transition exposure, operating resilience, and management credibility, yet disclosure can also reveal costly environmental impacts and expose inconsistencies between stated commitments and actual performance. Building on agency, stakeholder, legitimacy, signaling, and voluntary-disclosure perspectives, the article develops a framework that separates the breadth of environmental disclosure from its quality, financial materiality, and verification. Corporate governance is conceptualized through board independence and expertise, audit committee effectiveness, ownership oversight, and the integration of climate risk into board-level risk management. A structured synthesis of recent empirical literature and official reporting frameworks is combined with a replicable panel-data design for listed coal companies. The synthesis indicates that disclosure is unlikely to produce a uniform valuation premium: investors are more likely to respond positively when information is comparable, decision-useful, credible, and linked to financial exposure, while high emissions or weak environmental performance may still be priced negatively. Effective governance can strengthen credibility and reduce managerial discretion over selective reporting, but formal governance structures alone may not ensure substantive oversight. Because no original company-year dataset is estimated in this manuscript, it does not invent coefficients or claim new causal findings. Instead, it identifies testable hypotheses, operational measures, econometric specifications, and robustness checks for an empirical study of publicly listed coal companies, with particular relevance to emerging markets such as Indonesia.

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1. INTRODUCTION

Environmental information has become increasingly relevant to financial analysis because climate change can affect a company's costs, assets, liabilities, access to capital, and long-term commercial prospects. For carbon-intensive businesses, these effects are especially salient. Coal producers may face changes in demand, carbon policy, mine rehabilitation obligations, water and land-use constraints, litigation exposure, and financing conditions as governments and markets respond to climate risk. Investors therefore need more than a statement that a company supports sustainability; they need information that helps them estimate the financial consequences of environmental impacts and transition pressures. International sustainability disclosure standards have sought to make such information more comparable and decision-useful, particularly by connecting sustainability-related risks and opportunities to enterprise prospects (IFRS Foundation, 2023a; IFRS Foundation, 2023b).

Green accounting disclosure can be understood as the communication of environmental costs, impacts, risks, commitments, and performance in corporate reports. In the coal sector, relevant information may include greenhouse gas emissions, energy and water use, land disturbance, mine rehabilitation provisions, waste management, environmental penalties, environmental capital expenditure, emissions-reduction plans, and assumptions about future regulation. These disclosures can reduce information asymmetry when they

provide consistent and verifiable information about the firm's exposure. However, the label "green accounting" is used inconsistently in research. Some studies measure environmental expenditure, others count sustainability-report indicators, and others focus on carbon emissions or environmental certification. These measures capture different constructs and should not be treated as interchangeable (Borghei, 2021; IFRS Foundation, 2023b; GRI, 2021).

The coal industry offers a demanding context in which to test the valuation relevance of environmental disclosure. Coal firms can generate strong cash flows when commodity prices are high, while simultaneously carrying substantial long-term environmental and transition risks. Current profitability may therefore be a weak guide to the durability of future cash flows. An investor may interpret detailed disclosure as evidence of better risk management, or as new information about the scale of liabilities and exposure. The direction of the valuation response depends on the information disclosed, its credibility, and the extent to which investors had already incorporated the information into prices. Research on carbon risk shows that investors can demand compensation for carbon exposure, while cross-country evidence indicates that market responses are shaped by regulation and governance conditions (Bolton and Kacperczyk, 2021; Venturini, 2022; Wang et al., 2022).

The valuation question is therefore not simply whether more disclosure is better. More extensive reporting can be associated with higher firm value when it improves transparency, reduces uncertainty, and signals managerial capability. It can also be associated with lower value when it reveals previously underappreciated emissions, environmental liabilities, or weak preparedness for a low-carbon transition. A disclosure score that counts the number of environmental statements without considering their content may fail to distinguish these effects. The analytical task is to determine whether disclosure quality improves the market's assessment of the firm after accounting for the underlying environmental exposure and financial fundamentals.

Corporate governance may help explain why similar disclosure practices receive different market responses. Boards and audit committees can influence the completeness of environmental information, the reliability of internal controls, and the extent to which climate-related risks enter capital allocation and enterprise risk management. Independent directors may challenge optimistic assumptions, while directors with environmental, financial, or mining expertise may be better positioned to scrutinize rehabilitation provisions, emissions data, and transition plans. Institutional owners can demand more rigorous reporting, although concentrated ownership can either strengthen oversight or protect controlling shareholders from external scrutiny. Governance is thus not a single characteristic but a set of mechanisms that can influence both disclosure quality and the credibility of the information communicated to investors (IFRS Foundation, 2023a; OECD, 2023; Ramadhan, 2026).

Existing studies provide useful but incomplete guidance. Reviews of carbon disclosure research identify inconsistent definitions and a need to connect emissions reporting more closely to climate-related risks and financial consequences (Borghei, 2021; Taking Stock of Carbon Disclosure Research While Looking to the Future, 2022). Empirical work on carbon emissions and market value suggests that emissions can be priced by investors, but the magnitude and interpretation of this relationship depend on the setting and the measure used (Bolton and Kacperczyk, 2021; Qureshi and Ahsan, 2022). Studies of Indonesian mining and energy companies also report mixed relationships between environmental disclosure and firm value, while indicating that governance may condition these relationships (Kurniawan et al., 2024; Susbiyani and Animah, 2024; Kartikawati et al., 2026). Regional evidence from ASEAN-listed firms likewise shows that the valuation benefit of ESG disclosure is strongest in heavily regulated sectors and is reinforced by governance attributes (Hasan, 2025). These findings are informative, but the evidence base remains heterogeneous in sector scope, variable construction, sample period, and estimation strategy.

Three gaps motivate this article. First, green accounting disclosure is frequently proxied by a checklist or broad sustainability index, leaving limited distinction between the quantity of disclosure and its decision-usefulness. Second, governance is often included as a direct explanatory variable or a composite score rather than explicitly tested as a moderator that can strengthen or weaken the valuation consequences of disclosure. Third, coal-specific valuation dynamics deserve separate attention because environmental liabilities, carbon intensity, rehabilitation obligations, and transition risks are unusually material to this sector. Evidence from

diversified manufacturing or the broader mining sector cannot be transferred to coal companies without considering these characteristics.

This article addresses these gaps by developing an accounting and governance framework for publicly listed coal-sector companies. It asks: (1) how is the quality of green accounting disclosure expected to relate to investor valuation? (2) does corporate governance strengthen the association between disclosure and valuation? and (3) which measurement and econometric choices are necessary to distinguish disclosure credibility from underlying environmental performance and financial risk? The article is relevant to financial accounting, corporate governance, and capital-market research, with particular applicability to Indonesia and other emerging markets where coal remains economically important but climate-related scrutiny is increasing.

The contribution is threefold. Conceptually, the article distinguishes disclosure quantity, quality, and environmental performance, thereby avoiding the assumption that a larger report necessarily means better environmental outcomes. Theoretically, it integrates agency and signaling perspectives with stakeholder and legitimacy explanations to clarify why disclosure may have positive or negative valuation implications. Methodologically, it proposes a panel-data design that tests governance as a moderator while controlling for emissions intensity, profitability, leverage, commodity prices, and firm-specific characteristics. The article is presented as a structured evidence synthesis and empirical research framework; it does not claim original regression estimates because a company-year dataset has not been assembled and analyzed for this manuscript.

The remainder of the article is organized as follows. Section 2 reviews theoretical foundations and recent empirical evidence, then develops hypotheses. Section 3 describes the proposed research design, sample, measures, and econometric approach. Section 4 synthesizes the evidence and derives implications for the hypotheses without inventing original estimates. Section 5 discusses theoretical and practical implications, limitations, and future research. Section 6 concludes.

2. LITERATURE REVIEW

2.1 Green accounting disclosure in carbon-intensive firms

Green accounting disclosure sits at the intersection of environmental measurement and financial reporting. In a broad sense, it includes the identification and communication of environmental expenditures, obligations, physical impacts, and management responses. In a narrower accounting sense, it can include environmental costs recognized in financial statements, provisions for rehabilitation and remediation, asset impairment assumptions, environmental liabilities, and capital expenditure related to pollution control or transition. Sustainability reports expand this information by describing physical emissions, targets, governance, and strategy. The two reporting channels overlap but are not equivalent: a sustainability report can disclose emissions without showing their financial implications, while financial statements can recognize a provision without explaining the underlying environmental pathway in sufficient detail.

This distinction is important because investors use information for different decisions. Physical emissions data can help investors assess exposure to carbon pricing, technology shifts, or customer pressure. Environmental expenditure can reveal the level of resources committed to mitigation and remediation. Provisions and contingent liabilities can signal future cash outflows, although accounting estimates depend on assumptions about timing, legal obligations, discount rates, and the scope of restoration. Transition plans may indicate how management expects to respond to changing markets, but they are informative only when assumptions and milestones are credible. IFRS S1 and IFRS S2 seek to improve the connection between sustainability-related risks, governance, strategy, risk management, metrics, and prospects (IFRS Foundation, 2023a; IFRS Foundation, 2023b).

Disclosure should therefore be evaluated across several dimensions: completeness, specificity, comparability, timeliness, consistency, financial materiality, and assurance. Completeness concerns whether material topics are covered. Specificity distinguishes quantified information from generic language. Comparability concerns whether metrics use stable boundaries and units over time. Timeliness reflects whether information is available before it loses decision value. Financial materiality asks whether the

disclosure helps investors evaluate cash flows, access to finance, or cost of capital. Assurance can increase confidence in the process, but it cannot guarantee that the chosen indicators fully represent the firm's environmental performance.

For coal companies, environmental disclosure should ideally connect operational data with financial consequences. Emissions disclosure is more useful when it identifies scopes, organizational boundaries, estimation methods, and changes in production. Mine rehabilitation information is more useful when provisions, expected timing, and key assumptions are explained. Environmental capital expenditure is more informative when the company distinguishes maintenance or compliance spending from investments intended to change its operating model. Without these connections, an environmental report may be extensive yet difficult to translate into valuation assumptions.

2.2 Investor valuation and the information environment

Investor valuation is forward-looking. Market prices reflect expectations about future cash flows, growth, risk, and the information available to market participants. Environmental disclosure can influence valuation by changing expected revenue, operating costs, capital expenditure, liabilities, and the risk premium demanded by investors. It may also affect investors' confidence in management's ability to identify and manage uncertainty. Yet the market reaction depends on whether the information is new, credible, and financially material. Disclosure that simply repeats already-known information may have little incremental effect, even if the underlying environmental issue is important.

Carbon risk is not a single exposure. Physical risk includes damage from floods, heat, drought, or other climate-related events that can disrupt operations and infrastructure. Transition risk arises from policy, technology, market, and reputational changes associated with decarbonization. For coal firms, transition risk can include declining demand, restrictions on financing, changing export markets, carbon pricing, and asset impairment. Environmental liabilities such as rehabilitation and water management may create additional cash-flow exposure. The corporate-finance literature emphasizes that these risks can affect firm value through both expected cash flows and discount rates (Supranta and Permatasari, 2025; Venturini, 2022; Wang et al., 2022).

Empirical evidence suggests that markets do not necessarily treat carbon exposure as a purely reputational issue. Bolton and Kacperczyk (2021) find that firms with higher emissions and increases in emissions can earn higher stock returns, a pattern consistent with investors requiring compensation for carbon exposure rather than necessarily rewarding high emitters. This result should not be interpreted as evidence that high emissions increase firm value; expected returns and contemporaneous valuation are different concepts. A high expected return can reflect a higher required return or risk premium, which may reduce the present value of future cash flows. Qureshi and Ahsan (2022) further show that investor responses to environmental performance disclosures can vary across cultural and institutional contexts. Together, these studies support a conditional view of environmental information rather than a universal positive-disclosure hypothesis.

Firm valuation is commonly proxied by Tobin's Q, market-to-book ratio, or market capitalization adjusted for accounting fundamentals. Tobin's Q is intended to capture how the market values the firm relative to the replacement or book value of its assets, although practical approximations vary. Market-to-book is easier to compute but is sensitive to intangible assets, leverage, and accounting policy. Market capitalization reflects investor expectations but is affected by overall market conditions. These measures should be treated as related but non-identical outcomes, and results should be tested with more than one proxy where possible.

2.3 Theoretical foundations

2.3.1 Agency theory

Agency theory focuses on the separation between ownership and control and the information asymmetry that can arise when managers possess more information than outside investors. Environmental reporting can reduce this asymmetry by providing information about risks, costs, and management actions that may otherwise remain difficult to observe. However, managers also have incentives to present performance

favorably, particularly when environmental information affects compensation, financing access, or reputation. Selective disclosure may emphasize achievements and targets while underreporting adverse outcomes or uncertainties. In this setting, governance mechanisms can reduce agency costs by strengthening monitoring, internal controls, and accountability (OECD, 2023; Ramadhan, 2026).

The agency perspective predicts that governance can strengthen the relationship between disclosure and valuation when board oversight improves the reliability of reported information. An independent audit committee may question inconsistent data, scrutinize assumptions behind environmental provisions, and ensure that sustainability reporting aligns with financial statements. Board-level risk oversight can require environmental scenarios to be incorporated into strategic planning. These mechanisms can make disclosure more credible and reduce investors' concerns about opportunistic reporting. Yet the prediction is conditional: formal independence does not guarantee expertise or diligence, and directors may lack the information or incentives needed to challenge management effectively.

2.3.2 *Signaling theory*

Signaling theory explains how firms communicate information about quality or prospects to external stakeholders when insiders know more than outsiders. Detailed, consistent, and externally assured green accounting disclosure may signal that management has developed robust environmental data systems and is willing to be accountable for performance. A firm that quantifies its liabilities, reports emissions on stable boundaries, and explains its transition assumptions may be viewed as more transparent than one relying on general sustainability language. The signal is stronger when disclosure is costly to imitate through rhetoric alone and when subsequent performance can be compared with stated targets.

The same theory also predicts a possible negative valuation response. A credible disclosure can reveal that environmental liabilities are larger than investors expected or that a transition plan is less advanced than management's prior messaging suggested. Such a response does not necessarily mean that transparency destroys value; it may mean that prices are adjusting to information that was previously incomplete. Accordingly, a positive coefficient on disclosure is not the only theoretically plausible result. The core prediction is that higher-quality information improves price discovery, while the direction of the price adjustment depends on the content of the information and the firm's underlying exposure.

2.3.3 *Stakeholder theory and legitimacy*

Stakeholder theory argues that firms depend on relationships with groups that can affect their resources, operations, and social acceptance. In coal mining, stakeholders include investors, lenders, employees, local communities, regulators, customers, and civil society. Environmental disclosure can demonstrate responsiveness to stakeholder concerns and reduce uncertainty about the company's conduct. Legitimacy theory adds that firms may disclose environmental information to maintain consistency with social expectations and preserve a license to operate. These explanations are especially relevant where environmental impacts are visible and politically contested.

Legitimacy-oriented reporting can nevertheless become symbolic. Firms may produce extensive sustainability reports to demonstrate conformity without materially changing operations. A legitimacy strategy based on selective positive narratives may temporarily protect reputation but can backfire if independent evidence contradicts the claims. For investors, the distinction between substantive and symbolic disclosure is crucial. Governance can influence this distinction by requiring independent review, linking claims to operational indicators, and ensuring that adverse outcomes are not omitted. The framework therefore treats governance as a condition that may affect the credibility of disclosure rather than assuming that all disclosure is equally informative.

2.3.4 *Institutional theory and climate disclosure standards*

Institutional theory emphasizes how regulation, professional standards, investor expectations, and peer practices shape organizational behavior. Sustainability disclosure requirements are evolving toward greater consistency, with IFRS S1 setting general requirements for sustainability-related financial information and IFRS S2 addressing climate-related risks and opportunities (IFRS Foundation, 2023a; IFRS Foundation, 2023b). These standards aim to improve the information available to capital providers, but their adoption

and enforcement differ across jurisdictions. A listed coal company's reporting incentives may therefore depend on exchange rules, national regulation, investor demand, and the degree of external scrutiny.

Institutional pressure can improve comparability but may also produce boilerplate reporting when companies treat compliance as a documentation exercise. The quality of implementation depends on internal data systems, governance, assurance, and whether the information is integrated into decisions. For cross-country studies, institutional differences should be modeled explicitly rather than assumed away. In a single-country study such as Indonesia, differences across firms in reporting quality and governance may still be shaped by ownership, size, exposure to international capital, and the strength of external monitoring.

2.4 Green accounting disclosure and investor valuation

A positive association between green accounting disclosure and valuation is plausible when transparency reduces information asymmetry and allows investors to better estimate environmental risk. More complete information can reduce uncertainty around remediation obligations, operational interruptions, and compliance expenditure. It can also signal that management has systems to monitor material environmental issues. In a capital-intensive sector, the ability to identify and explain long-term obligations may be especially valuable because environmental liabilities can extend well beyond a single operating cycle.

However, a disclosure index may combine positive and negative information. More extensive reporting can reveal high emissions, weak environmental performance, or substantial rehabilitation costs. In such cases, the market may respond negatively even though the disclosure is high quality. This creates a measurement challenge: disclosure quantity is not the same as environmental performance, and the sign of the valuation association depends on what is being disclosed. A rigorous study should separately measure disclosure quality and underlying environmental indicators such as emissions intensity, reported violations, and environmental expenditure.

The empirical literature illustrates this ambiguity. Borghei (2021) identifies fragmentation in carbon disclosure research, including inconsistent conceptualizations and a need to connect emissions reporting to climate risk. The review Taking Stock of Carbon Disclosure Research While Looking to the Future (2022) similarly highlights the development of research themes and persistent gaps. In Indonesia, Kurniawan et al. (2024) examine the value relevance of carbon emission disclosure and environmental performance in mining firms, while recent studies of energy and mining companies report varying results depending on the measures and samples used (Susbiyani and Animah, 2024; Kartikawati et al., 2026). The mixed evidence suggests that the effect should be tested rather than assumed.

Accordingly, the first hypothesis is formulated in a conditional but testable form: **H1:** higher-quality green accounting disclosure is positively associated with investor valuation in publicly listed coal-sector companies, after controlling for underlying environmental performance and financial fundamentals. The expected positive association concerns the information quality component of disclosure, not the proposition that a firm with higher emissions or larger liabilities should receive a higher valuation. The empirical design should be capable of distinguishing these constructs.

2.5 Corporate governance as a moderator

Corporate governance can strengthen the disclosure–valuation relationship through monitoring, expertise, and accountability. Board independence may reduce the likelihood that management controls the environmental narrative. Audit committee effectiveness may improve the reliability of environmental cost data and the consistency between sustainability disclosures and financial statements. Board expertise can help directors evaluate technical claims about emissions, mine closure, rehabilitation, and transition investments. Institutional ownership may increase monitoring incentives, particularly when investors have the resources to engage with management. These mechanisms can make disclosure more credible and therefore more useful to investors.

Governance may also fail to strengthen the relationship. Independent directors can be nominally independent but lack time, expertise, or access to operational data. Audit committees may focus on conventional financial reporting and treat environmental data as a separate communications exercise. Concentrated ownership can align monitoring with long-term value, but it can also protect controlling

shareholders from scrutiny. Board size and diversity may improve the range of perspectives but do not automatically ensure effective oversight. Governance variables should therefore be selected based on the mechanism they are intended to represent, rather than aggregated mechanically into a single score.

The moderation hypothesis follows from the credibility channel. When governance is effective, investors should have greater confidence that environmental information has been scrutinized, that reporting boundaries are reasonably stable, and that management is accountable for material omissions. Under weak governance, the same disclosure score may be interpreted as less credible or more symbolic. The relevant interaction is not simply disclosure multiplied by the number of directors; it is disclosure quality multiplied by a governance mechanism that plausibly improves oversight. **H2:** corporate governance quality positively moderates the association between green accounting disclosure quality and investor valuation, such that the association is stronger when governance oversight is more effective.

2.6 Governance dimensions and their expected roles

Board independence is expected to strengthen oversight when independent directors possess sufficient authority, information, and expertise. The proportion of independent directors is a common measure, but it does not capture meeting attendance, access to technical advice, or the independence of appointment processes. A coal-sector board may benefit from directors who understand environmental liabilities and transition economics, as well as directors with accounting and finance expertise. Where available, board skill composition and the presence of a sustainability or risk committee may provide more direct measures of monitoring capacity than board size alone.

Audit committee characteristics are relevant because green accounting often relies on estimates, physical data, and cross-functional reporting systems. The committee's independence, financial expertise, meeting frequency, and responsibilities can influence whether environmental data are reconciled with accounting records. Yet audit committee expertise in financial reporting may not be sufficient to assess emissions methodologies or rehabilitation assumptions. Effective oversight may require access to specialist assurance and clear responsibilities for environmental data controls. A study should distinguish audit committee presence from audit committee effectiveness.

Ownership structure is another potential governance mechanism. Institutional investors may have incentives and capabilities to scrutinize long-term climate risk, but not all institutions share the same investment horizon or engagement approach. State ownership can create both policy alignment and competing objectives. Family or controlling ownership may support long-term planning but can reduce the influence of minority shareholders. Rather than assuming a universal direction, ownership variables should be interpreted in the context of local institutions and firm characteristics.

H3: board independence strengthens the positive association between green accounting disclosure and valuation. **H4:** audit committee effectiveness strengthens the positive association between green accounting disclosure and valuation. **H5:** the moderating effect of governance is stronger when governance measures capture substantive expertise and oversight, rather than formal board structure alone. These hypotheses recognize that governance is multidimensional and that a composite index should be validated before it is used as the principal moderator.

2.7 Environmental performance, disclosure credibility, and competing explanations

A central challenge is separating the information effect of disclosure from the environmental performance that disclosure reveals. If firms with lower emissions also disclose more, a positive relationship between disclosure and valuation may reflect better environmental performance rather than transparency. Conversely, firms with poor environmental records may disclose more because they face greater scrutiny, creating a negative association between disclosure and value. Without controlling for actual emissions and environmental incidents, the estimated disclosure coefficient can be misleading.

Environmental performance should therefore be measured separately, using emissions intensity, absolute emissions where comparable, environmental penalties, rehabilitation expenditure, or third-party environmental ratings. These indicators also have limitations. Emissions intensity can improve while absolute emissions rise because production expands. Absolute emissions can be difficult to compare across

firms with different output mixes. Penalty data reflect both underlying conduct and enforcement intensity. The study should retain several indicators and test whether the disclosure coefficient is robust to their inclusion.

Reverse causality is another concern. Higher-valued firms may have more resources to develop sophisticated reporting systems, hire assurance providers, and appoint directors with specialist expertise. Investor pressure may also cause firms to disclose more. Firm fixed effects, lagged explanatory variables, and event-based designs can reduce some sources of bias, but they do not fully solve time-varying confounding. Where a disclosure mandate or reporting rule creates plausibly exogenous variation, a difference-in-differences design may be appropriate, provided the identification assumptions are tested.

2.8 Conceptual model and hypotheses

The conceptual model places green accounting disclosure quality at the center of the relationship with investor valuation. Corporate governance is modeled as a moderator that may increase the credibility and decision-usefulness of disclosure. Environmental performance, profitability, leverage, firm size, growth, liquidity, production scale, commodity prices, and year-specific market conditions are treated as controls. Governance is operationalized through board independence, audit committee effectiveness, and where feasible board expertise and ownership oversight. Investor valuation is measured primarily through Tobin's Q, with market-to-book ratio as an alternative outcome.

The framework makes a distinction between a direct disclosure effect and a governance-conditioned effect. A positive main effect is expected when disclosure reduces uncertainty, while a positive interaction is expected when governance strengthens credibility. The model also allows for an adverse direct effect if disclosure reveals significant environmental liabilities or weak performance. Such a result would not invalidate the transparency argument; it would indicate that the information is informative and that the market is repricing the underlying exposure. Interpretation should therefore focus on marginal effects and on the separate coefficients for disclosure quality and environmental performance.

Table 1. Summary of proposed hypotheses

Hypothesis	Proposed relationship	Expected interpretation
H1	Disclosure quality → investor valuation	Positive association, conditional on environmental exposure
H2	Disclosure quality × governance → investor valuation	Positive interaction
H3	Disclosure quality × board independence → valuation	Positive interaction
H4	Disclosure quality × audit committee effectiveness → valuation	Positive interaction
H5	Substantive governance expertise strengthens disclosure credibility	Stronger interaction for expertise/oversight measures

Source: Authors' elaboration.

3. RESEARCH METHODOLOGY

3.1 Research design and scope

This manuscript adopts a structured evidence-synthesis approach and proposes a replicable empirical design for publicly listed coal-sector companies. The evidence synthesis draws on recent peer-reviewed studies and official standards or reports to identify theoretical mechanisms, recurring findings, and measurement challenges. The proposed empirical design is intended for implementation using company-year data from stock exchanges, audited annual reports, sustainability reports, and market databases. No original dataset has been estimated for this manuscript; consequently, the analysis does not report fabricated coefficients, significance tests, or company-level findings. The results section synthesizes published evidence and develops testable implications rather than presenting new econometric estimates.

The evidence review prioritizes sources published from 2021 onward, including research on carbon disclosure, carbon risk and stock returns, environmental disclosure, corporate governance, and the valuation consequences of climate-related information. Official sources are used to define disclosure requirements and

contextual risks. The synthesis is structured around the focal constructs and their relationships rather than presented as an exhaustive systematic review. It therefore does not claim a registered protocol or a PRISMA-complete search. A subsequent empirical paper should document database search strings, dates, screening decisions, and exclusion criteria if the authors intend to position the work as a systematic review.

3.2 Population, sampling frame, and period

The target population consists of publicly listed coal-sector companies. For an Indonesia-focused study, the sampling frame should include coal mining and coal-related production companies listed on the Indonesia Stock Exchange, subject to a transparent sector-classification rule. A regional extension could include listed coal producers in other Asian markets, but cross-country comparability would require careful harmonization of accounting standards, governance rules, market data, and disclosure regimes. The core design should begin with one jurisdiction if the number of comparable firms is limited, and then consider a regional extension as a robustness or comparative analysis.

A feasible observation window is 2018–2025, depending on the availability of complete annual and sustainability reports. The period captures changing climate disclosure expectations and commodity-market volatility. However, the choice of window should be guided by data completeness and the relevant reporting regime rather than selected to maximize statistical significance. Delisted firms should remain in the sample where historical information is available, reducing survivorship bias. Firms that changed their business model or were involved in major acquisitions should be flagged because their reporting boundaries and financial ratios may not be comparable across the full period.

The sample selection log should identify all listed coal-sector firms at the start of the period, the number of firm-years available for financial data, the number with usable environmental disclosures, and the reasons for any exclusions. Missing environmental disclosure should not automatically lead to exclusion because disclosure absence may itself be informative. A preferred approach is to retain the broad financial panel and separately report the environmental-data subsample. This makes the risk of selection bias visible and allows sensitivity tests comparing the two samples.

3.3 Data sources and collection procedures

Financial variables should be collected from audited annual reports, stock-exchange filings, and a consistent financial database where available. Market value, total assets, total liabilities, revenue, operating income, profit after tax, capital expenditure, cash, debt, and equity should be cross-checked against published financial statements. Stock price and shares outstanding should be aligned to a consistent measurement date, such as fiscal year-end, while noting any market closures or unusual trading conditions. Currency conversions should be applied only where necessary and documented in the data dictionary.

Green accounting disclosure should be coded from annual reports, sustainability reports, integrated reports, and climate-related disclosures. Each coded item should record the source document, reporting year, page, unit, organizational boundary, whether the information is quantitative or qualitative, whether it is financially linked, and whether it has external assurance. The codebook should distinguish disclosed targets from achieved performance, general policy language from quantified metrics, and environmental expenditure from environmental liabilities. Where a company reports no information on a topic, the coding should distinguish non-disclosure from a confirmed zero value.

Governance data should include board independence, board size, director expertise, board meeting frequency, audit committee independence and financial expertise, existence and mandate of a sustainability or risk committee, institutional ownership, and ownership concentration where available. The variables should be measured consistently across firms and years. A governance committee should not be coded as effective merely because it exists; the researcher should examine its responsibilities and, if data permit, whether climate and environmental risk appear in its mandate or meeting disclosures. Qualitative coding should be performed using a documented protocol, with a second coder reviewing a sample and disagreements reconciled.

Environmental performance data should include Scope 1 and Scope 2 emissions where disclosed, Scope 3 where sufficiently comparable, emissions intensity, environmental incidents or penalties, rehabilitation

provisions, and environmental capital expenditure. For coal companies, production volume is an important denominator for intensity metrics, but differences in coal quality, mine type, and operational boundary can still limit comparability. Environmental penalties should be interpreted in light of enforcement and disclosure practices. The data collection process should not infer a clean environmental record solely from the absence of a reported incident.

3.4 Measurement of variables

The primary dependent variable is Tobin's Q, approximated consistently as the market value of equity plus the book value of liabilities divided by the book value of total assets. This proxy is widely used in firm-value studies, but it is not a direct measure of investor beliefs about environmental information. As a robustness outcome, the study should use the market-to-book ratio or market capitalization scaled by assets. If market prices are highly volatile, alternative year-end or average-price measures may be tested. The chosen formula should be reported explicitly, since alternative Tobin's Q approximations can produce different values.

The main independent variable is a Green Accounting Disclosure Quality Index (GADQI). The index should include indicators for environmental costs and expenditure; emissions and energy metrics; environmental liabilities and rehabilitation provisions; environmental targets and progress; compliance incidents and remediation; climate-related risks and opportunities; financial implications of transition scenarios; and external assurance. Each item can be coded 1 when disclosed with sufficient specificity and 0 otherwise, with a separate quality score for quantified, comparable, and financially connected disclosure. The index should not reward generic statements at the same level as quantified and verifiable information. A weighted version may be used as a robustness test, but weights should be theory-based and pre-specified.

Corporate governance quality is the moderator. The primary governance measure can be a standardized index comprising board independence, audit committee independence and expertise, board-level environmental or climate oversight, and risk-management integration. However, the study should also estimate separate interaction models for board independence and audit committee effectiveness to avoid obscuring mechanisms in a composite score. A composite governance index should be validated for internal consistency and construct coherence; statistical convenience alone is not sufficient justification for aggregation.

Environmental performance should be measured separately from disclosure. Potential measures include emissions intensity, absolute Scope 1 and Scope 2 emissions, environmental penalties, and rehabilitation provisions relative to assets or production. Because these measures capture different exposures, they should not be combined into a single index unless the rationale and direction of each component are clear. A company can disclose more because it performs poorly or because it has better reporting systems; controlling for performance is therefore essential to isolate the information-quality association.

Control variables should include firm size (natural logarithm of total assets), profitability (ROA or operating margin), leverage (debt-to-assets or liabilities-to-assets), sales growth, liquidity, capital intensity, production volume, firm age, ownership structure, and year effects. Coal prices and exchange rates may be included where firms are exposed to global commodity markets. For a multi-country sample, country-year fixed effects or explicit institutional variables may be required, although these can absorb variation in national regulatory indicators. The control set should be theoretically justified and parsimonious enough to avoid overfitting a small coal-sector sample.

Table 2. Operational definitions

Variable	Proposed measure	Role	Key data source
Investor valuation	Tobin's Q; market-to-book	Dependent	Market data and financial statements
Green accounting disclosure quality	Specificity, quantification, financial linkage, consistency, assurance	Independent	Annual and sustainability reports
Corporate governance	Board independence, audit committee expertise, climate oversight	Moderator	Annual reports and governance statements
Environmental performance	Emissions intensity, absolute emissions, penalties, rehabilitation provisions	Control / separate explanatory factor	Environmental disclosures and regulators

Variable	Proposed measure	Role	Key data source
Firm size	Log total assets	Control	Audited statements
Profitability	ROA / operating margin	Control	Audited statements
Leverage	Debt or liabilities divided by assets	Control	Audited statements
Growth and liquidity	Sales growth; current ratio or cash/assets	Control	Audited statements
Commodity exposure	Coal price index, production, export exposure where available	Control / context	Market data and company reports

Source: Authors' elaboration.

3.5 Econometric specification

The baseline model can be expressed as:

$$VALUE_{it} = \beta_0 + \beta_1 GADQI_{i,t-1} + \beta_2 GOV_{i,t-1} + \beta_3 (GADQI \times GOV)_{i,t-1} + \beta_4 ENVPERF_{i,t-1} + \beta_5 CONTROLS_{i,t-1} + \mu_i + \tau_t + \varepsilon_{it} \quad (1)$$

where VALUE represents Tobin's Q or an alternative valuation proxy; GADQI is disclosure quality; GOV is corporate governance quality; ENVPERF captures underlying environmental performance; μ_i denotes firm fixed effects; and τ_t denotes year fixed effects. The coefficient β1 estimates the association between disclosure quality and valuation at the reference level of governance, while β3 tests whether governance changes that association.

The interaction coefficient should not be interpreted without marginal effects. The researcher should plot the estimated association between disclosure quality and valuation at low, median, and high governance levels, with confidence intervals. If β3 is positive, the disclosure–valuation association becomes more positive as governance improves, but this does not guarantee a positive effect at every governance level. If the main disclosure coefficient is negative and the interaction positive, the result may indicate that disclosure initially reveals risk but becomes more valuation-supportive when credible governance is present. Such patterns should be discussed in economic terms rather than reduced to a binary significant/not-significant decision.

Firm fixed effects are suitable when stable unobserved characteristics such as historical reputation, mine quality, ownership culture, and business model are correlated with disclosure and valuation. Year effects absorb common market shocks, including commodity-price cycles and global investor sentiment. Where the sample spans multiple countries, country-year conditions may need to be modeled, but the researcher should recognize that highly saturated fixed effects can eliminate the variation needed to estimate institutional moderators. Standard errors should generally be clustered at firm level; when the number of firms is small, inference should be treated cautiously and supplemented with suitable small-sample procedures or alternative specifications.

To address reverse causality, the primary model should use lagged disclosure and governance variables. Additional tests can estimate contemporaneous and two-year lagged relationships. A dynamic panel estimator should be considered only if the panel structure and instrument count justify it; the small number of coal firms may make complex GMM specifications unreliable. If a new disclosure mandate or exchange rule creates a credible quasi-experiment, difference-in-differences or event-study methods may help identify market responses, provided the treatment group, comparison group, pre-trend assumptions, and concurrent policy changes are carefully examined.

3.6 Validity, reliability, and robustness

Content validity requires a codebook that maps each disclosure item to a clear construct and provides examples of acceptable evidence. The index should be tested on a pilot sample before full coding. Inter-coder reliability can be assessed using percentage agreement and an appropriate statistic such as Cohen's kappa for categorical items. If one coder is used, the study should still retain an audit trail and re-code a sample after a time interval. Disagreements should be resolved through documented rules rather than intuitive adjustment after results are known.

Robustness tests should replace Tobin's Q with market-to-book, use alternative disclosure indices, separate quantitative disclosure from narrative disclosure, and test board independence and audit committee effectiveness separately. The analysis should exclude extreme commodity-price years or include commodity-price controls, compare firms with and without external assurance, and test alternative definitions of emissions intensity. The model should also assess whether results are driven by one large company or one unusually high-valuation year. Outlier treatment, missing data procedures, and winsorization thresholds should be reported transparently.

Endogeneity cannot be eliminated merely by adding control variables. Firms with stronger governance may be more transparent and better managed, while high valuation can provide resources to improve disclosure. A positive association can also reflect omitted firm characteristics, including access to international investors or the quality of internal controls. The research should state the limits of causal interpretation and reserve causal language for designs with defensible identification. If a quasi-experimental strategy is not feasible, the results should be described as conditional associations rather than proof that disclosure causes valuation changes.

4. RESULTS AND EVIDENCE-BASED ANALYSIS

4.1 Scope and interpretation of the results

This section synthesizes findings from published research and derives implications for the proposed coal-sector panel model. Since the manuscript does not contain an original firm-year dataset, it does not report new descriptive statistics, regression coefficients, p-values, or hypothesis acceptance decisions. The evidence is interpreted in relation to the proposed hypotheses, and the discussion identifies the patterns that an empirical study should test. This distinction is essential because a plausible theoretical model is not a substitute for observed data, and numerical results should not be inferred from prior studies conducted in different samples.

Recent research supports the view that carbon and environmental information can be financially relevant, but it does not establish a universally positive valuation premium for disclosure. Bolton and Kacperczyk (2021) show that carbon emissions are associated with stock-return patterns consistent with investors pricing carbon risk. Their findings are important because they distinguish the pricing of risk from a simple preference for low-emission firms. Higher expected returns can reflect compensation for risk and may coexist with lower market valuations. For coal firms, this means that the valuation implications of emissions information must be interpreted in relation to expected cash flows and required returns, not as a simple sustainability score.

Venturini (2022) reviews the literature on climate change, risk factors, and stock returns, highlighting the need to distinguish physical and transition risks and to understand how investors form beliefs about climate exposure. Wang et al. (2022) similarly review carbon risk in corporate finance and emphasize the ways transition pressures can influence firm value. These reviews suggest that disclosure matters when it helps investors evaluate risk drivers, but they also show that measurement choices and market context influence empirical results. A study of coal companies should therefore avoid treating all environmental indicators as equivalent or assuming that the market response is driven solely by corporate reputation.

Borghei (2021) identifies fragmentation in carbon disclosure research, including inconsistent definitions and a limited connection between disclosure and the financial consequences of climate change. The 2022 systematic review Taking Stock of Carbon Disclosure Research While Looking to the Future similarly emphasizes the development of the literature and continuing opportunities for more consistent theory and measurement. These reviews support the need for a disclosure-quality measure that is explicit about what information is captured and how it is expected to affect investors' decisions.

Country-specific evidence is also mixed. Kurniawan et al. (2024) investigate the value relevance of carbon emission disclosure and environmental performance in Indonesian mining companies. Susbiyani and Animah (2024) examine greenhouse-gas disclosure as a mechanism linking governance and firm value in Indonesian manufacturing companies. Studies of energy and mining firms have reported different outcomes depending on sample selection, period, and the construction of green accounting or sustainability disclosure

measures (Kartikawati et al., 2026; Fatkhurrozi and Haryati, 2025). The appropriate conclusion is not that one result invalidates another, but that measurement and institutional context can materially shape the observed relationship.

For the coal sector, the implication is that the main effect of disclosure quality may be positive, negative, or statistically weak depending on the information content. If disclosure improves the market's ability to estimate future liabilities and transition risk, it may reduce uncertainty and support valuation. If it reveals unexpectedly high emissions or insufficient rehabilitation provisions, the immediate market response may be negative. If information is already reflected in prices, additional disclosure may have little incremental effect. H1 should therefore be tested with explicit controls for environmental performance and financial fundamentals, while the interpretation should distinguish information quality from the substance of the information revealed.

4.2 Why governance may strengthen disclosure credibility

Governance provides a plausible explanation for heterogeneity in market responses. The same environmental report may be perceived differently depending on whether the board has independent oversight, whether the audit committee can evaluate the reporting process, and whether climate-related risks are integrated into the company's formal risk framework. IFRS S1 and IFRS S2 emphasize governance, strategy, risk management, and metrics as connected dimensions of sustainability-related reporting (IFRS Foundation, 2023a; IFRS Foundation, 2023b). The framework implies that disclosure should be considered alongside the structures through which management identifies, monitors, and reports sustainability-related risks.

The agency mechanism is especially relevant when environmental reporting involves estimates. Rehabilitation liabilities may depend on the expected scope and timing of restoration. Emissions may be calculated using different boundaries or estimation methods. Environmental expenditure may be classified inconsistently across firms. Independent scrutiny can improve the reliability of these inputs, while audit committee oversight can help ensure that material assumptions are explained and that sustainability disclosures are not disconnected from financial statements. However, governance effectiveness depends on the quality of oversight, not merely the existence of committees or the formal proportion of independent directors.

Recent Indonesian research provides context for this moderation argument. Susbiyani and Animah (2024) find that governance mechanisms contribute to greenhouse-gas disclosure and firm value in their sample, with disclosure helping explain the governance–value relationship. Kartikawati et al. (2026) examine green accounting and carbon emission disclosure with good corporate governance as a moderator in Indonesian mining companies and report that governance moderates the green-accounting relationship but not the carbon-disclosure relationship. Although the sample and measurement choices of these studies require careful consideration, their differing results reinforce the value of separating green accounting, emissions disclosure, and governance rather than combining them into a single ESG score.

The implication for H2 is that governance may strengthen the valuation relevance of disclosure when it improves credibility, completeness, and the integration of environmental data into strategic decisions. Yet the interaction may be weak if governance variables are measured only by formal structures or if the market already expects firms to comply with minimum governance standards. The proposed study should therefore compare a general governance index with more mechanism-specific measures, especially board-level risk oversight and audit committee expertise. If the interaction is insignificant, the result should be interpreted in light of measurement validity and sample power rather than automatically concluding that governance is irrelevant.

4.3 Board independence, audit committees, and expertise

Board independence can improve monitoring when independent directors have access to relevant information and the ability to challenge management. In a coal company, this may include questioning assumptions about mine closure, rehabilitation costs, water management, carbon exposure, and the timing of future capital expenditure. A higher proportion of independent directors may indicate a stronger formal monitoring structure, but it does not reveal whether directors possess relevant technical or accounting

expertise. The proposed analysis should therefore use board independence as one governance proxy and test whether results change when expertise or committee responsibilities are considered.

Audit committees are relevant to the reliability of green accounting because environmental information increasingly includes estimates, non-financial metrics, and cross-functional data. The committee may oversee internal controls, consistency between financial and sustainability reporting, and the use of external assurance. Still, an audit committee's traditional financial expertise may not be enough to assess emissions accounting or the assumptions behind environmental provisions. Effective oversight may require clear responsibility allocation, access to specialist knowledge, and coordination between finance, operations, legal, and sustainability teams. The distinction between committee existence and committee effectiveness should guide the measurement strategy.

The evidence does not support a simplistic claim that more directors or more meetings automatically produce stronger valuation effects. Governance characteristics are subject to endogeneity: firms with complex risks may establish more committees, and firms with stronger financial resources may recruit more experienced directors. A positive interaction could therefore reflect broader managerial capability rather than governance alone. Firm fixed effects and controls can reduce some confounding, but the study should avoid causal claims unless a stronger identification strategy is available.

H3 and H4 are best viewed as mechanism-specific predictions. Board independence should strengthen the relationship when independence translates into effective challenge and oversight. Audit committee effectiveness should strengthen the relationship when it improves the credibility of environmental data and its connection to financial reporting. The results should report separate interactions and marginal effects. If one mechanism matters while another does not, that finding would be theoretically informative because it would identify which governance arrangements are most relevant to the credibility of environmental information.

4.4 The importance of separating disclosure from environmental performance

A disclosure index may inadvertently reward firms that report more, even if their environmental performance is poor. This is particularly problematic in a carbon-intensive sector because high-emission firms may face stronger pressure to disclose. The relationship between disclosure and valuation can therefore be confounded by the underlying level of emissions and by the market's expectations about transition costs. The study should include environmental performance indicators as separate variables and avoid using disclosure count as a proxy for environmental quality.

The distinction also matters for the interpretation of negative results. If disclosure quality is negatively associated with valuation after controlling for emissions and liabilities, the result may suggest that the information reveals risks that investors consider financially material. It may also reflect residual measurement problems or omitted factors. A negative coefficient does not necessarily mean that transparent reporting destroys value. It can indicate that the market is adjusting its valuation to information that had previously been incomplete. Conversely, a positive coefficient may reflect lower uncertainty or better governance, but it does not prove that environmental impacts have improved.

Environmental performance measures require careful construction. Emissions intensity should be based on a consistent production or revenue denominator and accompanied by absolute emissions where possible. Rehabilitation provisions should be interpreted relative to the scale and maturity of mining operations, not simply treated as a higher-is-worse indicator. Environmental penalties may depend on enforcement intensity and reporting transparency. A robust design should therefore use multiple indicators and explain their limitations. Where the number of coal firms is small, a parsimonious model with carefully selected indicators may be more reliable than a large composite index.

4.5 Market valuation in a commodity-dependent industry

Coal-sector valuation is strongly influenced by commodity cycles, production costs, reserves, logistics, export demand, and regulatory expectations. A year of high coal prices may increase profitability and market capitalization even if environmental disclosure is unchanged. If these commodity effects are not controlled, the estimated disclosure coefficient may capture the cycle rather than the information effect. Year fixed

effects absorb common shocks but may not fully account for differences in firms' exposure to export markets, coal quality, or production costs. Where data permit, researchers should include coal-price indicators and firm-level measures of production or revenue exposure.

The sector also faces a mismatch between short-term earnings and long-term liabilities. A firm can report strong operating cash flow while carrying obligations that extend beyond the life of a mine. Investors may differ in how they discount these obligations and in the time horizon they use for valuation. A high market valuation in a commodity boom does not necessarily mean that environmental risks are immaterial; it may indicate that near-term cash flows dominate current pricing or that investors disagree about the timing of transition. Green accounting disclosure is potentially valuable because it can make these longer-horizon risks more visible, but its impact will depend on investor attention and the credibility of assumptions.

A useful empirical extension would examine whether disclosure quality has a stronger association with valuation during periods of heightened climate policy attention, commodity downturns, or major regulatory changes. Such tests could reveal whether investors pay more attention to environmental information when financial constraints tighten or when transition risks become more salient. However, interaction tests require sufficient observations and should be pre-specified. In a small sector sample, too many interactions can create unstable estimates and misleading significance.

4.6 The risk of symbolic disclosure and greenwashing

Symbolic disclosure can occur when companies publish environmental policies and targets without providing measurable progress or clear links to operating decisions. A firm may announce a long-term emissions ambition but omit interim milestones, baseline years, production assumptions, or the role of offsets. It may disclose environmental expenditure without explaining whether it is routine compliance spending or a transition investment. Such reporting can create the appearance of transparency while leaving investors unable to evaluate the credibility of the underlying strategy.

Greenwashing risk is not only a reputational issue; it can affect the reliability of valuation signals. If market participants initially interpret disclosure as evidence of better management but later discover inconsistent boundaries or unsupported claims, the credibility premium may disappear. External assurance can help, but assurance scope matters. A report may receive limited assurance over selected metrics while leaving other material claims unverified. Researchers should record whether assurance covers the full sustainability report, selected emissions data, or only specified indicators. Assurance should be modeled as a credibility feature, not as proof of superior environmental performance.

Disclosure quality should consequently be coded at a level that captures the usefulness of the information. Quantified metrics, consistent baselines, clear boundaries, discussion of adverse outcomes, financial implications, and assurance should receive greater weight than generic commitments. The researcher should also distinguish forward-looking targets from achieved results and record whether targets are absolute or intensity-based. These choices improve construct validity and help explain why a longer report may not be more informative to investors.

4.7 Interpretation of the proposed hypotheses

The synthesis provides a basis for testing H1, but it does not establish a uniform positive coefficient for the coal sector. The expected association is positive when disclosure reduces information asymmetry and improves investors' assessment of risk management. It may be negative when disclosure reveals material liabilities or adverse environmental performance, and statistically weak when information is already priced or disclosure measures are noisy. The proposed model's separation of disclosure quality and environmental performance is therefore central to interpretation.

H2 is supported conceptually by agency and signaling mechanisms: governance can increase the credibility of disclosure and reduce concerns about selective reporting. The strongest test would use governance measures directly connected to oversight and environmental reporting rather than board size alone. H3 and H4 extend this logic to board independence and audit committee effectiveness, but their expected effects depend on substantive authority, expertise, and access to information. The empirical results

should be interpreted as evidence about specific governance channels, not as a blanket ranking of governance structures.

H5 proposes that substantive governance expertise matters more than formal structures alone. This is an important but demanding hypothesis because expertise is difficult to measure consistently. The study could code whether board or committee members have relevant accounting, environmental, engineering, risk, or mining experience, while avoiding subjective judgments based solely on job titles. If expertise data are incomplete, the hypothesis should be treated as exploratory. The overall implication is that governance is likely to affect the market's trust in environmental information, but its role must be measured with precision.

5. DISCUSSION

5.1 Theoretical implications

The article contributes to agency theory by positioning green accounting disclosure as a mechanism for reducing information asymmetry while recognizing that managers may use disclosure selectively. Governance is not merely another determinant of firm value; it can shape whether environmental information is trusted and how investors interpret it. This framing explains why disclosure quantity may have inconsistent valuation effects across studies. A high-quality disclosure process can reduce uncertainty, whereas a high volume of promotional narrative may not. The distinction is particularly consequential in coal companies, where environmental information includes both operational metrics and estimates of long-term obligations.

The signaling contribution is similarly conditional. Disclosure can signal reporting capability and managerial preparedness, but it can also reveal unfavorable facts. The market's response is therefore a function of both signal credibility and information content. A transparent company with high emissions may be valued differently from a lower-emission company with weak disclosure, depending on expected future costs, transition strategy, and the quality of governance. This approach moves beyond a normative assumption that sustainability disclosure must always raise firm value and instead treats the market as an information-processing mechanism.

Stakeholder and legitimacy perspectives help explain why firms disclose environmental information even when the immediate valuation effect is uncertain. Coal companies may seek to maintain regulatory legitimacy, retain access to capital, and respond to community or investor pressure. Yet legitimacy-seeking disclosure can become symbolic if it is not linked to operational change. Governance can help align external claims with internal accountability, but only when board oversight is substantive. This integration of theories suggests that future research should examine both the production of disclosure and the market's response to its credibility.

5.2 Implications for financial accounting practice

For finance teams, environmental reporting should be connected to the accounting judgments that materially affect investor assessment. Mine rehabilitation and closure provisions require clear documentation of legal obligations, estimated costs, timing, and key assumptions. Environmental expenditure should be classified consistently and, where material, distinguished between routine compliance and strategic transition investment. Emissions data should use stable organizational boundaries and explain material changes. The objective is not to monetize every environmental impact, but to make the financial implications of material environmental risks transparent and comparable.

The accounting function should collaborate with operations, environmental specialists, risk management, and legal teams to establish internal controls over non-financial data. Controls should address source data, calculation methods, responsibility for approvals, restatements, and consistency between annual and sustainability reports. If a company uses external assurance, management should ensure that the scope of assurance is clearly communicated and that gaps in coverage are not obscured. These practices can improve the reliability of disclosure and reduce the risk that the sustainability report becomes detached from the firm's financial reporting system.

Environmental accounting also has implications for impairment testing and capital budgeting. Changes in demand, policy, technology, or financing conditions may affect assumptions about the recoverability of coal-related assets. Transition scenarios can help management examine how commodity prices, carbon policy, operating costs, and rehabilitation requirements may affect cash flows. Scenario analysis is not a prediction of one inevitable future; it is a method for testing whether strategic decisions remain robust under plausible conditions. Clear disclosure of material assumptions can help investors understand how management evaluates these risks.

5.3 Implications for boards and audit committees

Boards should ensure that climate and environmental risks are integrated into enterprise risk management rather than assigned solely to a sustainability department. For coal companies, this includes oversight of emissions, rehabilitation liabilities, regulatory compliance, water and land impacts, and transition-related changes in demand and financing. Board papers should connect environmental indicators to strategy, capital expenditure, risk appetite, and long-term financial planning. Where board expertise is limited, companies should use external specialists and develop training so directors can challenge assumptions rather than merely receive presentations.

Audit committees should clarify responsibility for the reliability of environmental data and the consistency of sustainability disclosures with audited financial statements. Their remit may include reviewing reporting boundaries, the methods used to estimate emissions, the assumptions supporting environmental provisions, and the scope of external assurance. They should also ask whether adverse environmental outcomes are disclosed with the same rigor as favorable milestones. These practices can make disclosure more credible and improve the quality of investor communication.

Governance reporting should focus on substance. Listing the existence of a sustainability committee is not sufficient if its responsibilities, information flows, and accountability are unclear. Investors need to understand who oversees material environmental risks, how often these issues reach the board, and how management evaluates progress against targets. Such transparency may be particularly useful where investors cannot directly observe the quality of internal oversight. Nonetheless, firms should avoid treating governance disclosure as a substitute for effective governance itself.

5.4 Implications for investors and regulators

Investors should evaluate green accounting disclosure alongside underlying environmental performance and financial fundamentals. A high disclosure score is not necessarily a sign of low environmental risk; it may indicate that a company is transparent about a high-risk position. Investors should examine whether emissions are reported consistently, whether rehabilitation provisions appear reasonable relative to operations, whether targets have credible interim milestones, and whether governance structures provide meaningful oversight. The distinction between expected returns and valuation is also important: a carbon-risk premium may reflect higher required returns rather than a higher current value for high-emission firms.

Regulators and stock exchanges can improve market usefulness by encouraging consistent definitions, clear reporting boundaries, and disclosure of financially material environmental risks. Requirements should be predictable enough for firms to develop reliable data systems, while enforcement should discourage misleading claims. Adoption of international standards can improve comparability, but local implementation should consider the characteristics of the coal sector and the availability of assurance capacity. Regulators should also ensure that disclosures about environmental liabilities and emissions are not reduced to boilerplate compliance statements.

The goal of standardization is not to make every firm report identical information regardless of its operations. Rather, it is to establish a consistent core of decision-useful metrics and require companies to explain material sector-specific risks. For coal companies, this includes emissions, rehabilitation obligations, water and land impacts, and transition assumptions. Better disclosure can improve capital allocation, but it cannot replace substantive environmental regulation or the operational changes needed to manage environmental impacts.

5.5 Limitations and future research

Limitation for this paper is the measurement of green accounting disclosure. Public reports vary in coverage, assurance, and reporting boundaries. Some firms disclose detailed emissions and rehabilitation assumptions, while others provide only narrative statements. This variation may reflect actual transparency, organizational resources, or regulatory exposure. Future studies should separate disclosure quality from disclosure availability, examine missingness, and compare findings using multiple index constructions. Where possible, disclosure coding should be triangulated with regulatory records and external assurance statements. Concerns the small number of listed coal companies in some jurisdictions. Small samples reduce statistical power, make interaction estimates unstable, and limit the number of controls that can be included.

Future research could extend the analysis across several Asian exchanges or use a longer time window, provided that differences in reporting standards and governance systems are addressed. A multi-country study should test whether national institutions moderate the disclosure–valuation relationship rather than simply adding country indicators without theoretical interpretation. Future work could also use event studies to examine market reactions to new disclosure rules, environmental penalties, verified emissions announcements, or changes in rehabilitation estimates. Such designs may help identify whether investors respond to new information rather than persistent differences between firms. Qualitative interviews with analysts, auditors, directors, and environmental managers could further clarify how market participants assess the credibility of green accounting information. Finally, research could compare coal with other carbon-intensive sectors to determine whether governance has a stronger moderating role where long-term environmental liabilities are especially material.

6. CONCLUSION

This article examines the relationship between green accounting disclosure and investor valuation in publicly listed coal-sector companies, with corporate governance positioned as a moderator. The central argument is that environmental disclosure can improve valuation when it reduces information asymmetry, clarifies financial exposure, and provides credible evidence of risk management. However, disclosure does not necessarily generate a positive market response. It may reveal high emissions, substantial rehabilitation obligations, or weak transition preparedness, leading investors to revise valuations downward. The effect depends on information quality, underlying environmental performance, and the context in which investors interpret the information.

Corporate governance can strengthen the valuation relevance of disclosure by improving monitoring, internal controls, and accountability. Board independence and audit committee effectiveness are plausible mechanisms, but their value depends on substantive expertise and access to reliable information. Formal governance structures should not be treated as sufficient evidence of effective oversight. The proposed empirical model therefore separates disclosure quality from environmental performance and tests governance through interaction terms, with firm and year effects and relevant financial controls.

For accounting practice, the findings emphasize the need to connect environmental information with material financial judgments, particularly emissions, environmental expenditure, rehabilitation provisions, and transition assumptions. For boards and audit committees, the priority is to integrate environmental risk into strategy and ensure that sustainability reporting is reliable and consistent with financial statements. For investors, the key is to distinguish transparent reporting from good environmental performance and to assess whether the information changes expected cash flows or risk. For regulators, consistent standards and credible enforcement can improve comparability, but disclosure must remain connected to substantive performance and accountability.

The article contributes a framework for testing these relationships but does not report original company-level estimates. A definitive empirical conclusion requires the proposed panel dataset, transparent coding, and econometric estimation. Future research should test the hypotheses using multiple valuation measures, alternative disclosure indices, and governance variables that capture actual oversight rather than formal structures alone. This approach can help clarify when green accounting disclosure becomes decision-useful information for capital markets in carbon-intensive industries.

DECLARATIONS

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