

## RESEARCH ARTICLE OPEN ACCESS

# Powering Transparency: Global Drivers of Sustainability Reporting in the Electricity Sector

Alva Marasigan<sup>1</sup> | Muhammad Nurul Houqe<sup>1</sup>  | Warwick Stent<sup>1</sup>  | Olayinka Moses<sup>2,3</sup>

<sup>1</sup>School of Accountancy, Economics and Finance, Massey Business School, Massey University, Auckland, New Zealand | <sup>2</sup>School of Accounting and Commercial Law, Victoria University of Wellington, Wellington, New Zealand | <sup>3</sup>Department of Financial Accounting, University of South Africa–Muckleneuk Campus, Pretoria, South Africa

**Correspondence:** Muhammad Nurul Houqe ([n.houqe@massey.ac.nz](mailto:n.houqe@massey.ac.nz))

**Received:** 5 October 2025 | **Revised:** 6 January 2026 | **Accepted:** 14 January 2026

**Keywords:** electricity generators sector | GRI | institutional factors | legitimacy theory | stakeholder theory | sustainability performance | sustainability reporting quality

## ABSTRACT

We examine the drivers of sustainability reporting quality (QSR), conceptualised along two complementary dimensions, relevance and reliability, to assess how firm-level attributes and institutional conditions jointly shape disclosure practices in the electricity sector. Using data from S&P Global Top 250, we find that stronger sustainability performance, the adoption of the Global Reporting Initiative framework, and the presence of institutional and foreign investors are positively associated with higher QSR. These underscore the importance of internal performance, established reporting frameworks, and market-based mechanisms in enhancing the credibility and decision usefulness of sustainability reporting. In contrast, rule of law and carbon pricing policies exhibit negative associations with disclosure relevance, suggesting strategic opacity or compliance fatigue in more highly regulated environments. This study provides industry-specific, cross-national evidence from a critical yet underexplored sector. The findings offer timely insights for managers, regulators, investors and standard setters as mandatory sustainability reporting under IFRS S1 and S2 is implemented across jurisdictions.

## 1 | Introduction

Amid intensifying global social and environmental concerns, firms face mounting pressure to demonstrate credible sustainability commitments that signal long-term accountability and stewardship (Bui et al. 2020; Sheehan et al. 2023; Ehalaiye et al. 2025). These expectations reflect a broader call for corporate accountability and transparency in the face of escalating global sustainability challenges. Research shows that strong sustainability practices not only align with stakeholder values but also reduce information asymmetry and build trust in corporate behaviour (Bui et al. 2020). In response, firms increasingly disclose their sustainability activities as a means of signalling accountability and strengthening external engagement with stakeholders (Ehalaiye et al. 2025; Moses et al. 2025). High-quality sustainability disclosures are widely regarded as critical

to long-term value creation, the strengthening of stakeholder relationships and the enhancement of corporate reputation (Hahn and Kühnen 2013; Steyn 2014). Notably, prior scholarships such as Bui et al. (2020) and Houqe and Khan (2025) highlight sustainability reputation as a valuable intangible asset that can yield competitive advantages such as improved investor confidence and lower capital costs.

Despite growing recognition of its importance, the credibility and comparability of sustainability reporting remain contested (Bingler et al. 2022; Christensen et al. 2021; Ismail et al. 2018). While credible sustainability information can influence asset prices and attract investor interest (Bingler et al. 2022; Christensen et al. 2021), reporting practices remain uneven, even within the same industry, akin to differences in ownership structures, institutional environments, awareness

This is an open access article under the terms of the [Creative Commons Attribution](https://creativecommons.org/licenses/by/4.0/) License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

© 2026 The Author(s). *Business Strategy and the Environment* published by ERP Environment and John Wiley & Sons Ltd.

levels and stakeholder complexity. As Adams (2002) argues, enhancing the quality of sustainability reporting (QSR) requires closer attention to these firm- and country-level dynamics. This is especially critical for high-impact sectors such as electricity generation, where robust disclosure practices are essential to advancing the Sustainable Development Goals (SDGs) (Ehalaiye et al. 2025).

Prior research on sustainability reporting in the electricity generation sector has often adopted a narrow analytical lens, focusing predominantly on the environmental pillar and examining isolated determinants of disclosure practices (Alrazi et al. 2016; Rahman et al. 2019; Kraft 2018). While these studies provide important early insights, their scope remains limited. For instance, Alrazi et al. (2016) advance understanding of reporting quality within the electricity industry, yet their exclusive emphasis on environmental disclosures constrains insight into how sustainability reporting reflects the sector's broader economic, social and environmental (ESE) impacts. Similarly, Rahman et al. (2019) demonstrate that carbon pricing initiatives exert an indirect institutional influence on the quality of voluntary environmental disclosures but again restrict their analysis to a single environmental mechanism shaping reporting behaviour. As a result, the literature remains fragmented, offering partial explanations that overlook the interconnected nature of sustainability challenges in the electricity sector. What remains largely underexplored is a holistic assessment of sustainability reporting quality (QSR) across the full ESE dimensions, and an integrated examination of how firm-level attributes and institutional conditions jointly shape both the relevance and reliability of disclosures. This study addresses this gap by providing a comprehensive and longitudinal analysis of QSR in the electricity generation industry.

Moreover, the need for the present study is particularly timely. The electricity sector is the world's largest source of greenhouse gas emissions, responsible for approximately 13,800 million tonnes of CO<sub>2</sub> in 2024, with emissions projected to rise due to ongoing industrialisation, data centre expansion, electrification and increased cooling demand (IEA 2024). These emissions are highly concentrated, with China, the United States and India accounting for 42.6% of global emissions between 1970 and 2021, and the top 10<sup>1</sup> emitters contributing over 62% (ClimateWatch 2024; Taurigana and Moses 2023). Furthermore, from a regulatory perspective, the electricity sector faces intense scrutiny (Alrazi et al. 2016) from multiple and often competing stakeholder groups, including regulators, investors, nongovernmental organisations, labour unions and local communities, all of whom demand credible and transparent sustainability information (Ehalaiye et al. 2025; Moseñe et al. 2013; Slacik and Greiling 2020; Parrot and Tierney 2012). At the same time, firms are expected to ensure affordability, reliability and universal access to electricity, creating what Moses et al. (2024) describe as a nexus of accountability (Maia and Garcia 2023; Rovere et al. 2010). Against this backdrop, there is a pressing need for empirical insights into how these complex and often poorly understood competing pressures shape sustainability reporting practices. This makes the electricity sector a critical yet understudied context for examining the determinants of QSR, particularly in light of the global transition towards mandatory sustainability reporting under IFRS S1 and S2.

Using 300 firm-year observations from 2018 to 2020 across multiple jurisdictions, this study examines how sustainability performance, GRI adoption, rule of law, carbon pricing policy (CPP), institutional ownership and foreign shareholding influence QSR. The results show that stronger sustainability performance and GRI adoption enhance QSR, while institutional and foreign ownership exert positive market-based pressure for greater transparency. In contrast, rule of law and CPP exhibit counterintuitive negative associations with disclosure relevance, indicating that stronger regulatory environments do not automatically translate into higher-quality sustainability reporting. Signifying that intensified coercive pressures may encourage firms to prioritise formal compliance over substantive transparency, leading to generic or boilerplate disclosures that satisfy regulatory requirements but offer limited decision usefulness (Bilicka et al. 2025; Boiral 2013). In such settings, sustainability reporting may function more as a defensive legitimacy mechanism than as a tool for meaningful accountability, reflecting symbolic conformity rather than genuine disclosure improvements (DiMaggio and Powell 1983; Moses et al. 2024). Heightened regulatory scrutiny may also induce compliance fatigue, whereby the cumulative costs of monitoring, reporting and assurance dampen managerial incentives to enhance disclosure relevance (Bingler et al. 2022; Christensen et al. 2021), particularly in carbon-intensive industries where firms may strategically limit forward-looking or granular information to avoid legal and political exposure (Marquis and Qian 2014). These insights challenge the assumption that stronger coercive mechanisms uniformly improve disclosure quality and instead suggest that regulation must be complemented by normative guidance and market-based accountability to foster substantive reporting.

Methodologically, the study advances QSR measurement by refining and extending Khan et al.'s (2021) framework to capture disclosure quality beyond mere presence or volume. Empirically, it provides new cross-national evidence on the institutional drivers of QSR in the electricity sector, a major emitter yet underexplored in sustainability reporting research. Practically, the findings offer timely insights for boards, regulators and standard setters, particularly the ISSB, as IFRS S1 and S2 are implemented in carbon-intensive industries.

The remainder of the paper is organised as follows: Section 2 reviews the relevant literature, theoretical foundations and hypothesis development. Section 3 outlines the research methodology. Section 4 presents the empirical results and discussion. Section 5 concludes with policy implications and suggestions for future research.

## 2 | Literature Review, Theoretical Foundation and Hypothesis Development

### 2.1 | Studies Related to Determinants of Sustainability Reporting

Sustainability broadly encompasses the environmental, social and governance (ESG) dimensions of corporate practice. This study focuses on QSR, that is, how firms disclose information on their environmental and social actions in alignment with

broader sustainability goals (Mamun 2023). High-quality disclosures are central to demonstrating corporate responsibility and signalling commitments to SDG priorities (Tauringana and Moses 2023). The environmental dimension includes efforts to reduce emissions, resource efficiency and ecological stewardship, while the social dimension covers labour practices, community engagement, human rights and ethical supply chains (GRI 2023; Mamun 2023). Although a growing literature has examined determinants of sustainability reporting, much of this work isolates specific ESG components—typically environmental disclosure—without adopting an integrated theoretical or multipillar perspective. Existing studies highlight regulatory and institutional factors (Ehalaiye et al. 2025; Khan et al. 2021; Kraft 2018), the adoption of standardised frameworks such as GRI (Khan et al. 2021; Rahman et al. 2019; Sreepriya et al. 2023) and sustainability performance itself (Imperiale et al. 2023) as key drivers. However, these determinants are often discussed descriptively, with limited interrogation of how stakeholder, legitimacy and institutional mechanisms interact—or conflict—in shaping reporting quality.

Within the electricity generation industry, an emergent stream of literature has begun to investigate sustainability reporting, particularly the quality of environmental disclosures. Our review of 38 electricity related studies (2001–2023), including 12 focused specifically on QSR determinants, shows that seven concentrate almost exclusively on environmental disclosure quality, often neglecting social and governance dimensions (see Table 1). For

instance, Alrazi et al. (2016) provide a global assessment of environmental disclosure quality among electricity generators, analyzing the influence of environmental performance indices, emissions trading schemes (ETSs), legal systems and financial indicators. Similarly, Rahman et al. (2019) examine the voluntary environmental disclosures of electricity companies from a global lens, focusing on drivers such as carbon pricing policies, GRI adoption and ISO certification. Chang (2013), in the Chinese context, links environmental disclosure quality to ownership structures and financial leverage, while Kraft (2018) evaluates how climate-related disclosure substantiveness varies in response to regulatory, shareholder and civil society pressures within US electricity markets.

Several theoretical and empirical gaps emerge from this literature. First, the predominant focus on environmental disclosure quality leaves the broader economic, social and environmental (ESE) pillars underexplored, limiting our understanding of how firms balance competing stakeholder expectations across multiple sustainability dimensions. More specifically, some studies suggest that stronger regulatory and institutional settings, reinforced through peer behaviour, may induce higher-quality sustainability reporting (Oyewo et al. 2025; Zharfpeykan and Ng 2021), while other scholars advance a counterintuitive position, arguing that heightened regulation does not necessarily improve disclosure quality (Bingler et al. 2022; Christensen et al. 2021). Second, most prior studies adopt a single-country or regionally bounded focus, which constrains the generalisability

**TABLE 1** | Selected prior studies on determinants of sustainability reporting.

Reference	Focus area (setting)	Key determinants identified*
Cormier and Gordon (2001)	Environmental and social (Canada)	Public ownership; positive and negative news disclosures
van der Laan Smith et al. (2005)	Environmental and social (Denmark, Norway, USA)	National stakeholder orientation
Alrazi et al. (2010)	Environmental (Global)	Legal system; rule of law
Alrazi et al. (2016)	Environmental (Global)	Environmental performance index; emissions trading scheme (ETS); media pressure
Chang (2013)	Environmental (China)	State vs. nonstate ownership; ownership concentration
Alrazi et al. (2018)	Environmental (Asia)	GRI framework use; law enforcement strength; environmental performance
Kraft (2018)	Environmental (USA)	Access to regulatory processes
Rahman et al. (2019)	Environmental (Global)	Carbon pricing policy; ISO certification; GRI framework use
Traxler and Greiling (2019)	Environmental, social and economic (global)	Stock exchange listing status
Slacik and Greiling (2020)	Environmental, social and economic (global)	Ownership structure; listing status; regional and stakeholder influences
Anwar et al. (2021)	Environmental (global)	Carbon pricing policy; ISO certification; GRI use; national legal structure
Imperiale et al. (2023)	ESG (USA)	Environmental, social, and combined ESG performance

\*Exclude governance attributes and financial measures control variables.

of findings across diverse institutional contexts. Third, the literature offers limited insight into several underexplored determinants of reporting quality. For example, prior evidence on the effect of board gender diversity is mixed, with some studies suggesting enhanced transparency due to diverse perspectives, while others report no effect or even negative associations (Al-Shaer and Zaman 2016). These inconsistencies indicate that stakeholder, legitimacy and institutional theories may not fully capture the contextual contingencies shaping board behaviour, particularly in highly regulated and high-emission sectors.

## 2.2 | Theoretical Foundation

We draw on stakeholder theory, legitimacy theory and institutional theory to gain insight into the determinants of QSR in the electricity generation sector. Together, these perspectives offer a multilevel explanatory lens for understanding how firms navigate complex stakeholder expectations, legitimacy pressures and institutional environments in shaping their disclosure practices, particularly in carbon-intensive and highly scrutinised sectors (Larrán Jorge et al. 2019). Stakeholder theory positions the firm within a dynamic web of relationships, wherein diverse actors, including regulators, investors, communities and employees, hold varying degrees of salience and influence over corporate conduct (Freeman 1994; Schons and Steinmeier 2016). From this perspective, sustainability reporting functions not only as a normative mechanism of accountability but also as a strategic response to stakeholder pressures, particularly as institutional investors increasingly advocate for transparency aligned with ESE goals (Ehalaiye et al. 2025; Velte 2023). Moreover, the stakeholder theory suggests that the organisation must cater to the needs and interests of a broad range of stakeholders in order to be successful (Jadoon et al. 2021). The salience of stakeholders in the electricity sector, ranging from state regulators to local communities, drives firms to adopt disclosure strategies that preserve trust and secure long-term licence to operate (Bui et al. 2020).

Legitimacy theory extends this rationale by emphasising the firm's need to align with evolving societal norms, values and expectations (Ehalaiye et al. 2025; Suchman 1995). In settings where sustainability reporting remains discretionary, firms may engage in selective disclosure, emphasising favourable environmental or social outcomes while concealing less desirable aspects, to maintain legitimacy (Deegan 2002; Hummel and Schlick 2016). Symbolic disclosure strategies, such as voluntary participation in ESG frameworks, may be especially prevalent among firms with weaker sustainability performance, as a means of deflecting scrutiny or avoiding regulatory backlash (Bae 2014). Legitimacy, however, is not static; it evolves through continued stakeholder interaction, shaping both the form and substance of QSR over time (Ehalaiye et al. 2025; Zollo et al. 2023).

Institutional theory offers a powerful macro-structural lens for understanding sustainability reporting by emphasising how external pressures shape organisational behaviour and disclosure practices. In particular, coercive pressures such as regulatory requirements, mimetic pressures arising from peer imitation and normative pressures linked to professional standards and

societal expectations collectively drive organisational conformity in sustainability practices (Campbell 2007; DiMaggio and Powell 1983). These institutional forces facilitate the diffusion of reporting practices, including the adoption of the GRI framework and alignment with national carbon pricing mechanisms, as firms seek legitimacy and comparability within their institutional environments (Oyewo et al. 2025; Zharfpeykan and Ng 2021). Importantly, institutional theory also enables examination of how internal governance characteristics, such as ownership structures and board composition, interact with external legal and policy environments to shape reporting outcomes, rather than treating firm- and country-level influences in isolation (Hyatt and Berente 2017; Khan et al. 2021; Moses et al. 2025).

That said, institutional theory also accommodates an important counterargument that stronger regulatory environments do not necessarily translate into higher-quality sustainability reporting. When coercive pressures intensify, firms may respond by prioritising formal compliance over substantive transparency, leading to generic, standardised or boilerplate disclosures that meet regulatory expectations but offer limited decision usefulness (Boiral 2013). In such contexts, sustainability reporting may function primarily as a defensive legitimacy mechanism rather than as a tool for meaningful accountability, that is, only a mechanism for symbolic conformity and compliance for legitimacy (Bilicka et al. 2025; DiMaggio and Powell 1983; Moses et al. 2024). Moreover, heightened regulatory scrutiny can generate compliance fatigue, whereby the cumulative costs of monitoring, reporting and assurance weaken managerial incentives to enhance the relevance and credibility of sustainability information (Bingler et al. 2022; Christensen et al. 2021). These competing theoretical expectations underscore the need for further empirical investigation into when and how institutional pressures enhance, rather than constrain, QSR.

Taken together, these theoretical insights provide a robust foundation for analysing QSR in the electricity generation sector. The integrated framework informs our empirical examination of how firm- and country-level factors, including sustainability performance, GRI adoption, carbon pricing policies and rule of law, shape the relevance and reliability of sustainability disclosures among electricity generators operating across diverse institutional contexts. Appendix A summarises the combined theoretical framing underpinning the study's analysis of QSR.

## 2.3 | Determinants of QSR

Our investigation on the determinants of QSR among electricity generators builds on prior research across sectors and jurisdictions (e.g., Alrazi et al. 2016; Correa-Garcia et al. 2020; Ismail et al. 2018; Khan et al. 2021; Rahman et al. 2019) to address the research question: *What factors influence QSR in the electricity generation sector?* Drawing from the extant literature, we examine the following seven key determinants: (i) sustainability performance, (ii) adoption of GRI framework, (iii) board gender diversity, (iv) rule of law, (v) CPP, (vi) institutional shareholding and (vii) foreign shareholding. While these factors have been explored in diverse industry and country contexts, relatively few studies have focused explicitly on the electricity sector,

an omission this study seeks to address by testing whether these established determinants hold within this high-impact, regulation-intensive industry.

### 2.3.1 | Sustainability Performance

The relationship between sustainability performance and QSR is theoretically grounded in both legitimacy theory and institutional theory, yet arguably empirically contested. From a legitimacy perspective, firms with strong environmental and social performance are incentivised to disclose substantively in order to build credibility, signal accountability and reinforce their social licence to operate (Deegan 2002; Ehalaiye et al. 2025; Shabana and Ravlin 2016). High-quality disclosures help reduce information asymmetry, improve stakeholder trust and enhance competitive positioning, particularly in sectors like electricity generation where firms are under growing scrutiny from regulators, investors and civil society (Bui et al. 2020; Khan et al. 2021; Nobanee and Ellili 2016). Institutional theory complements this by suggesting that firms embedded in environments with strong sustainability norms, regulatory oversight or stakeholder activism are more likely to align actual performance with transparent reporting practices (Campbell 2007). In this sense, good performers may feel both normative and coercive pressure to report credibly and consistently.

However, this relationship is far from straightforward. Legitimacy theory also warns that disclosures may be decoupled from actual performance, that is, used strategically to manage perceptions rather than to reflect genuine accountability (Hummel and Schlick 2016; Talbot and Boiral 2018). Empirical studies reflect this tension. For instance, while Imperiale et al. (2023) find that environmental and social performance positively influence sustainability disclosures among US utilities, Eng and Fikru (2022) report no significant relationship in a similar sectoral context. Earlier work by Alrazi et al. (2016) and Wiseman (1982) similarly question whether sustainability disclosures are performance-driven or shaped more by institutional norms and symbolic pressures. This ambiguity is particularly salient in the electricity sector, where firms face intensifying expectations to demonstrate decarbonisation leadership but also operate in diverse regulatory environments that may enable both substantive and symbolic disclosure strategies. As such, whether better sustainability performers produce higher quality disclosures in this sector remains an open empirical question. To explore this, we propose the following hypothesis:

**H1.** *Sustainability performance is positively associated with QSR among electricity generators.*

### 2.3.2 | Use of GRI Framework

The GRI framework is the most widely adopted sustainability reporting standard, used by around 77% of the world's largest 250 companies (Luo and Tang 2023; Nobanee and Ellili 2016). In the electricity generation sector, where firms face growing pressure to justify their carbon footprint, the GRI offers a structured, stakeholder-focused and materiality-driven approach to disclosing ESG information (Graafland and Smid 2019). Prior studies

associate GRI adoption with improved QSR, as it supports transparency, comparability and engagement with material climate risks (Chelli et al. 2018; Khan et al. 2021). Luo and Tang (2023) argue that adopting GRI standards signals genuine commitment to environmental transparency, enhances stakeholder dialogue and reduces information asymmetry. Importantly, the GRI's prescriptive guidance helps 'limit or reduce the use of boilerplate language' by requiring specific, comparable disclosures (p. 2988). This is particularly relevant for electricity firms navigating investor scrutiny and regulatory uncertainty.

However, concerns persist around symbolic or superficial adoption, particularly in carbon-intensive sectors like electricity, where firms may report against GRI indicators without substantive performance improvements (Bilicka et al. 2025; Boiral 2013; Moses et al. 2024). High implementation costs and limited assurance capacity in emerging markets may further hinder deep engagement. While some scholars highlight the GRI's role in fostering legitimacy and voluntary disclosure (Rahman et al. 2019), others warn of box-ticking behaviours that undermine its transformative potential (Khan et al. 2021). Nonetheless, emerging evidence suggests that rigorous application of GRI's materiality principles, especially around emissions, can enhance report quality and stakeholder relevance (Henriques et al. 2022). Collectively, these insights suggest that GRI adoption may positively influence QSR, but outcomes depend on how substantively the framework is implemented. We therefore hypothesise that:

**H2.** *Use of the GRI framework is positively associated with QSR among electricity generators.*

### 2.3.3 | Board Gender Diversity

Board gender diversity is increasingly recognised as a key governance mechanism influencing QSR. Grounded in stakeholder and legitimacy theories, gender-diverse boards are seen to enhance firms' responsiveness to environmental and social expectations by broadening perspectives and strengthening accountability to a wider set of stakeholders (Bui et al. 2020; Moses et al. 2025; Oyewo et al. 2025). Female directors are often associated with stronger ethical orientation, stakeholder sensitivity and long-term thinking, traits aligned with transparent, credible sustainability reporting (Gerwing et al. 2022; Moses et al. 2025). Empirical evidence supports this association across various contexts. Studies have found that gender-diverse boards are linked to higher SRQ, reduced impression management and stronger climate governance (Al-Shaer and Zaman 2016; García-Sánchez et al. 2019; Oyewo et al. 2025).

In the energy sector, Shahbaz et al. (2020) show that female board representation correlates with stronger sustainability commitments, while Gerwing et al. (2022) highlight board diversity as a key predictor of reporting quality under the EU CSR Directive. Moses et al. (2025) also find that women on boards enhance preparedness for climate-related disclosures (e.g., TCFD), reflecting a greater awareness of environmental risk and reputational concerns (Orazalin and Mahmood 2021). While the strength of this relationship may vary by context, particularly in regulated sectors like electricity generation, the weight of

evidence suggests that board gender diversity contributes positively to the quality and transparency of sustainability reporting. We therefore hypothesise that:

**H3.** *There is a positive relationship between board gender diversity and QSR among electricity generators.*

### 2.3.4 | Institutional Shareholding

The decarbonisation of the global energy system demands significant investment in green infrastructure. While governments acknowledge the scale of funding required, they increasingly look to private capital, particularly institutional investors, to finance clean energy transitions. Institutional shareholders, due to their voting power and strategic influence, are well-positioned to demand enhanced ESE disclosures that strengthen firms' competitive advantage and investment appeal (Bae et al. 2018). Although few studies directly examine the electricity sector, prior research points to a positive link between institutional ownership and QSR. For example, Shahab and Ye (2018), in a study of Chinese listed firms, found institutional ownership to be significantly associated with stronger CSR disclosures.

Institutional investors can leverage their influence to promote comprehensive sustainability reporting, thereby expanding investment opportunities (Das et al. 2023; Velte 2023). As signatories to global frameworks like the UN Principles for Responsible Investment (PRI), institutional investors are often active stewards who monitor board practices and press for sustainability commitments (Velte 2023). Shafai et al. (2024) similarly report a significant positive relationship between institutional shareholding and QSR. From a stakeholder theory perspective, firms are expected to respond to the demands of powerful stakeholders, and institutional investors are among the most influential (Ehalaiye et al. 2025). Thus, their presence can drive greater transparency and accountability in sustainability reporting. However, findings are mixed. Studies by Khan et al. (2021) and Ismail et al. (2018) report no significant impact of institutional shareholding on QSR, potentially due to low ownership stakes and limited board influence in some contexts (Masum et al. 2020). In light of this, we hypothesise the following:

**H4.** *Institutional ownership is positively associated with QSR in the electricity generation sector.*

### 2.3.5 | Foreign Shareholding

Foreign shareholders bring diverse experiences, values and strategic expectations that can influence corporate governance and disclosure practices. According to Aksan and Gantjowati (2020), foreign investors tend to favour firms with strong governance, legal protections and high-quality disclosures. From a stakeholder theory perspective, foreign investors are considered key external stakeholders who can exert pressure on firms to enhance sustainability responsibility and transparency (Bae et al. 2018; D'Souza et al. 2022). Several studies support the view that foreign ownership

contributes positively to QSR. Ismail et al. (2018) find a significant relationship between foreign shareholding and the quality of corporate environmental disclosure (CED), while Correa-Garcia et al. (2020) show that foreign-owned business groups in Latin America report higher-quality sustainability information, attributing this to broader strategic perspectives and cross-cultural governance expectations. Similarly, Dong et al. (2023) and Ananzeh et al. (2023) argue that foreign investors drive improvements in sustainability disclosures by expecting credible, globally aligned ESG practices. Al Amosh and Khatib (2022) further contend that foreign ownership enhances stakeholder value by pressuring firms to improve governance and respond to external information demands, including sustainability reporting. However, findings are not unanimous. Khan et al. (2021), for example, report no significant relationship between foreign ownership and QSR in the context of Bangladeshi banks, highlighting potential variation across institutional and sectoral contexts. Given the evidence and theoretical expectations, we hypothesise that:

**H5.** *Foreign ownership is positively associated with QSR in the electricity generation sector.*

### 2.3.6 | Rule of Law

The rule of law, as defined by Kaufmann et al. (2011, 223), reflects the degree to which individuals and institutions have confidence in, and abide by, societal rules, particularly regarding contract enforcement, property rights and judicial quality. Strong rule of law cascades benefits from the national to the corporate level, fostering greater transparency and accountability. In this context, firms are more likely to produce high-quality sustainability disclosures that meet stakeholder expectations. Empirical studies support this view, particularly in the electricity sector. Alrazi et al. (2016) find that stronger national rule of law is positively associated with carbon emissions disclosures by electricity firms. Alrazi et al. (2018) further identify the rule of law as one of the most influential institutional drivers of sustainability reporting, alongside GRI compliance and environmental commitment. Frías-Aceituno et al. (2013) similarly show that firms operating in jurisdictions with strong legal systems and stakeholder-oriented cultures are more likely to issue comprehensive integrated reports. These findings align with both legitimacy and institutional theory: Firms disclose sustainability information to maintain legitimacy, comply with social norms (Alrazi et al. 2016) and demonstrate socially responsible behaviour (Campbell 2007; Ehalaiye et al. 2025). While a few studies report insignificant or mixed results (e.g., Alrazi et al. 2010), the majority suggest a positive relationship between rule of law and QSR. We therefore hypothesise that:

**H6.** *There is a stronger rule of law positively associated with QSR in the electricity generation sector.*

### 2.3.7 | Carbon Pricing Policy

Carbon pricing has become a central policy tool for addressing climate change under multilateral frameworks such as the

Paris Agreement (Green 2021; Oyewo et al. 2025). Mechanisms such as ETSs and carbon taxes aim to incentivise firms to reduce GHG emissions by either capping allowable emissions or applying price signals that promote investment in cleaner technologies (Ko and Lee 2022; Oyewo et al. 2025). While ETS relies on tradable permits and market-based pricing to manage carbon output (Rogge et al. 2011), carbon taxes impose direct costs on emissions, encouraging firms to shift toward lower-carbon energy sources (Green 2021). These pricing mechanisms create regulatory and reputational pressures that increase stakeholder demand for transparent sustainability disclosures. As institutional theory suggests, firms often respond to such pressures by aligning with evolving norms and regulatory expectations (Rahman et al. 2019). In the electricity sector, where carbon pricing is especially relevant, firms are likely to enhance voluntary environmental disclosures to demonstrate compliance, legitimacy and environmental stewardship (Anwar et al. 2021).

Empirical evidence supports this view. Alrazi et al. (2016) and Rahman et al. (2019) find that national carbon pricing policies are associated with improved environmental disclosure quality. Firms subject to ETS or carbon tax regimes often disclose beyond mandatory requirements to pre-empt stricter regulation and meet stakeholder expectations (Bebington and Larrinaga-González 2008; Cowan and Deegan 2011). However, selective disclosure remains a risk, as firms may highlight positive outcomes while concealing negative impacts (Kim and Lyon 2011). Overall, carbon pricing creates an institutional environment conducive to higher-quality sustainability reporting, particularly in emissions-intensive industries like electricity generation. Accordingly, we hypothesise that:

**H7.** *National carbon pricing policies are positively associated with QSR in the electricity generation sector.*

### 3 | Research Methodology

#### 3.1 | Sample Selection

The sample comprises electricity generation firms listed in the 2021 S&P Platts Top 250 Global Energy Companies Rankings (S&P Global 2021). These firms are recognised for their strong financial performance, measured by asset value, revenues, profits and return on invested capital including operational excellence. From the initial list of 138 companies spanning electric utilities, independent power producers (IPPs), energy traders and multi-utility firms, the final sample was reduced to 100. Excluded were companies solely involved in electricity transmission/distribution or infrastructure, firms with non-English reports and those whose disclosures were inaccessible via official websites or third-party repositories (e.g., [annualreports.com](https://www.annualreports.com), [responsibilityreports.com](https://www.responsibilityreports.com),<sup>2</sup> [corporateregister.com](https://www.corporateregister.com)). The final sample spans 27 countries across the Americas, Asia-Pacific, as well as Europe, Middle East, and Africa (EMEA) regions. However, because the sample focuses on large, publicly listed firms, the findings may not fully generalise to smaller utilities or state-owned enterprises, both of which play significant roles in many electricity systems. This limitation is acknowledged and discussed in the conclusion.

#### 3.2 | Variables and Regression Models

This study employs content analysis to assess the sustainability disclosures of sampled electricity generation firms, drawing from their annual, integrated and sustainability reports, including relevant hyperlinks. QSR is measured using an assessment tool adapted from Khan et al. (2021), incorporating two key dimensions: relevance (including materiality) (RM) and reliability (R), with expanded scoring ranges (e.g., 0–3, 0–5) for a more nuanced evaluation.

The relevance dimension includes the following five quality indicators: RM1—sustainability strategies, RM2—stakeholder inclusiveness, RM3—environmental and social Bloomberg scores, RM4—economic disclosures and RM5—materiality determination process. The reliability dimension comprises the following: R1—trends over time, R2—readability, R3—verifiability, R4—accuracy and R5—value and timeliness of data. Scoring criteria are adapted from Ahmed Haji and Anifowose (2016), Al-Shaer and Zaman (2016), Hąbek and Wolniak (2016), Khan et al. (2021) and Yadava and Sinha (2016). Full details of the tool are provided in Appendix B. The following three QSR measures are derived: QSR\_RM, QSR\_R and QSR\_Total, computed as the actual score divided by the maximum score. These serve as the study's dependent variables. The hypotheses are tested using the main model adapted from Khan et al. (2021) to examine key drivers on QSR in the electricity sector.

$$\begin{aligned} \text{QSR\_Total}_{i,t} = & \beta_0 + \beta_1 \text{SUSPER}_{i,t} + \beta_2 \text{GRI}_{i,t} + \beta_3 \text{GENDIV}_{i,t} \\ & + \beta_4 \text{INSTSHARE}_{i,t} + \beta_5 \text{FOREIGNOWN}_{i,t} + \beta_6 \text{LAW}_{i,t} \\ & + \beta_7 \text{CPP1}_{i,t} + \beta_8 \text{LnTA}_{i,t} + \beta_9 \text{TOBINSQ}_{i,t} + \beta_{10} \text{ROA}_{i,t} \quad (1) \\ & + \beta_{11} \text{SALESTA}_{i,t} + \beta_{12} \text{LTDTA}_{i,t} + \sum \text{YEAR}_{i,t} \\ & + \sum \text{COUNTRY}_{i,t} + \varepsilon_{i,t}, \dots \dots \dots \end{aligned}$$

where QSR\_Total<sub>i,t</sub> is the overall quality of sustainability reporting; SUSPER, the Sustainability performance is the aggregate score for ESG pillars on the Refinitiv's ESG rating from DataStream (TRESG). Scores range from 0 to 100, with higher scores representing higher sustainability performance and vice versa (e.g., Engelhardt et al. 2021). GRI, refers to the use of global reporting framework, measured as a dummy variable that equals 1 if a firm follows the GRI reporting framework as a standardised template for nonfinancial and sustainability information, and 0 otherwise (Khan et al. 2021; Rahman et al. 2019); GENDIV, gender diversity measured as a dummy variable coded as 1 for ratio greater than the GENDIV mean and 0 otherwise (Al-Shaer and Zaman 2016; Bui et al. 2020; Fernandez-Feijoo et al. 2014; Nekhili et al. 2017); INSTSHARE, the percentage of institutional shareholding and FOREIGNOWN is the percentage of foreign shareholding—both collected from Bloomberg. The percentage of foreign ownership is derived by deducting the percent ownership at the home country (geographic ownership) from 100. For example, in the case of A2A S.p.A, in 2018, percent foreign ownership is 27.4% (100–72.6 as appearing in the Bloomberg database); LAW captures the strength of law enforcement in a company's domicile country. Firms in countries with stronger legal systems are expected to disclose more sustainability information. Similar to Alrazi et al. (2016), data

from the World Bank rule of law is used. The scores range from -2.5 to 2.5. A higher score means the country has a strong law enforcement environment and vice versa (Alrazi et al. 2016); CPP is a dummy variable indicating whether the company is from a carbon pricing country or not. Companies domiciled in countries with carbon pricing have a code of 1, and 0 otherwise (Anwar et al. 2021; Rahman et al. 2019). Data are sourced from the World Bank State and Trends of Carbon Pricing 2018–2020.

The selection of control variables is guided by established empirical evidence in the sustainability reporting literature and is intended to capture key firm-level characteristics that may systematically influence QSR. Consistent with prior studies, we include firm size (LnTA), market valuation (Tobin's Q) and profitability (ROA) (Alrazi et al. 2016; Bui et al. 2020; Khan et al. 2021), operational efficiency (SALESTA) (Hapsoro and Husain 2019) and leverage (LTDTA) (Alkayed et al. 2023; Bose et al. 2018). From a theoretical perspective, larger and better-performing firms are expected to possess greater organisational resources, reporting capabilities and visibility, enabling them to respond more effectively to stakeholder demands for transparency and accountability. Enhanced sustainability disclosure can, in turn, reinforce investor confidence and support long-term value creation, consistent with stakeholder theory and the demand for decision-useful sustainability information (Bui et al. 2020; Ehalaiye et al. 2025; Hapsoro and Husain 2019). Empirically, prior evidence documents a positive and significant association between firm size (LnTA) and QSR (Alrazi et al. 2016; Khan et al. 2021), while Singhania et al. (2023) report a positive relationship between Tobin's Q and QSR, suggesting that firms with stronger market valuations may face greater incentives to maintain credible sustainability narratives. In contrast, profitability, measured by ROA, has been found to exhibit an insignificant relationship with QSR in several studies (Alrazi et al. 2016; Khan et al. 2021), indicating that disclosure quality may be driven more by strategic and institutional considerations than by short-term

financial performance alone, in alignment with institutional perspectives. Operational intensity, captured by SALESTA, has been shown to influence sustainability reporting practices, reflecting differences in business models and revenue generation structures (Hapsoro and Husain 2019). Evidence on leverage (LTDTA) remains mixed, with Alrazi et al. (2016) and Khan et al. (2021) reporting no significant association with QSR, while Alkayed et al. (2023) document a significant effect, underscoring the need to control for capital structure in disclosure models.

All financial variables are obtained from Bloomberg and cross-validated against annual reports. For consistency across jurisdictions, monetary values are converted to US dollars. Finally, year fixed effects (YEAR) are included to control for common macroeconomic shocks and temporal trends, while country fixed effects (COUNTRY) are employed to capture unobserved cross-country institutional heterogeneity that may influence QSR. Detailed definitions and measurements of all variables are provided in Appendix C.

The same model structure is applied to the two sub-dimensions: QSR\_RM and QSR\_R. To address potential endogeneity, particularly reverse causality, all independent and control variables are lagged by 1 year, consistent with prior studies (Bose et al. 2018; Johnes and Virmani 2020; Khan et al. 2021; Safiullah et al. 2021).

$$\begin{aligned}
 \text{QSR\_Total}_{i,t} = & \beta_0 + \beta_1 \text{SUSPER\_lag}_{i,t} + \beta_2 \text{GRI\_lag}_{i,t} \\
 & + \beta_3 \text{GENDIV\_lag}_{i,t} + \beta_4 \text{INSTSHARE\_lag}_{i,t} \\
 & + \beta_5 \text{FOREIGNOWN\_lag}_{i,t} + \beta_6 \text{LAW\_lag}_{i,t} \\
 & + \beta_7 \text{CPP1\_lag}_{i,t} + \beta_8 \text{LnTA\_lag}_{i,t} + \beta_9 \text{TOBINSQ\_lag}_{i,t} \\
 & + \beta_{10} \text{ROA\_lag}_{i,t} + \beta_{11} \text{SALESTA\_lag}_{i,t} + \beta_{12} \text{LTDTA\_lag}_{i,t} \\
 & + \sum \text{YEAR}_{i,t} + \sum \text{COUNTRY}_{i,t} + \varepsilon_{i,t}, \dots \dots \dots
 \end{aligned}
 \tag{2}$$

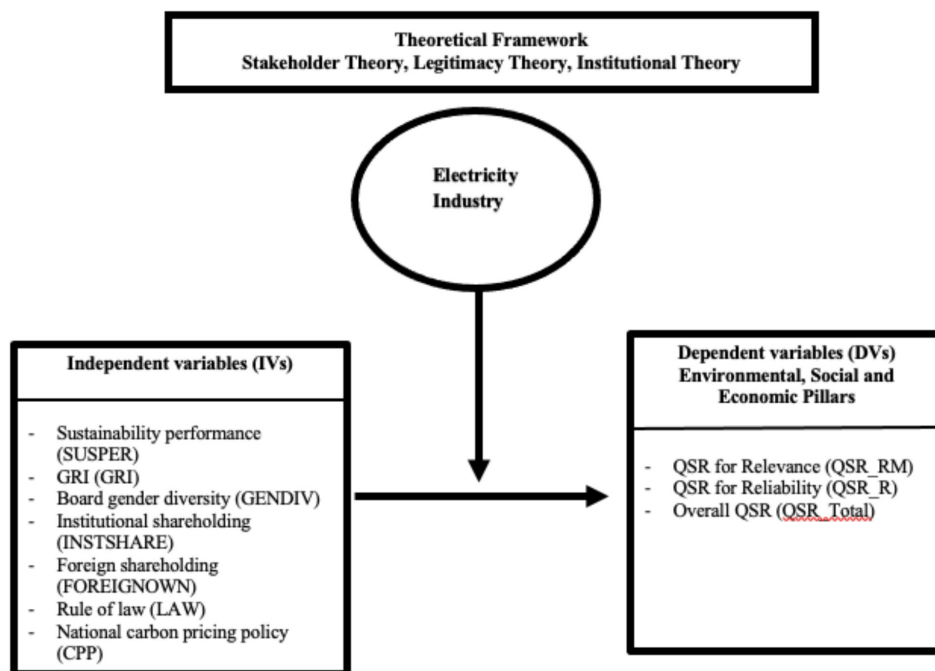


FIGURE 1 | Research framework.

The research framework is shown on Figure 1, adapted from Chang et al. (2019) but modified to suit the requirements of this study.

**TABLE 2** | Descriptive statistics.

Variable(s)	Observations	Mean	Med.	SD
<i>QSR_RM</i>	300	0.51	0.50	0.13
<i>QSR_R</i>	300	0.65	0.65	0.18
<i>QSR_Total</i>	300	0.55	0.54	0.13
<i>SUSPER</i>	283	0.58	0.59	0.16
<i>GRI</i>	300	0.81	1.00	0.39
<i>GENDIV</i>	300	0.51	1.00	0.50
<i>INSTSHARE</i>	300	0.64	0.65	0.25
<i>FOREIGNOWN</i>	298	0.31	0.20	0.27
<i>LAW</i>	300	0.97	1.43	0.79
<i>CPP</i>	300	0.57	1.00	0.50
<i>LnTA</i>	300	10.23	10.20	0.91
<i>TOBINSQ</i>	300	1.11	1.09	0.27
<i>ROA</i>	300	0.03	0.03	0.03
<i>SALESTA</i>	300	0.34	0.29	0.22
<i>LTDTA</i>	300	0.32	0.33	0.13

Note: All variable definitions are presented in Appendix C.

## 4 | Results

### 4.1 | Descriptive Statistics

Table 2 reports summary statistics for the sampled firm-year observations. The average QSR is moderate across dimensions: *QSR\_RM* (0.51), *QSR\_R* (0.65) and *QSR\_Total* (0.55), with low variability, suggesting relatively consistent disclosure practices. Firms show strong uptake of the GRI framework (mean = 0.81) and moderate sustainability performance (*SUSPER* = 0.58). Gender diversity is notable (mean = 0.51; median = 1), indicating that many firms have at least one female board member. Institutional ownership is high (mean = 0.64), while foreign ownership is lower (mean = 0.31), with wide dispersion. The rule of law varies across jurisdictions (mean = 0.97), and over half the firms operate under a CPP (*CPP* = 0.57). Control variables such as firm size (*LnTA*), market value (*TOBINSQ*) and profitability (*ROA*) show expected variation, supporting their inclusion in the regression analysis. Overall, the data show sufficient variability across key variables to enable robust empirical testing.

Table 3 presents the descriptive statistics by region. The results reveal clear regional differences in QSR. Europe, Middle East and Africa (EMEA) firms report the highest scores across all QSR dimensions (*QSR\_RM* = 0.61; *QSR\_R* = 0.80), likely reflecting stronger institutional environments and stakeholder expectations (Alrazi et al. 2016; Frías-Aceituno et al. 2013). Asia/Pacific firms lag behind, particularly in relevance and gender diversity (*GENDIV* = 0.15), indicating weaker stakeholder-oriented governance (Orazalin and Mahmood 2021). US firms

**TABLE 3** | Descriptive statistics by region.

Variable(s)	Americas		Asia/Pacific		Europe, Middle East and Africa (EMEA)	
	Obs.	Mean	Obs.	Mean	Obs.	Mean
<i>QSR_RM</i>	114	0.49	108	0.46	78	0.61
<i>QSR_R</i>	114	0.60	108	0.60	78	0.80
<i>QSR_Total</i>	114	0.52	108	0.50	78	0.66
<i>SUSPER</i>	114	0.61	96	0.48	73	0.67
<i>GRI</i>	114	0.73	108	0.84	78	0.90
<i>GENDIV</i>	114	0.70	108	0.15	78	0.72
<i>INSTSHARE</i>	114	0.77	108	0.50	78	0.63
<i>FOREIGNOWN</i>	114	0.23	108	0.33	76	0.42
<i>LAW</i>	114	1.26	108	0.72	78	0.91
<i>CPP</i>	114	0.40	108	0.56	78	0.85
<i>LnTA</i>	114	10.33	108	10.02	78	10.38
<i>TOBINSQ</i>	114	1.24	108	0.99	78	1.07
<i>ROA</i>	114	0.03	108	0.03	78	0.03
<i>SALESTA</i>	114	0.25	108	0.35	78	0.45
<i>LTDTA</i>	114	0.35	108	0.36	78	0.23

Note: All variable definitions are presented in Appendix C.

perform moderately but show higher institutional ownership (INSTSHARE=0.77), aligning with evidence that institutional investors drive QSR (Oyewo et al. 2025; Velte 2023). GRI adoption and CPP are strongest in EMEA, supporting prior findings that regulatory and normative pressures enhance disclosure quality (Rahman et al. 2019). Differences in rule of law (Kaufmann et al. 2011) and foreign ownership also align with cross-national variation in sustainability governance. Overall, institutional context appears central to QSR variation across regions.

## 4.2 | Correlation Matrix

The correlation matrix (Table 4) reveals several significant relationships with implications for QSR. As expected, QSR\_Total is highly correlated with its sub-dimensions: QSR\_RM ( $r=0.96$ ) and QSR\_R ( $r=0.86$ ), indicating strong internal consistency (Khan et al. 2021). SUSPER shows a moderate positive correlation with QSR ( $r=0.55$ ), suggesting that firms with stronger ESG performance tend to disclose more transparently (Al-Shaer and Zaman 2016). Likewise, GRI adoption is positively associated with QSR ( $r=0.44$ ), reinforcing the value of structured reporting frameworks (Luo and Tang 2023). Gender diversity and rule of law are positively linked to QSR, consistent with stakeholder theory and the role of diverse, accountable governance in enhancing ESG transparency (Gerwing et al. 2022; Oyewo et al. 2025). Foreign ownership is also positively associated ( $r=0.25$ ), supporting the influence of external accountability pressures (Correa-Garcia et al. 2020). In contrast, long-term debt (LTDTA) is negatively correlated with QSR, potentially reflecting disclosure aversion due to resource constraints (Ismail et al. 2018). Multicollinearity is not a concern. All correlations fall below the 0.80 threshold (Gujarati and Porter 2009), and the highest VIF (1.75) is well below the recommended limit of 10. The mean VIF is 1.58, confirming model robustness (Das et al. 2023; Khan et al. 2021).

## 4.3 | Main Empirical Results

Table 5 presents OLS regression results examining the effects of firm-level and institutional factors on QSR, using both contemporaneous and 1-year lagged specifications (Bui et al. 2020). All continuous independent variables were winsorised at the 1st and 99th percentiles to minimise the influence of outliers (Obeng et al. 2021). Regressions include year and country fixed effects to control for time-invariant and regional heterogeneity. All models demonstrate strong explanatory power, with adjusted  $R^2$  values ranging from 0.37 to 0.52.  $F$ -statistics are significant ( $p < 0.01$ ), indicating good model fit. The consistency between contemporaneous and lagged models enhances the robustness of the findings, and variance inflation factors (VIFs) confirm that multicollinearity is not a concern (Gujarati and Porter 2009; Khan et al. 2021).

Our analysis shows that sustainability performance is a strong, positive and highly significant predictor of all QSR measures in both panels ( $p < 0.001$ ), supporting *H1*. This supports earlier findings that firms with stronger ESG performance disclose more comprehensively to signal legitimacy and accountability (Khan et al. 2021; Mahmoudian et al. 2022; Schreck and Raithel 2018).

However, it is worth noting that some lower-performing firms may also disclose extensively for symbolic legitimacy (Alrazi et al. 2018; Imperiale et al. 2023), highlighting potential decoupling between reporting and actual performance. Relatedly, GRI adoption is significantly and positively associated with QSR across both models ( $p < 0.01$ ), affirming *H2*. Beyond confirming prior findings, this result has practical implications. This finding echoes studies that link structured, globally recognised reporting frameworks with enhanced relevance and reliability of disclosures (Alrazi et al. 2018; Anwar et al. 2021; Luo and Tang 2023). From both stakeholder and institutional theory perspectives, GRI adoption signals a firm's intent to align with external expectations and normative standards (Freeman 1994; Khan et al. 2021).

Contrary to *H3*, gender diversity shows no significant impact on QSR in the contemporaneous model and a negative effect on reliability (QSR\_R) in the lagged model. This partially aligns with Cucari et al. (2018) and Dragomir and Dumitru (2023), who also report weak or negative links between board gender diversity and disclosure quality. These inconsistencies suggest that gender diversity may not uniformly translate into stronger sustainability oversight, particularly in highly regulated sectors where board discretion is constrained (Dragomir and Dumitru 2023). The negative lagged effect may reflect institutional complexity or tokenistic appointments that do not translate into meaningful influence on reporting processes (Oyewo et al. 2025). Evidently, as our findings suggest in the electricity sector, board attributes based on gender diversity alone may be insufficient, akin on institutional context to facilitate QSR. Variations in impact may stem from contextual differences in board influence across jurisdictions (Amran et al. 2014; Singhania et al. 2023). While some studies (e.g., Al-Shaer and Zaman 2016) show a positive link between female board representation and QSR due to stakeholder orientation, the inconsistent evidence suggests the need for nuanced, context-specific interpretation.

In terms of institutional shareholding (INSTSHARE), the result shows a consistently positive and significant effect on all QSR dimensions ( $p < 0.01$ ), supporting *H4*. This reinforces the stakeholder-agency perspective that institutional investors demand more transparent disclosures to mitigate information asymmetry (Bose et al. 2018; Shahab and Ye 2018). Given the electricity sector's high capital intensity and ownership concentration, institutional investors may exert greater influence through active board participation (Pucheta-Martínez and Chiva-Ortells 2018). Amidst the climate crisis, climate-related risk information is most important to institutional investors (Gebhardt et al. 2024), which the firm should satisfy for better-informed sustainability linked investment decisions in line with stakeholder theory. These findings contrast with Khan et al. (2021), who found no such relationship, highlighting variation by industry and ownership structure. The results provide insights to managers and boards and highlight the importance of disclosing high-quality sustainability information needed by institutional investors.

Relatedly, the analysis supports *H5*, with foreign ownership showing a positive and significant relationship with QSR\_RM and QSR\_Total in both models. This finding aligns with

TABLE 4 | Pearson's correlation.

Variable(s)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>QSR_RM (1)</i>	1														
<i>QSR_R (2)</i>	0.70***	1													
<i>QSR_Total (3)</i>	0.96***	0.86***	1												
<i>SUSPER (4)</i>	0.53***	0.46***	0.55***	1											
<i>GRI (5)</i>	0.41***	0.40***	0.44***	0.22***	1										
<i>GENDIV (6)</i>	0.20***	0.18***	0.20***	0.47***	-0.02	1									
<i>INSTSHARE (7)</i>	-0.03	-0.05	-0.03	0.11*	-0.14***	0.18***	1								
<i>FOREIGNOWN (8)</i>	0.23***	0.24***	0.25***	0.09	0.08	0.03	0.03	1							
<i>LAW (9)</i>	-0.10*	0.04	-0.05	0.18***	-0.11**	0.41***	0.22***	-0.01	1						
<i>CPP (10)</i>	-0.01	0.21***	0.07	0.07	0.12**	0.21***	0.26***	0.21***	-0.19***	1					
<i>LnTA (11)</i>	0.11*	0.10*	0.11**	0.26**	0.24***	0.18***	0.31***	0.24***	0.21***	0.04	1				
<i>TOBINSQ (12)</i>	0.10*	0.07	0.10*	0.27***	-0.17***	0.31***	0.24***	-0.20***	0.32**	-0.08	-0.12**	1			
<i>ROA (13)</i>	0.20***	0.09*	0.17***	0.11**	-0.06	0.00	-0.17***	-0.28***	-0.10*	0.33	-0.34***	0.37***	1		
<i>SALESTA (14)</i>	0.07	0.26***	0.15***	0.05	0.08	-0.05	-0.16***	0.18***	-0.14**	0.19***	-0.18***	-0.01	0.15***	1	
<i>LTDTA (15)</i>	-0.20***	-0.16***	-0.20***	-0.25***	0.06	-0.19***	0.07	0.04	0.06	-0.11*	-0.03	-0.02	-0.13**	-0.24***	1

Note: All variable definitions are presented in Appendix C. \*\*\*, \*\* and \* represent statistical significance at the 1%, 5% and 10% levels, respectively (two-tailed tests).

TABLE 5 | Main results.

Variable(s)	Panel A: contemporaneous effect			Panel B: 1-year lagged effect		
	DV = QSR_RM	DV = QSR_R	DV = QSR_Total	DV = QSR_RM	DV = QSR_R	DV = QSR_Total
	Column 1	Column 2	Column 3	Column 1	Column 2	Column 3
	Coefficient (t value)	Coefficient (t value)	Coefficient (t value)	Coefficient (t value)	Coefficient (t value)	Coefficient (t value)
<i>SUSPER</i>	0.3749*** (8.50)	0.4534*** (7.44)	0.3975*** (9.20)	0.0039*** (6.88)	0.0048*** (6.88)	0.0041*** (7.46)
<i>GRI</i>	0.0775*** (4.52)	0.0846*** (3.57)	0.0796*** (4.74)	0.0535** (2.47)	0.0591** (1.97)	0.0551** (2.58)
<i>GENDIV</i>	0.0109 (0.75)	-0.0192 (0.95)	0.0022 (0.16)	0.0175 (0.92)	-0.0468* (-1.77)	-0.0010 (-0.06)
<i>LAW</i>	-0.0204** (-2.28)	0.0068 (0.55)	-0.0126 (1.43)	-0.0268** (-2.37)	0.0018 (0.12)	-0.0185* (-1.66)
<i>CPP</i>	-0.0294** (-2.03)	0.0217 (1.08)	-0.0147 (-1.03)	-0.0439** (-2.44)	0.0109 (0.44)	-0.0281 (-1.59)
<i>INSTSHARE</i>	0.1000*** (3.66)	0.1092*** (2.89)	0.1027*** (3.83)	0.0011*** (3.04)	0.0012** (2.46)	0.0011*** (3.19)
<i>FOREIGNOWN</i>	0.0570** (2.50)	0.0495 (1.57)	0.0549** (2.45)	0.0005* (1.69)	0.0004 (1.10)	0.0005* (1.66)
<i>LnTA</i>	-0.0014 (-0.18)	-0.0165 (-1.52)	-0.0058 (-0.74)	0.0070 (0.73)	-0.051 (-0.39)	0.0035 (0.37)
<i>TOBINSQ</i>	0.0227 (0.82)	0.0323 (0.84)	0.0255 (0.94)	0.0320 (1.14)	0.0510 (1.31)	0.0375 (1.35)
<i>ROA</i>	0.5271** (2.06)	0.2329 (0.66)	0.4423* (1.76)	-0.0146 (-0.07)	0.3416 (1.21)	0.0880 (0.44)
<i>SALESTA</i>	-0.0644** (-2.23)	0.0583 (1.46)	-0.0291 (-1.03)	-0.0618* (-1.80)	0.0432 (0.91)	-0.0315 (-0.93)
<i>LTDTA</i>	-0.0711 (-1.50)	-0.0744 (-1.13)	-0.0721 (-1.55)	-0.008 (1.41)	-0.0004 (-0.56)	-0.0007 (1.24)
Coonstant	0.2058** (2.31)	0.3659*** (2.98)	0.2519*** (2.89)	0.1492 (1.40)	0.2566* (1.74)	0.1801* (1.71)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted $R^2$	0.4885	0.4125	0.5149	0.4595	0.3691	0.4761
$F$ value	18.86	4.11	20.81	11.54	8.25	12.27
Prob > $F$	0.000	0.000	0.000	0.000	0.000	0.000
Observations	281	281	281	187	187	187

Note: All variable definitions are presented in Appendix C. \*\*\*, \*\* and \* represent statistical significance at the 1%, 5% and 10% levels, respectively (two-tailed tests).

Ismail et al. (2018), who argue that foreign investors, often more professional and compliance-oriented, drive firms to align with international norms and improve transparency. From a stakeholder theory lens, firms respond strategically to powerful external stakeholders' expectations through enhanced disclosures (Ehalaiye et al. 2025; Udin et al. 2017). Adamo et al. (2025) find that from a corporate governance standpoint, one factor that has a positive influence on QSR is

foreign ownership. The results indicate that firms with more foreign ownership tend to disclose their sustainability reports (Liou et al. 2023), which also offer insights to managers and the board on the vital role of foreign owners in shaping and enhancing the sustainability reporting.

Unpredictably, rule of law is negatively associated with the relevance dimension and overall QSR in both models, rejecting

**H6.** This contradicts prior work (Alrazi et al. 2018) suggesting stronger legal environments encourage more comprehensive disclosure. One explanation, drawn from legitimacy theory, is that firms in weaker legal environments may overdisclose to gain societal approval (Alrazi et al. 2016). Alternatively, in high rule-of-law contexts, firms may focus on compliance rather than voluntary engagement. As a result, electricity generators may practice a symbolic approach to sustainability reporting (Khan et al. 2021), leading to greenwashing; hence, information asymmetry (Bilicka et al. 2025; Boiral 2013). In a similar pattern, CPP also shows a negative and significant effect on QSR\_RM, rejecting **H7**. These findings challenge institutional theory's assumption of coercive isomorphism (Anwar et al. 2021; Rahman et al. 2019), possibly because ETs or carbon taxes are often

administratively complex and costly to implement (Christensen et al. 2021; Alrazi et al. 2016). Similarly, the voluntary adoption of internal CPP by global companies (Bento and Gianfrate 2020), like those in the electricity industry (even in the absence of a national mandate), may indicate mimetic isomorphism, likely due to compliance fatigue, for example, reporting of climate footprint and actions. Moreover, in the absence of strong enforcement or stakeholder scrutiny, carbon pricing may not be sufficient to drive higher disclosure quality (Dong et al. 2023).

Among controls, ROA shows a significant positive association with relevance and overall QSR in the contemporaneous model, in line with Mahmoudian et al. (2022). This suggests that more profitable firms are better positioned to invest in sustainability

**TABLE 6** | Firm fixed effects results.

Variable(s)	DV = QSRRM	DV = QSRR	DV = QSRTotal
	Coefficient (t value)	Coefficient (t value)	Coefficient (t value)
SUSPER	0.1691*** (2.69)	0.1788* (1.73)	0.1719*** (2.84)
GRI	0.0559*** (2.80)	0.1492*** (4.54)	0.0828*** (4.31)
GENDIV	-0.0202 (-1.40)	-0.0057 (-0.24)	-0.0161 (-1.15)
LAW	-0.1226** (-1.98)	-0.1074 (-1.05)	-0.1182** (-1.98)
CPP	-0.0077 (-0.32)	-0.0026 (-0.06)	-0.0062 (-0.27)
INSTSHARE	0.0036 (0.07)	0.0016 (0.02)	0.0030 (0.06)
FOREIGNOWN	0.0991* (1.74)	0.1250 (-0.92)	0.1065* (1.94)
LnTA	-0.0178 (-0.50)	-0.0258 (-0.44)	-0.0201 (-0.58)
TOBINSQ	0.0777** (2.22)	0.0534 (0.93)	0.0707** (2.10)
ROA	0.1887 (0.98)	-0.2031 (-0.64)	0.0758 (0.41)
SALESTA	-0.0007 (-0.01)	0.0988 (1.05)	0.0280 (0.51)
LTDTA	0.0988 (1.08)	-0.2427 (-1.62)	0.0004 (0.00)
_cons (intercept)	0.5149 (1.35)	0.7316 (1.16)	0.5774 (1.57)
Year	Yes	Yes	Yes
Company	Yes	Yes	Yes
Overall R <sup>2</sup>	0.1471	0.1963	0.1878
Observations	281	281	281

Note: All variable definitions are presented in the Appendix C.

\*\*\*, \*\* and \* represent statistical significance at the 1%, 5% and 10% levels, respectively (two-tailed tests).

disclosure processes. SALESTA is negatively related to QSR\_RM, possibly indicating that high asset turnover firms prioritise operational efficiency over extensive nonfinancial reporting. Other control variables such as firm size (LnTA) and firm value (TOBINSQ) are not significant, and long-term debt (LTDTA) also lacks a consistent effect.

#### 4.4 | Robustness Tests

To address endogeneity, the study employs firm fixed effects to control for unobserved heterogeneity (Garcia-Castro et al. 2010; Mundlak 1978), change analysis and two-stage least squares

(IV-2SLS) to mitigate omitted variable bias and reverse causality (Zahid et al. 2020).

##### 4.4.1 | Firm Fixed Effects and Change Analysis

The firm fixed effects results (Table 6) (Alkayed et al. 2023; Bui et al. 2020; Gerged et al. 2023) largely confirm the robustness of the main findings: SUSPER, GRI and FOREIGNOWN remain positively and significantly associated with overall QSR and its relevance dimension (QSR\_RM), while LAW maintains a negative effect. Additionally, SUSPER and GRI positively influence the reliability dimension (QSR\_R), and TOBINSQ shows a

TABLE 7 | Change analysis.

Variable(s)	DV = $\Delta$ QSRRM	DV = $\Delta$ QSR	DV = $\Delta$ QSRTotal
	Coefficient (t value)	Coefficient (t value)	Coefficient (t value)
$\Delta$ SUSPER	0.0021*** (3.15)	0.0024** (2.16)	0.0022*** (3.25)
GRI	0.0097 (0.75)	0.0441** (1.98)	0.0196 (1.48)
GENDIV	-0.0052 (-0.50)	-0.0202 (-1.13)	-0.0095 (-0.89)
$\Delta$ LAW	-0.1711*** (-2.68)	-0.2382** (-2.17)	-0.1904*** (-2.92)
CPP	0.0085 (0.81)	0.0081 (0.45)	0.0084 (0.79)
$\Delta$ INSTSHARE	0.0003 (0.52)	0.0008 (0.79)	0.0005 (0.75)
$\Delta$ FOREIGNOWN	0.0007 (1.14)	0.0018* (1.65)	0.0010 (1.60)
$\Delta$ LnTA	0.0098 (0.40)	-0.0331 (-0.78)	-0.0026 (-0.10)
$\Delta$ TOBINSQ	0.0184 (0.72)	0.0287 (0.65)	0.0214 (0.82)
$\Delta$ ROA	0.9304 (0.85)	0.0100 (0.05)	0.0691 (0.62)
$\Delta$ SALESTA	0.0295 (0.50)	0.1415 (1.39)	0.0618 (1.03)
$\Delta$ LTDTA	0.0013 (1.31)	-0.0030* (-1.72)	0.0001 (0.08)
Condstant	-0.0352** (-2.10)	-0.0792*** (-2.74)	-0.0479*** (-2.80)
Country	Yes	Yes	Yes
Year	Yes	Yes	Yes
Adjusted $R^2$	0.2116	0.1811	0.2585
Observations	186	186	186

Note: All variable definitions are presented in the Appendix C.

\*\*\*, \*\* and \* represent statistical significance at the 1%, 5% and 10% levels, respectively (two-tailed tests).

positive effect on both QSR\_Total and QSR\_RM. Change analysis results (Table 7) further reinforce these findings. Significant associations are found for changes in SUSPER and LAW across all QSR measures, and for GRI and FOREIGNOWN with QSR\_R (Bui et al. 2020; Maniora 2017; Obeng et al. 2021), highlighting the dynamic influence of performance, governance and institutional factors on reporting quality.

#### 4.4.2 | Instrumental Variable Analysis

To further address endogeneity, we apply the IV-2SLS estimator (Al-Shaer and Zaman 2019; Khan et al. 2023). The instruments used are the average GRI adoption and average CPP across countries over time. Based on institutional theory, particularly mimetic and coercive isomorphism, firms may adopt GRI or align

TABLE 8 | Instrumental variable approach.

Variable(s)	Panel A—first stage regression		Panel B—second stage regression		
	DV = GRI		DV = QSRRM	DV = QSRR	DV = QSRTotal
	Coefficient (z value)		Coefficient (z value)	Coefficient (z value)	Coefficient (z value)
MeanYearCountryGRI	0.8859*** (7.48)				
MeanYearCountryCPP1	-0.1569* (-1.76)				
Predictedvalue			0.0617 (1.50)	0.0911 (1.62)	0.0702* (1.74)
SUSPER	0.6547*** (4.73)		0.3878*** (7.08)	0.4481*** (6.00)	0.4052*** (7.54)
GENDIV	-0.0577 (-1.15)		0.0105 (0.69)	-0.0190 (-0.92)	0.0020 (0.13)
LAW	-0.0425 (-1.44)		-0.0218** (-2.22)	0.0074 (0.55)	-0.0134 (-1.39)
CPP	0.0865 (1.27)		-0.0296** (-1.97)	0.0218 (1.07)	-0.0148 (-1.01)
INSTSHARE	0.0771 (0.84)		0.0989*** (3.48)	0.1097*** (2.83)	0.1020*** (3.66)
FOREIGNOWN	-0.0549 (-0.74)		0.0563** (2.37)	0.0498 (1.54)	0.0544** (2.34)
LnTA	0.1102*** 4.33		-0.0001 (0.01)	-0.0171 (-1.42)	-0.0049 (-0.56)
TOBINSQ	-0.0280 (-0.30)		0.0188 (0.62)	0.0339 (0.831)	0.0231 (0.78)
ROA	0.1271 (0.15)		0.5317** (2.01)	0.2310 (0.64)	0.4450* (1.71)
SALESTA	0.0821 (0.87)		-0.0638** (-2.13)	0.0580 (1.43)	-0.0287 (-0.98)
LTDTA	0.5385*** (3.56)		-0.0622 (-1.16)	-0.0781 (-1.07)	-0.0668 (-1.27)
Constant	-1.4457*** (-4.46)		0.2011** (2.17)	0.3678*** (2.92)	0.2491*** (2.86)
YEAR	Yes		Yes	Yes	Yes
COUNTRY	Yes		Yes	Yes	Yes
Observations	281		281	281	281
R <sup>2</sup>	0.3689		0.4536	0.3903	0.4796

Note: All variable definitions are presented in the Appendix C.

\*\*\*, \*\* and \* represent statistical significance at the 1%, 5% and 10% levels, respectively (two-tailed tests).

with CPP practices due to peer influence or regulatory pressure within their institutional environment (Khan et al. 2023). These instruments are correlated with the endogenous variables (GRI, CPP) but plausibly uncorrelated with the error term in the QSR equations. Table 8 reports results of two-stage IV-2SLS estimation, which remain consistent with the main findings. The

nonsignificant residual  $p$  values and postestimation tests (e.g., Durbin & Wu–Hausman) confirm the absence of endogeneity. The minimum eigenvalue statistic of 27.04 exceeds conventional thresholds, indicating strong instrument validity and supporting the robustness of GRI and CPP as exogenous explanatory variables.

TABLE 9 | Replicating main model with governance attributes.

Variable(s)	DV = QSRRM	DV = QSRR	DV = QSRTotal
	Coefficient ( $t$ value)	Coefficient ( $t$ value)	Coefficient ( $t$ value)
SUSPER	0.3379*** (7.56)	0.4037*** (6.64)	0.3568*** (8.26)
GRI	0.0753*** (4.46)	0.0757*** (3.29)	0.0754*** (4.62)
GENDIV	0.0112 (0.71)	−0.0109 (−0.51)	0.0048 (0.31)
LAW	−0.0232*** (−2.60)	−0.0006 (−0.05)	−0.0167* (−1.94)
CPP	−0.0275** (−1.91)	0.0212 (1.08)	−0.0135 (−0.97)
INSTSHARE	0.0986** (3.64)	0.1180*** (3.20)	0.1042*** (3.98)
FOREIGNOWN	0.0534** (2.35)	0.0563* (1.82)	0.0542** (2.47)
LnTA	−0.0042 (−0.53)	−0.0264** (−2.44)	−0.0106 (−1.38)
TOBINSQ	0.0240 (0.88)	0.0319 (0.86)	0.0263 (1.00)
ROA	0.5394** (2.15)	0.2594 (0.76)	0.4587* (1.90)
SALESTA	−0.0755*** (−2.61)	0.0537 (1.37)	−0.0383 (−1.37)
LTDTA	−0.0784* (−1.67)	−0.0674 (−1.05)	−0.0752* (−1.65)
BIND	0.0141 (0.74)	0.0103 (0.40)	0.0130 (0.70)
AUDCOM)	−0.0335*** (−2.79)	−0.0283* (−1.73)	−0.0320*** (−2.75)
LnBOD	0.0883*** (3.27)	0.1741*** (4.75)	0.1130*** (4.34)
Constant	0.0590 (0.60)	0.0796 (0.60)	0.0650 (0.69)
Country	Yes	Yes	Yes
Year	Yes	Yes	Yes
Adjusted $R^2$	0.5113	0.4562	0.5483
Observations	281	281	281

Note: All variable definitions are presented in the Appendix C.

\*\*\*, \*\* and \* represent statistical significance at the 1%, 5% and 10% levels, respectively (two-tailed tests).

TABLE 10 | Using raw scores instead of weighted scores.

Variable(s)	DV = TotalRM	DV = TotalR	DV = GrandTotal
	Coefficient ( <i>t</i> value)	Coefficient ( <i>t</i> value)	Coefficient ( <i>t</i> value)
SUSPER	15.7456*** (8.50)	7.7074*** (7.44)	23.4530*** (9.20)
GRI	3.2570*** (5.52)	1.4376*** (3.57)	4.6946*** (4.74)
GENDIV	0.4590 (0.75)	-0.3263 (-0.95)	0.1327 (0.16)
LAW	-0.8576** (2.23)	-0.1158 (-0.55)	-0.7418 (-1.43)
CPP	-1.2339** (-2.03)	0.3691 (1.08)	-0.8648 (0.82)
INSTSHARE	4.2010*** (3.66)	1.8567*** (2.89)	6.0578*** (3.83)
FOREIGNOWN	2.3955** (2.50)	0.8418 (1.57)	3.2373** (2.45)
LnTA	-0.0585 (-0.18)	-0.2811 (-1.52)	-0.3396 (-0.74)
TOBINSQ	0.9546 (0.82)	0.5487 (0.84)	1.5033 (0.94)
ROA	22.1362** (2.06)	3.9591 (0.66)	26.0952* (1.76)
SALESTA	-2.7061** (-2.23)	0.9912 (1.46)	-1.7149 (-1.03)
LTDTA	-2.9865 (-1.50)	-1.2652 (-1.13)	-4.2517 (-1.55)
Constant	8.6422** (2.31)	6.2206*** (2.98)	14.8628*** (2.89)
Country	Yes	Yes	Yes
Year	Yes	Yes	Yes
Adjusted R <sup>2</sup>	0.4885	0.4125	0.5149
Observations	281	281	281

Note: All variable definitions are presented in the Appendix C.

\*\*\*, \*\* and \* represent statistical significance at the 1%, 5% and 10% levels, respectively (two-tailed tests).

#### 4.5 | Additional Analyses

Additional analyses were conducted to validate the main findings: (1) inclusion of governance attributes in the regression model and (2) use of raw scores as dependent variables instead of weighted averages (Khan et al. 2021). As shown in Table 9, adding board independence, audit committee and board size confirms the robustness of the main results. Specifically, board size is positively and audit committee presence negatively associated with all QSR measures.

In a further robustness check, the baseline model was re-estimated using raw scores: GrandTotal, TotalRM and TotalR

as dependent variables, replacing QSR\_Total, QSR\_RM and QSR\_R, respectively (Khan et al. 2021). Here, GrandTotal is the sum of TotalRM (relevance) and TotalR (reliability). Results in Table 10 closely mirror the main findings, reinforcing the consistency of the study's conclusions.

#### 5 | Conclusion

Our study offers new insights into the drivers of QSR in the electricity generation sector i.e., one of the sectors at the heart of global decarbonisation efforts. Drawing on a multitheoretical lens: specifically, stakeholder, legitimacy and institutional

theories, we examined how firm-level attributes (e.g., sustainability performance, governance structures, ownership composition) and institutional factors (e.g., rule of law, CPP) shape both the relevance and reliability dimensions of QSR. This study identifies important factors that managers and decision makers should consider in improving the quality of sustainability-related communication (Minutiello and Tettamanzi 2022).

Our findings show that sustainability performance, GRI framework adoption, and the presence of institutional and foreign investors are consistently and positively associated with higher QSR. These effects reflect the normative expectations embedded in stakeholder and institutional theories, namely, that firms with stronger performance, deeper stakeholder engagement and more sophisticated ownership structures are more likely to disclose credible and decision-useful sustainability information (Bui et al. 2020; Khan et al. 2021; Das et al. 2023). Conversely, the rule of law and CPP, factors traditionally expected to enhance disclosure, exhibit negative associations with QSR among electricity generators. This counterintuitive evidence challenges the assumption that stronger formal institutions uniformly improve voluntary disclosure and instead lends support to legitimacy-based arguments that firms operating in weaker regulatory environments may engage in more proactive, albeit symbolic, reporting to secure societal legitimacy (Alrazi et al. 2016; Ehalaiye et al. 2025; Imperiale et al. 2023). Moreover, strict compliance with legal and carbon pricing regimes may impose significant financial and administrative burdens, giving rise to regulatory or compliance fatigue that constrains firms' capacity or willingness to produce high-quality sustainability information (Bingler et al. 2022; Christensen et al. 2021). In such settings, sustainability reporting may function primarily as a defensive legitimacy device rather than a mechanism for substantive accountability, reflecting symbolic conformity aimed at compliance rather than transparency (Bilicka et al. 2025; DiMaggio and Powell 1983; Moses et al. 2024). Notably, the study finds board gender diversity to have a limited effect on QSR. This may point to tokenistic board appointments that do not translate into meaningful influence over sustainability-related decisions (Oyewo et al. 2025) or to structural constraints that limit the involvement of female directors in key governance processes, such as sustainability committees. These findings highlight the need for further inquiry into the conditions under which board diversity can effectively enhance sustainability reporting outcomes in highly regulated and male-dominated sectors.

The findings contribute to the growing literature on sustainability disclosure by providing industry-specific evidence from a carbon-intensive and heavily scrutinised sector. It extends prior work by incorporating a dual-dimensional measure of QSR (relevance and reliability), aligned with emerging global standards, and confirms that internal performance, reporting frameworks and ownership configurations significantly shape disclosure practices. In doing so, the study supports calls to move beyond symbolic quantity-based metrics towards more in-depth qualitative assessments of sustainability disclosure (Henriques et al. 2022; Khan et al. 2023; Moses et al. 2024).

Importantly, these findings have direct implications for the implementation of IFRS Sustainability Disclosure Standards (S1 and S2). Our evidence suggests that firms with stronger

sustainability performance and GRI alignment are better positioned to meet the core content requirements of IFRS S1, particularly those relating to governance, strategy, risk management and metrics (Moses et al. 2025). Similarly, the influence of institutional investors and foreign ownership aligns with the market-driven logic of IFRS S2, where investors demand decision-useful, comparable climate-related information. Conversely, the unexpected negative influence of rule of law and CPP suggests that legal mandates alone may be insufficient to drive high-quality disclosure unless accompanied by strong stakeholder accountability and internal capacity.

In terms of practical implications, corporate boards, particularly in electricity firms, can draw insights from this study on the strategic value of sustainability reporting. The findings suggest that active involvement of institutional and foreign investors can strengthen board oversight and enhance the alignment between sustainability objectives and corporate strategy, reflecting the integrated thinking promoted by IFRS S1 (Farooq and de Villiers 2019; Tarquinio and Xhindole 2022). Second, regulators and standard setters, including the ISSB and jurisdictional standard-setting bodies, should consider the implications of sector-specific dynamics when implementing IFRS S1 and S2. The results indicate that voluntary frameworks such as GRI can play a complementary role in enhancing reporting quality, particularly in jurisdictions where enforcement capacity remains limited. Third, report users, including investors, civil society actors and assurance providers, can use these insights to better interpret variations in disclosure quality, especially where firms operate under differing institutional conditions or governance arrangements. Fourth, this study underpins the importance of management and the board positioning their objectives (Santos et al. 2025) to advance corporate governance of sustainability, stakeholder engagement and corporate transparency (Adamo et al. 2025), and adopt substantive sustainability reporting to address information asymmetry. Fifth, this study offers insights and suggestions to policymakers and regulators to assess the strengths and weaknesses of companies to come up with high-quality sustainability reporting by formulating clear regulatory guidelines that can cater to different sectors and avoid the occurrence of fragmentary situations (Adamo et al. 2025). This ensures compliance with regulation, for example, CPP, through mandatory and accurate reporting by companies to foster transparency.

This study focuses on large firms in the electricity sector, using the S&P Global Top 250 rankings, which may limit generalisability to smaller firms or other industries (Al-Shaer 2020). Furthermore, since the study focuses on a single industry involving mostly global companies, policymakers and regulators may lean towards developing 'one-size-fits-all' sustainability-related regulations and strategies which are effective for large firms but not for other businesses. Future research should explore longer time horizons, integrate additional firm-level factors (e.g., plant type, climate risk exposure) and examine sector-specific regulatory frameworks in greater depth. Moreover, the negative associations observed for gender diversity, rule of law and CPP with QSR warrant further theoretical and empirical investigation, particularly in the context of the global transition to mandatory sustainability reporting under IFRS S1/S2 and related frameworks. Future studies may focus on other industries in replicating this study (Chang et al. 2019).

## Author Contributions

All authors contributed equally to the conception, development and writing of this manuscript.

## Acknowledgements

Open access publishing facilitated by Massey University, as part of the Wiley - Massey University agreement via the Council of Australian University Librarians.

## Endnotes

<sup>1</sup>These are: China, The US, Russia, India, Japan, Germany, Brazil, Canada, UK, and Indonesia.

<sup>2</sup><https://www.responsibilityreports.com/>.

<sup>3</sup>Applicable to RM1, RM2, RM4, RM5, R5.

## References

- Adamo, S., C. De Matteis, R. Fasiello, and F. Imperiale. 2025. "A Literature Analysis of Sustainability Reporting Quality." *Corporate Social Responsibility and Environmental Management* 32, no. 3: 4194–4215.
- Adams, C. A. 2002. "Internal Organisational Factors Influencing Corporate Social and Ethical Reporting: Beyond Current Theorising." *Accounting, Auditing & Accountability Journal* 15, no. 2: 223–250.
- Ahmed Haji, A., and M. Anifowose. 2016. "The Trend of Integrated Reporting Practice in South Africa: Ceremonial or Substantive?" *Sustainability Accounting, Management & Policy Journal* 7, no. 2: 190–224. <https://doi.org/10.1108/SAMPJ-11-2015-0106>.
- Aksan, I., and E. Gantayowati. 2020. "Disclosure on Sustainability Reports, Foreign Board, Foreign Ownership, Indonesia Sustainability Reporting Awards and Firm Value." *Journal of Accounting and Strategic Finance* 3, no. 1: 33–51. <https://doi.org/10.33005/jasf.v3i1.69>.
- Al Amosh, H., and S. F. Khatib. 2022. "Ownership Structure and Environmental, Social and Governance Performance Disclosure: The Moderating Role of the Board Independence." *Journal of Business and Socio-Economic Development* 2, no. 1: 49–66.
- Alkayed, H., I. Yousef, K. Hussainey, and E. Shehadeh. 2023. "The Impact of COVID-19 on Sustainability Reporting: A Perspective From the US Financial Institutions." *Journal of Applied Accounting Research* 25: 279–297. <https://doi.org/10.1108/JAAR-12-2022-0345>.
- Alrazi, B., N. A. S. Bahari, N. M. Husin, and F. M. Khalid. 2018. "Institutional Governance Perspectives of Carbon Emission Disclosures Among Electricity Companies in Asia." *International Journal of Engineering and Technology (UAE)* 7, no. 4: 803–809. <https://doi.org/10.14419/ijet.v7i4.35.23111>.
- Alrazi B., C. de Villiers, C. J. Van Staden, 2010. "The Environmental Reporting of Electric Utilities: An International Comparison [Conference Paper]." 9th CSEAR Australasian Conference, Albury Wodonga, Australia.
- Alrazi, B., C. de Villiers, and C. J. Van Staden. 2016. "The Environmental Disclosures of the Electricity Generation Industry: A Global Perspective." *Accounting and Business Research* 46, no. 6: 665–701.
- Al-Shaer, H. 2020. "Sustainability Reporting Quality and Post-Audit Financial Reporting Quality: Empirical Evidence From the UK." *Business Strategy and the Environment* 29, no. 6: 2355–2373. <https://doi.org/10.1002/bse.2507>.
- Al-Shaer, H., and M. Zaman. 2016. "Board Gender Diversity and Sustainability Reporting Quality." *Journal of Contemporary Accounting and Economics* 12, no. 3: 210–222.
- Al-Shaer, H., and M. Zaman. 2019. "CEO Compensation and Sustainability Reporting Assurance: Evidence From the UK." *Journal of Business Ethics* 158, no. 1: 233–252. <https://doi.org/10.1007/s10551-017-3735-8>.
- Amran, A., S. P. Lee, and S. S. Devi. 2014. "The Influence of Governance Structure and Strategic Corporate Social Responsibility Toward Sustainability Reporting Quality." *Business Strategy and the Environment* 23, no. 4: 217–235. <https://doi.org/10.1002/bse.1767>.
- Ananzeh, H., A. Bugshan, and I. Amayreh. 2023. "Does Media Exposure Moderate the Relationship Between Ownership Structure and Environmental Disclosure Quality: Evidence From Jordan." *Management of Environmental Quality* 34, no. 1: 59–79.
- Anwar, M., S. Rahman, and M. N. Kabir. 2021. "Does National Carbon Pricing Policy Affect Voluntary Environmental Disclosures? A Global Evidence." *Environmental Economics and Policy Studies* 23, no. 2: 211–244. <https://doi.org/10.1007/s10018-020-00287-2>.
- Bae, H. 2014. "Voluntary Disclosure of Environmental Performance: Do Publicly and Privately Owned Organizations Face Different Incentives/Disincentives?" *American Review of Public Administration* 44, no. 4: 459–476–476.
- Bae, S. M., M. A. K. Masud, and J. D. Kim. 2018. "A Cross-Country Investigation of Corporate Governance and Corporate Sustainability Disclosure: A Signaling Theory Perspective." *Sustainability* 10, no. 8: 1–16. <https://doi.org/10.3390/su10082611>.
- Bebbington, J., and C. Larrinaga-González. 2008. "Carbon Trading: Accounting and Reporting Issues." *European Accounting Review* 17, no. 4: 697–717.
- Bento, N., and G. Gianfrate. 2020. "Determinants of Internal Carbon Pricing." *Energy Policy* 143: 111499.
- Bilicka, K., E. Casi, C. Seregini, and B. M. Stage. 2025. "Tax Strategy Disclosure: A Greenwashing Mandate?" *Journal of Accounting Research* 63, no. 5: 1857–1915. <https://doi.org/10.1111/1475-679X.12617>.
- Bingler, J. A., M. Kraus, M. Leippold, and N. Webersinke. 2022. "Cheap Talk and Cherry-Picking: What ClimateBert Has to Say on Corporate Climate Risk Disclosures." *Finance Research Letters* 47: 102776.
- Boiral, O. 2013. "Sustainability Reports as Simulacra? A Counter-Account of A and A+ GRI Reports." *Accounting, Auditing & Accountability Journal* 26, no. 7: 1036–1071.
- Bose, S., H. Z. Khan, A. Rashid, and S. Islam. 2018. "What Drives Green Banking Disclosure? An Institutional and Corporate Governance Perspective." *Asia Pacific Journal of Management* 35, no. 2: 501–527. <https://doi.org/10.1007/s10490-017-9528-x>.
- Bui, B., M. N. Houqe, and M. Zaman. 2020. "Climate Governance Effects on Carbon Disclosure and Performance." *British Accounting Review* 52, no. 2: 100880.
- Campbell, J. L. 2007. "Why Would Corporations Behave in Socially Responsible Ways? An Institutional Theory of Corporate Social Responsibility." *Academy of Management Review* 32, no. 3: 946–967.
- Chang, K. 2013. "The Effects of Ownership and Capital Structure on Environmental Information Disclosure: Empirical Evidence From Chinese Listed Electric Firms." *TERI Information Digest on Energy and Environment* 12, no. 3: 315–330.
- Chang, W. F., A. Amran, M. Iranmanesh, and B. Foroughi. 2019. "Drivers of Sustainability Reporting Quality: Financial Institution Perspective." *International Journal of Ethics and Systems* 35, no. 4: 632–650.
- Chelli, M., S. Durocher, and A. Fortin. 2018. "Normativity in Environmental Reporting: A Comparison of Three Regimes." *Journal of Business Ethics* 149, no. 2: 285–311.
- Christensen, H. B., L. Hail, and C. Leuz. 2021. "Mandatory CSR and Sustainability Reporting: Economic Analysis and Literature Review." *Review of Accounting Studies* 26, no. 3: 1176–1248.

- ClimateWatch. 2024. "Historical GHG Emissions." [https://www.climatewatchdata.org/ghg-emissions?end\\_year=2020&start\\_year=1990](https://www.climatewatchdata.org/ghg-emissions?end_year=2020&start_year=1990). Accessed March 14, 2024.
- Cormier, D., and I. M. Gordon. 2001. "An Examination of Social and Environmental Reporting Strategies." *Accounting, Auditing & Accountability Journal* 14, no. 5: 587–617. <https://doi.org/10.1108/EUM0000000006264>.
- Correa-Garcia, J. A., M. A. Garcia-Benau, and E. Garcia-Meca. 2020. "Corporate Governance and Its Implications for Sustainability Reporting Quality in Latin American Business Groups." *Journal of Cleaner Production* 260: 121142. <https://doi.org/10.1016/j.jclepro.2020.121142>.
- Cowan, S., and C. Deegan. 2011. "Corporate Disclosure Reactions to Australia's First National Emission Reporting Scheme." *Accounting and Finance* 51, no. 2: 409–436. <https://doi.org/10.1111/j.1467-629X.2010.00361.x>.
- Cucari, N., S. Esposito De Falco, and B. Orlando. 2018. "Diversity of Board of Directors and Environmental Social Governance: Evidence From Italian Listed Companies." *Corporate Social Responsibility and Environmental Management* 25, no. 3: 250–266.
- Das, S. K., M. Khalilur Rahman, and S. Roy. 2023. "Does Ownership Type Affect Sustainability Reporting Disclosure? Evidence From an Emerging Market." *International Journal of Disclosure and Governance* 21: 52–68. <https://doi.org/10.1057/s41310-023-00180-w>.
- Deegan, C. 2002. "Introduction: The Legitimising Effect of Social and Environmental Disclosures – A Theoretical Foundation." *Accounting, Auditing & Accountability Journal* 15, no. 3: 282–311.
- DiMaggio, P. J., and W. W. Powell. 1983. "The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields." *American Sociological Review* 48, no. 2: 147–160.
- Dong, S., L. Xu, and R. P. McIver. 2023. "Sustainability Reporting Quality and the Financial Sector: Evidence From China." *Meditari Accountancy Research* 31, no. 5: 1190–1214. <https://doi.org/10.1108/MEDAR-05-2020-0899>.
- Dragomir, V. D., and M. Dumitru. 2023. "Does Corporate Governance Improve Integrated Reporting Quality? A Meta-Analytical Investigation." *Meditari Accountancy Research* 31, no. 6: 1846–1885. <https://doi.org/10.1108/MEDAR-03-2022-1618>.
- D'Souza, C., T. Ahmed, M. A. Khashru, R. Ahmed, V. Ratten, and M. Jayaratne. 2022. "The Complexity of Stakeholder Pressures and Their Influence on Social and Environmental Responsibilities." *Journal of Cleaner Production* 358: 132038.
- Ehalaiye, D., O. Moses, F. Laswad, and N. Botica Redmayne. 2025. "Local Government Enterprises Climate Action: An Exploration of New Zealand Container Seaports' Climate-Related Disclosure Practices." *Financial Accountability & Management* 41, no. 1: 60–88. <https://doi.org/10.1111/faam.12406>.
- Eng, L. L., and M. G. Fikru. 2022. "Are US Electric Utilities Improving Their Sustainability Disclosures and Performance?" *Electricity Journal* 35, no. 10: 107221. <https://doi.org/10.1016/j.tej.2022.107221>.
- Engelhardt, N., J. Ekkenga, and P. Posch. 2021. "Esg Ratings and Stock Performance During the Covid-19 Crisis." *Sustainability* 13, no. 13: 7133.
- Farooq, M. B., and C. de Villiers. 2019. "Understanding How Managers Institutionalise Sustainability Reporting: Evidence From Australia and New Zealand." *Accounting, Auditing & Accountability Journal* 32, no. 5: 1240–1269. <https://doi.org/10.1108/AAAJ-06-2017-2958>.
- Fernandez-Feijoo, B., S. Romero, and S. Ruiz-Blanco. 2014. "Women on Boards: Do They Affect Sustainability Reporting?" *Corporate Social Responsibility and Environmental Management* 21, no. 6: 351–364.
- Freeman, R. E. 1994. "The Politics of Stakeholder Theory: Some Future Directions." *Business Ethics Quarterly* 4, no. 4: 409–421.
- Frías-Aceituno, J. V., L. Rodríguez-Ariza, and I. M. García-Sánchez. 2013. "Is Integrated Reporting Determined by a Country's Legal System? An Exploratory Study." *Journal of Cleaner Production* 44: 45–55. <https://doi.org/10.1016/j.jclepro.2012.12.006>.
- García-Castro R., M. A. Ariño, and M. A. Canela. 2010. "Does Social Performance Really Lead to Financial Performance? Accounting for Endogeneity." *Journal of Business Ethics* 92, no. 1: 107–126. <https://doi.org/10.1007/s10551-009-0143-8>.
- García-Sánchez, I.-M., O. Suárez-Fernández, and J. Martínez-Ferrero. 2019. "Female Directors and Impression Management in Sustainability Reporting." *International Business Review* 28, no. 2: 359–374.
- Gebhardt, M., A. Schneider, M. Seefloth, and H. Zülch. 2024. "Institutional Investors' Information Needs in the Context of the Sustainable Finance Disclosure Regulation (EU/2019/2088): The Implications for Companies' Sustainability Reporting." *Journal of Applied Accounting Research* 25, no. 5: 913–942.
- Gerged, A. M., R. Salem, and E. Beddewela. 2023. "How Does Transparency Into Global Sustainability Initiatives Influence Firm Value? Insights From Anglo-American Countries." *Business Strategy and the Environment* 32: 4519–4547. <https://doi.org/10.1002/bse.3379>.
- Gerwing, T., P. Kajüter, and M. Wirth. 2022. "The Role of Sustainable Corporate Governance in Mandatory Sustainability Reporting Quality." *Journal of Business Economics* 92, no. 3: 517–555. <https://doi.org/10.1007/s11573-022-01092-x>.
- Graafland, J., and H. Smid. 2019. "Decoupling Among CSR Policies, Programs, and Impacts: An Empirical Study." *Business and Society* 58, no. 2: 231–267. <https://doi.org/10.1177/0007650316647951>.
- Green, J. F. 2021. "Does Carbon Pricing Reduce Emissions? A Review of Ex-Post Analyses." *Environmental Research Letters* 16, no. 4: 043004. <https://doi.org/10.1088/1748-9326/abd9e9>.
- GRI. 2023. "Finishing Line in Sight for New EU Standards." <https://www.globalreporting.org/news/news-center/finishing-line-in-sight-for-new-eu-standards/>. Accessed June 27, 2024.
- Gujarati, D. N., and D. C. Porter. 2009. *Basic Econometrics*. McGraw-Hill.
- Hąbek, P., and R. Wolniak. 2016. "Assessing the Quality of Corporate Social Responsibility Reports: The Case of Reporting Practices in Selected European Union Member States." *Quality and Quantity* 50, no. 1: 399–420. <https://doi.org/10.1007/s11135-014-0155-z>.
- Hahn, R., and M. Kühnen. 2013. "Determinants of Sustainability Reporting: A Review of Results, Trends, Theory, and Opportunities in an Expanding Field of Research." *Journal of Cleaner Production* 59: 5–21.
- Hapsoro, D., and Z. F. Husain. 2019. "Does Sustainability Report Moderate the Effect of Financial Performance on Investor Reaction? Evidence of Indonesian Listed Firms." *International Journal of Business* 24, no. 3: 308–328.
- Henriques, R., C. Gaio, and M. Costa. 2022. "Sustainability Reporting Quality and Stakeholder Engagement Assessment: The Case of the Paper Sector at the Iberian Level." *Sustainability* 14, no. 21: 14404. <https://doi.org/10.3390/su142114404>.
- Houque, M. N., and H. Z. Khan. 2025. "Corruption, Sustainable Development Goals Performance and Modern Slavery Practices: An International Evidence." *Journal of Accounting Literature* 47, no. 5: 323–351. <https://doi.org/10.1108/JAL-03-2024-0045>.
- Hummel, K., and C. Schlick. 2016. "The Relationship Between Sustainability Performance and Sustainability Disclosure—Reconciling Voluntary Disclosure Theory and Legitimacy Theory." *Journal of Accounting and Public Policy* 35, no. 5: 455–476.
- Hyatt, D. G., and N. Berente. 2017. "Substantive or Symbolic Environmental Strategies? Effects of External and Internal Normative

- Stakeholder Pressures.” *Business Strategy and the Environment* 26, no. 8: 1212–1234.
- IEA. 2024. “The Path to 1.5° C Has Narrowed, but Clean Energy Growth Is Keeping It Open.” <https://www.iea.org/topics/global-energy-transitions-stocktake>. Accessed March 14, 2024.
- Imperiale, F., S. Pizzi, and S. Lippolis. 2023. “Sustainability Reporting and ESG Performance in the Utilities Sector.” *Utilities Policy* 80: 101468. <https://doi.org/10.1016/j.jup.2022.101468>.
- Ismail, A. H., A. Abdul Rahman, and A. A. Hezabr. 2018. “Determinants of Corporate Environmental Disclosure Quality of Oil and Gas Industry in Developing Countries.” *International Journal of Ethics and Systems* 34, no. 4: 527–563.
- Jadoon, I. A., A. Ali, U. Ayub, M. Tahir, and R. Mumtaz. 2021. “The Impact of Sustainability Reporting Quality on the Value Relevance of Corporate Sustainability Performance.” *Sustainable Development* 29, no. 1: 155–175. <https://doi.org/10.1002/sd.2138>.
- Johnes, J., and S. Virmani. 2020. “Chief Executive Pay in UK Higher Education: The Role of University Performance.” *Annals of Operations Research* 288, no. 2: 547–576. <https://doi.org/10.1007/s10479-019-03275-2>.
- Kaufmann, D., A. Kraay, and M. Mastruzzi. 2011. “The Worldwide Governance Indicators: Methodology and Analytical Issues.” *Hague Journal on the Rule of Law* 3, no. 2: 220–246. <https://doi.org/10.1017/s1876404511200046>.
- Khan, H. Z., S. Bose, A. T. Mollik, and H. Harun. 2021. ““Green Washing” or “Authentic Effort”? An Empirical Investigation of the Quality of Sustainability Reporting by Banks.” *Accounting, Auditing & Accountability Journal* 34: 338–369. <https://doi.org/10.1108/AAAJ-01-2018-3330>.
- Khan, H. Z., M. N. Houque, and I. K. Ielemia. 2023. “Organic Versus Cosmetic Efforts of the Quality of Carbon Reporting by Top New Zealand Firms. Does Market Reward or Penalise?” *Business Strategy and the Environment* 32, no. 1: 686–703. <https://doi.org/10.1002/bse.3169>.
- Kim, E.-H., and T. P. Lyon. 2011. “Strategic Environmental Disclosure: Evidence From the DOE’s Voluntary Greenhouse Gas Registry.” *Journal of Environmental Economics and Management* 61, no. 3: 311–326. <https://doi.org/10.1016/j.jeem.2010.11.001>.
- Ko, I., and T. Lee. 2022. “Carbon Pricing and Decoupling Between Greenhouse Gas Emissions and Economic Growth: A Panel Study of 29 European Countries, 1996–2014.” *Review of Policy Research* 39, no. 5: 654–673. <https://doi.org/10.1111/ropr.12458>.
- Kraft, B. 2018. “Shedding Light on Stakeholder Power in a Regulated Market: A Study of Variation in Electric Utilities’ Climate Change Disclosures.” *Organization & Environment* 31, no. 4: 314–338.
- Larrán Jorge, M., F. J. Andrades Peña, and J. Herrera Madueño. 2019. “An Analysis of University Sustainability Reports From the GRI Database: An Examination of Influential Variables.” *Journal of Environmental Planning and Management* 62, no. 6: 1019–1044–1044.
- Liou, R. S., P. H. Ting, and Y. Y. Chen. 2023. “The Cost of Foreign Ownership: Voluntary Sustainability Reporting and Financial Performance in an Emerging Economy.” *Cross Cultural and Strategic Management* 30: 581–612. <https://doi.org/10.1108/CCSM-09-2021-0165>.
- Luo, L., and Q. Tang. 2023. “The Real Effects of ESG Reporting and GRI Standards on Carbon Mitigation: International Evidence.” *Business Strategy and the Environment* 32, no. 6: 2985–3000.
- Mahmoudian, F., J. A. Nazari, and I. M. Herremans. 2022. “Sustainability Control System Components, Reporting and Performance.” *Corporate Governance (Bingley)* 22, no. 4: 633–652. <https://doi.org/10.1108/CG-06-2020-0208>.
- Maia, R. G. T., and K. C. Garcia. 2023. “What They Say, What They Do and How They Do It: An Evaluation of the Energy Transition and GHG Emissions of Electricity Companies.” *Energy Policy* 174: 113462.
- Mamun, M. 2023. “Sustainability Reporting of Major Electricity Retailers in Line With GRI: Australia Evidence.” *Journal of Accounting and Organizational Change* 19, no. 3: 474–493.
- Maniora, J. 2017. “Is Integrated Reporting Really the Superior Mechanism for the Integration of Ethics Into the Core Business Model? An Empirical Analysis.” *Journal of Business Ethics* 140, no. 4: 755–786. <https://doi.org/10.1007/s10551-015-2874-z>.
- Marquis, C., and C. Qian. 2014. “Corporate Social Responsibility Reporting in China: Symbol or Substance?” *Organization Science* 25, no. 1: 127–148.
- Masum, M. H., A. R. A. Latiff, and M. N. H. Osman. 2020. “Ownership Structure and Corporate Voluntary Disclosures in Transition Economy.” *Journal of Asian Finance, Economics and Business* 7, no. 10: 601–611.
- Minutiello, V., and P. Tettamanzi. 2022. “The Quality of Nonfinancial Voluntary Disclosure: A Systematic Literature Network Analysis on Sustainability Reporting and Integrated Reporting.” *Corporate Social Responsibility and Environmental Management* 29, no. 1: 1–18.
- Moseñe, J. A., R. L. Burritt, M. V. Sanagustín, J. M. Moneva, and J. Tingey-Holyoak. 2013. “Environmental Reporting in the Spanish Wind Energy Sector: An Institutional View.” *Journal of Cleaner Production* 40: 199–211.
- Moses, O., B. Bui, M. N. Houque, and Z. Borghei. 2025. “Readiness for Mandatory Climate-Related Disclosures: A Tri-Jurisdictional Analysis of Governance Attributes in Australia, New Zealand and the United Kingdom.” *Business Strategy and the Environment* 34, no. 3: 3739–3763.
- Moses, O., D. Ehalaiye, M. Sorola, and P. Lassou. 2024. “Extractive Sector Governance: Does a Nexus of Accountability Render Local Extractive Industries Transparency Initiatives Ineffective?” *Meditari Accountancy Research* 32, no. 1: 176–206.
- Mundlak, Y. 1978. “On the Pooling of Time Series and Cross Section Data.” *Econometrica* 46, no. 1: 69–85. <https://doi.org/10.2307/1913646>.
- Nekhili, M., H. Nagati, T. Chtioui, and A. Nekhili. 2017. “Gender-Diverse Board and the Relevance of Voluntary CSR Reporting.” *International Review of Financial Analysis* 50: 81–100.
- Nobanee, H., and N. Ellili. 2016. “Corporate Sustainability Disclosure in Annual Reports: Evidence From UAE Banks: Islamic Versus Conventional.” *Renewable and Sustainable Energy Reviews* 55: 1336–1341.
- Obeng, V. A., K. Ahmed, and S. F. Cahan. 2021. “Integrated Reporting and Agency Costs: International Evidence From Voluntary Adopters.” *European Accounting Review* 30, no. 4: 645–674. <https://doi.org/10.1080/09638180.2020.1805342>.
- Orazalin, N., and M. Mahmood. 2021. “Toward Sustainable Development: Board Characteristics, Country Governance Quality, and Environmental Performance.” *Business Strategy and the Environment* 30, no. 8: 3569–3588.
- Oyewo, B., O. Moses, and N. Orazalin. 2025. “Board Gender Diversity and Carbon Trade Finance: Evidence From Multinational Corporations on the Role of Institutional Quality and Cultural Environment.” *Business Strategy and the Environment* 34, no. 4: 4165–4190.
- Parrot, K. W., and B. X. Tierney. 2012. “Integrated Reporting, Stakeholder Engagement, and Balanced Investing at American Electric Power.” *Journal of Applied Corporate Finance* 24, no. 2: 27–37.
- Pucheta-Martínez, M. C., and C. Chiva-Ortells. 2018. “The Role of Directors Representing Institutional Ownership in Sustainable Development Through Corporate Social Responsibility Reporting.” *Sustainable Development* 26, no. 6: 835–846. <https://doi.org/10.1002/sd.1853>.
- Rahman, S., T. Khan, and P. Siriwardhane. 2019. “Sustainable Development Carbon Pricing Initiative and Voluntary Environmental Disclosures Quality.” *Business Strategy and the Environment* 28, no. 6: 1072–1082.

- Rogge, K. S., M. Schneider, and V. H. Hoffmann. 2011. "The Innovation Impact of the EU Emission Trading System-Findings of Company Case Studies in the German Power Sector." *Ecological Economics* 70, no. 3: 513–523. <https://doi.org/10.1016/j.ecolecon.2010.09.032>.
- Rovere, E. L. L., J. B. Soares, L. B. Oliveira, and T. Lauria. 2010. "Sustainable Expansion of Electricity Sector: Sustainability Indicators as an Instrument to Support Decision Making." *Renewable and Sustainable Energy Reviews* 14, no. 1: 422–429.
- Ruiz-Lozano, M., M. De Vicente-Lama, P. Tirado-Valencia, and M. Cordobes-Madueno. 2022. "The Disclosure of the Materiality Process in Sustainability Reporting by Spanish State-Owned Enterprises." *Accounting, Auditing & Accountability Journal* 35, no. 2: 385–412.
- S&P Global. 2021. "The Platts Top 250 Global Energy Company Rankings." <https://www.spglobal.com/platts/top250/rankings>. Accessed October 16, 2021.
- Safiullah, M., M. N. Kabir, and M. D. Miah. 2021. "Carbon Emissions and Credit Ratings." *Energy Economics* 100: 105330. <https://doi.org/10.1016/j.eneco.2021.105330>.
- Santos, C., A. Coelho, and B. L. Cancela. 2025. "The Impact of Greenwashing on Sustainability Through Green Supply Chain Integration: The Moderating Role of Information Sharing." *Environment, Development and Sustainability* 27, no. 9: 21709–21736.
- Schons, L., and M. Steinmeier. 2016. "Walk the Talk? How Symbolic and Substantive CSR Actions Affect Firm Performance Depending on Stakeholder Proximity." *Corporate Social Responsibility and Environmental Management* 23, no. 6: 358–372.
- Schreck, P., and S. Raithel. 2018. "Corporate Social Performance, Firm Size, and Organizational Visibility: Distinct and Joint Effects on Voluntary Sustainability Reporting." *Business and Society* 57, no. 4: 742–778. <https://doi.org/10.1177/0007650315613120>.
- Shabana, K. M., and E. C. Ravlin. 2016. "Corporate Social Responsibility Reporting as Substantive and Symbolic Behavior: A Multilevel Theoretical Analysis." *Business and Society Review* 121, no. 2: 297–327. <https://doi.org/10.1111/basr.12089>.
- Shafai, N. A., H. Abd-Mutalib, and S. N. H. J. N. Nor-Ahmad. 2024. "Ownership Structures and Sustainability Reporting of Malaysian Listed Companies." *Jurnal Pengurusan* 70: 1–14. <https://doi.org/10.17576/pengurusan-2024-70-2>.
- Shahab, Y., and C. Ye. 2018. "Corporate Social Responsibility Disclosure and Corporate Governance: Empirical Insights on Neo-Institutional Framework From China." *International Journal of Disclosure and Governance* 15, no. 2: 87–103. <https://doi.org/10.1057/s41310-018-0038-y>.
- Shahbaz, M., A. S. Karaman, M. Kilic, and A. Uyar. 2020. "Board Attributes, CSR Engagement, and Corporate Performance: What Is the Nexus in the Energy Sector?" *Energy Policy* 143: 111582. <https://doi.org/10.1016/j.enpol.2020.111582>.
- Sheehan, N. T., G. Vaidyanathan, K. A. Fox, and M. Klassen. 2023. "Making the Invisible, Visible: Overcoming Barriers to ESG Performance With an ESG Mindset." *Business Horizons* 66, no. 2: 265–276.
- Singhania, S., J. Singh, D. Aggrawal, and S. Rana. 2023. "Board Gender Diversity and Sustainability Reporting Quality: A Generalized Ordered Logit Approach." *Kybernetes* 53: 2679–2699. <https://doi.org/10.1108/K-07-2022-0963>.
- Slacik, J., and D. Greiling. 2020. "Coverage of G4-Indicators in GRI-Sustainability Reports by Electric Utilities." *Journal of Public Budgeting, Accounting & Financial Management* 32, no. 3: 359–378.
- Sreepriya, J., K. R. Suprabha, and K. Prasad. 2023. "Does GRI Compliance Moderate the Impact of Sustainability Disclosure on Firm Value?" *Society and Business Review* 18, no. 1: 152–174.
- Steyn, M. 2014. "Organisational Benefits and Implementation Challenges of Mandatory Integrated Reporting: Perspectives of Senior Executives at South African Listed Companies." *Sustainability Accounting, Management & Policy Journal* 5, no. 4: 476–503-503.
- Suchman, M. C. 1995. "Managing Legitimacy: Strategic and Institutional Approaches." *Academy of Management Review* 20, no. 3: 571–610.
- Talbot, D., and O. Boiral. 2018. "GHG Reporting and Impression Management: An Assessment of Sustainability Reports From the Energy Sector." *Journal of Business Ethics* 147, no. 2: 367–383. <https://doi.org/10.1007/s10551-015-2979-4>.
- Tarquino, L., and C. Xhindole. 2022. "The Institutionalisation of Sustainability Reporting in Management Practice: Evidence Through Action Research." *Sustainability Accounting, Management & Policy Journal* 13, no. 2: 362–386. <https://doi.org/10.1108/SAMPJ-07-2020-0249>.
- Tauringana, V., and O. Moses. 2023. "Greenhouse Gas Reporting and Management in Top Emitting Countries and Companies." In *Green House Gas Emissions Reporting and Management in Global Top Emitting Countries and Companies*, 1–9. Emerald Publishing Limited.
- Traxler, A. A., and D. Greiling. 2019. "Sustainable Public Value Reporting of Electric Utilities." *Baltic Journal of Management* 14, no. 1: 103–121. <https://doi.org/10.1108/BJM-10-2017-0337>.
- Udin, S., M. A. Khan, and A. Y. Javid. 2017. "The Effects of Ownership Structure on Likelihood of Financial Distress: An Empirical Evidence." *Corporate Governance: The International Journal of Business In Society* 17, no. 4: 589–612. <https://doi.org/10.1108/CG-03-2016-0067>.
- van der Laan Smith, J., A. Adhikari, and R. H. Tondkar. 2005. "Exploring Differences in Social Disclosures Internationally: A Stakeholder Perspective." *Journal of Accounting and Public Policy* 24, no. 2: 123–151. <https://doi.org/10.1016/j.jaccpubpol.2004.12.007>.
- Velte, P. 2023. "Does Sustainable Board Governance Drive Corporate Social Responsibility? A Structured Literature Review on European Archival Research." *Journal of Global Responsibility* 14, no. 1: 46–88.
- Wiseman, J. 1982. "An Evaluation of Environmental Disclosures Made in Corporate Annual Reports." *Accounting, Organizations and Society* 7, no. 1: 53–63. [https://doi.org/10.1016/0361-3682\(82\)90025-3](https://doi.org/10.1016/0361-3682(82)90025-3).
- Yadava, R. N., and B. Sinha. 2016. "Scoring Sustainability Reports Using GRI 2011 Guidelines for Assessing Environmental, Economic, and Social Dimensions of Leading Public and Private Indian Companies." *Journal of Business Ethics* 138, no. 3: 549–558. <https://doi.org/10.1007/s10551-015-2597-1>.
- Zahid, M., H. U. Rahman, M. Khan, W. Ali, and F. Shad. 2020. "Addressing Endogeneity by Proposing Novel Instrumental Variables in the Nexus of Sustainability Reporting and Firm Financial Performance: A Step-by-Step Procedure for Non-Experts." *Business Strategy and the Environment* 29, no. 8: 3086–3103.
- Zharfpeykan, R., and F. Ng. 2021. "COVID-19 and Sustainability Reporting: What Are the Roles of Reporting Frameworks in a Crisis?" *Pacific Accounting Review* 33: 189–198. <https://doi.org/10.1108/PAR-09-2020-0169>.
- Zollo, L., M. M. Pellegrini, G. Faldetta, and R. Rialti. 2023. "How to Combine Multiple Identities and Gaining Stakeholders Legitimacy in Hybrid Organizations? An Organizational Design Response." *Journal of Management and Governance* 27, no. 4: 1189–1222.

## Appendix A

### Theoretical Framework on Quality Sustainability Reporting.

Theoretical lens	Assumptions	Key mechanisms/drivers	Expected influence on QSR	Selected references
Stakeholder Theory	Firms are accountable to multiple stakeholders who hold varying degrees of power, legitimacy, and urgency	Stakeholder salience; proximity; institutional investor pressure; board responsiveness to stakeholder interests	Firms with more salient and active stakeholders are more likely to produce relevant and responsive sustainability disclosures	Freeman (1994); D'Souza et al. (2022); Ehalaiye et al. (2025); Velte (2023)
Legitimacy Theory	Firms seek to gain, maintain or repair societal approval through disclosure practices	Voluntary reporting as symbolic action; selective disclosure to manage perceptions; legitimacy maintenance in high-impact sectors	Firms with weaker sustainability performance or greater public scrutiny may engage in symbolic or inflated disclosures to preserve legitimacy	Suchman (1995); Deegan (2002); Hummel and Schlick (2016); Zollo et al. (2023)
Institutional Theory	Organisational behaviour is shaped by coercive, mimetic, and normative institutional pressures	Regulatory enforcement (coercive); peer imitation (mimetic); professional norms and industry frameworks (normative)	Strong institutional environments and global frameworks (e.g., GRI, carbon pricing) encourage convergence in reporting quality across firms	DiMaggio and Powell (1983); Campbell (2007); Khan et al. (2021); Zharfpeykan and Ng (2021)

## Appendix B

### Assessment Tool.

Quality Indicator	Name	Reference	Description (Scoring References)	Max Score
<i>Dimension A: relevance (including Materiality) (RM)</i>				<b>42</b>
RM1	Sustainability strategies linked with business strategy/objectives	Khan et al. (2021)	Sustainability strategies consistent with the UN SDGs are clearly linked to the electricity generator's business strategy/objectives. Scoring: 0 = no disclosure; 1 = general disclosure; 2 = specific information; 3 = detailed/elaborate discussion (Ahmed Haji and Anifowose 2016) <sup>3</sup>	3
RM2	Stakeholder inclusiveness	Khan et al. (2021)	The report identifies the organisation's stakeholders, their expectations, and describes stakeholder engagement processes.	3
RM3	Environmental and social disclosure scores (Bloomberg)	Khan et al. (2021)	Bloomberg disclosure scores for the report for Environmental, and Social. Scores range from 0 to 6 for each of these two sustainability indicators (resembles Refinitiv ESG score range) 0 = no disclosure; 0.5 ≥ 0 to 0.083 (–D); 1 ≥ 0.083. to 0.16. (D); 1.5 ≥ 0.16. to 0.25 (D+); 2 ≥ 0.25 to 0.33. (C–); 2.5 ≥ 0.33. to 0.416. (D); 3 ≥ 0.416. to 0.50 (C+); 3.5 ≥ 0.50 to 0.583. (B–); 4 ≥ 0.583. to 0.66. (B); 4.5 ≥ 0.66. to 0.75 (B+); 5 ≥ 0.75 to 0.83. (A–); 5.5 ≥ 0.83. to 0.916. (A); 6 ≥ 0.916. to 1(A+)	12
RM3.a	Environmental disclosures		Bloomberg disclosure scores for the report's Environmental pillar disclosures.	6
RM3.b	Social disclosures		Bloomberg disclosure score for the report's Social pillar.	6
RM4	Economic disclosures	Sustainability Pillar Yadava and Sinha (2016)	The report presents the electricity generator's its (1) infrastructure projects/investments and impact, and (2) climate related risks and opportunities. Scores range from 0–3 for each of the two sector-specific economic disclosures.	21

Quality Indicator	Name	Reference	Description (Scoring References)	Max Score
RM4.a	Economic performance		GRI 201–1 Direct economic value generated and distributed GRI 201–3 Defined benefit plan obligations and other retirement benefits GRI- 201-4- Financial assistance received from government	9
RM4.b	Market presence		GRI 202–1 standard entry level wage GRI 202–2 Proportion of senior management hired from local communities.	6
RM4.c	Indirect economic impact		GRI 203–1 1 Infrastructure investments and services supported GRI 203–2 Significant indirect economic impacts.	6
RM5	Materiality determination process	Ruiz-Lozano et al. (2022)	The report contains the electricity generator's materiality determination process to determine what matters most to stakeholders.	3
<i>Dimension B: reliability (R)</i>				<b>17</b>
R1	Trends over time	Khan et al. (2021); Rahman et al. (2019); Yadava and Sinha (2016)	Information is contained over several reporting periods, indicating the direction of change in sustainability performance information ensuring comparability and consistency. 0- no mention; 1- general statement; 2- extensive coverage (detailed information but did not cover more than 1 year data); and 3- coverage was full and systematic which covered more than 2-year data in comparable form. (Yadava and Sinha 2016).	3
R2	Readability	Rahman et al. (2019)	The report has a logical structure, uses graphical presentation of the data, uses drawings, maps, links, data tables, and explanations where required or uses other tools to help navigate through the document enabling understandability of sustainability report. 0 = no graphics/effective reporting techniques used; 1 = use of little graphics and data tables and other reporting techniques; 2 = use of adequate graphics and data tables and other reporting techniques with explanation; 3 = best practices and creative approach (modified Håbek and Wolniak 2016)	3
R3	Verifiability	Al-Shaer and Zaman (2016); Khan et al. (2021)	External verification is used for sustainability reporting. 0 = the company has not sustainability committee affiliated with the board of directors; 1 = the company has a sustainability committee affiliated with the board of directors; 2 = the assurance is provided on sustainability information by a nonaudit firm; 3 = sustainability information is externally assured by a non-Big 4 audit firm; 4 = sustainability information is externally assured by one of the Big 4 audit firms with limited coverage; 5 = sustainability information is externally assured by one of the Big 4 audit firms with comprehensive coverage (modified Al-Shaer and Zaman 2016).	5
R4	Accuracy	Khan et al. (2021)	The report contains unbiased reporting of sustainability information. 0 = no disclosure; 1 = qualitative reporting; 2 = quantitative but nonmonetary reporting; 3 = monetary reporting or financial quantification of sustainability information (Khan et al. 2021).	3
R5	Value and timeliness of data	Khan et al. (2021)	The report describes the processes and procedures of collection, aggregation and transformation of data into information objectively and with integrity. It also indicates the framework used in preparing the sustainability report and describes timely reporting of the sustainability performance information.	3
Total				<b>59</b>

## Appendix C

### Definition of Variables

Variable(s)			
Label	Name	Measurement	Data Source
<i>QSR_RM</i>	QSR for RM dimension	Total RM score/maximum RM score	Computed from companies' scores
<i>QSR_R</i>	QSR for R dimension	Total R score/maximum R score	Computed from companies' scores
<i>QSR_Total</i>	Overall QSR	RM plus R scores/total Maximum score	Computed from companies' scores
<i>SUSPER</i>	Sustainability performance	Total score for environmental, social and governance, with code TRESG in Refinitiv	Refinitiv
<i>GRI</i>	Use of GRI reporting framework	Coded as 1 if the company uses GRI framework, and 0 otherwise	AR
<i>GENDIV</i>	Gender diversity	Coded as 1 if the percent of women on the Board is above the mean for the total population, and 0 otherwise	Bloomberg
<i>INSTSHARE</i>	Institutional shareholding	Percent held by institutional investors	Bloomberg
<i>FOREIGNOWN</i>	Foreign shareholding	Percent held by foreign investors	Bloomberg
<i>LAW</i>	Rule of law	Company's score for rule of law ranging from -2.5 to 2.5.	World Bank rule of law
<i>CPPI</i>	Country's carbon pricing policy	Coded as 1 if the company is domiciled in a country or state with carbon pricing policy, and 0 otherwise.	World Bank State and Trends of Carbon Policy
<i>LnTA</i>	Firm size	The natural logarithm of the firm's total assets	AR/Compustat/Eikon/Bloomberg
<i>TOBINSQ</i>	Leverage	Total assets less book value of equity plus market value of equity/market capitalisation divided by total assets	Bloomberg/AR
<i>ROA</i>	Return on assets	Net Profit/divided by Ave. Total Assets	Bloomberg
<i>SALESTA</i>	Sales to total assets	Sales divided by total assets	Bloomberg
<i>LTDTA</i>	Ratio of long-term debt to total assets	Long-term debt divided by total assets	Bloomberg
<i>BIND</i>	Ratio of independent directors on the board to the total number of directors on the board	Coded as 1 if the ratio is more than the mean of BIND and 0 otherwise.	Bloomberg
<i>AUDCOM</i>	Number of audit committee members	Coded as 1 if the ratio is more than the AUDCOM mean and 0 otherwise	Bloomberg
<i>LnBOD</i>	Number of directors on the board	Log of the number of BOD	Bloomberg