THE APPLICABILITY OF IFRS S1 AND S2 IN SUSTAINABILITY REPORTING IN THE ENERGY SECTOR: THE CASE OF TÜRKIYE

Tuğçe Uzun Kocamış [*], Gülçin Kazan [**], Ayşegül Güngör [***]

[*] *Corresponding author,* Vocational School of Social Sciences, Istanbul University-Cerrahpaşa, Istanbul, Türkiye
Contact details: Vocational School of Social Sciences, Istanbul University-Cerrahpaşa, Esentepe, 2364. Sk. No:75, 34265 Sultangazi/Istanbul, Türkiye
[**] International Trade and Finance Department, Faculty of Business and Management Sciences, Istanbul Sabahattin Zaim University, Istanbul, Türkiye
[***] Faculty of Economics, Administrative and Social Sciences, Istanbul Nisantasi University, Istanbul, Türkiye

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Abstract

This study examines the voluntary adoption and usability of the International Financial Reporting Standards (IFRS) S1 and IFRS S2 by energy companies in Türkiye, before their mandatory implementation in January 2024. A qualitative content analysis was conducted on the sustainability, integrated, and annual reports of 10 energy firms listed on Borsa Istanbul (BIST) for the period 2021–2023. Key disclosure themes, such as transparency, accountability, carbon emissions, climate-related risks, and net-zero strategies, were systematically analyzed using a 0–3 scoring system to assess the degree of compliance with IFRS principles. The findings demonstrate a marked improvement in both the frequency and quality of sustainability disclosures over three years. In 2021, most companies exhibited only symbolic or limited reporting, while by 2023, significant or full compliance was observed, particularly among larger firms. However, persistent shortcomings remain in areas such as independent assurance and strategic alignment with long-term net-zero targets. By placing focus on both developments and enduring shortcomings, the research presents current information regarding Turkish firms' preparedness for global sustainability practices and identifies the need for targeted capacity-building and assurance instruments towards complete compliance.

Keywords: IFRS S1, IFRS S2, Sustainability Reporting, Energy Sector, Türkiye, ESG

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1. INTRODUCTION

The energy sector, being immensely environmentally intensive, is an industry of high visibility where this shift can be observed explicitly. Sustainability, originally defined in the 1987 Brundtland Report as "meeting present needs without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development [WCED], 1987, p. 51), has emerged as a priority strategy for corporate governance, particularly in environmentally intensive industries such as the energy sector. Over the past decade, corporate sustainability reporting has evolved from an adjunct communications vehicle to a core vehicle of transparency, risk management, and stakeholder engagement.

One of the most important of these developments was the release of the International Financial Reporting Standards (IFRS) S1 and IFRS S2

by the International Sustainability Standards Board (ISSB) in 2023. IFRS S1 establishes requirements for disclosure of material sustainability-related financial information, and IFRS S2 focuses on climate-related risks, opportunities, and carbon disclosures (IFRS Foundation, 2023a, 2023b). The standards aim to improve consistency, comparability, and decision-usefulness of sustainability disclosures across jurisdictions. However, the existing literature on the implementation of IFRS S1 and IFRS S2 is still limited, indicating the need for further academic research on their integration with financial and sustainability reporting (Pratama et al., 2024).

In Türkiye, this global shift has been preceded and accompanied by national policy initiatives like the Capital Markets Board's (CMB) Guide to Sustainable Debt Instruments (CMB, 2022) and the Central Bank's green finance roadmap in alignment with the 2053 net-zero target. These culminated in December 2023 with the adoption of IFRS S1 and S2 as Türkiye Sustainability Reporting Standards (TSRS) 1 and 2, which came into effect from January 2024 onwards.

In the voluntary phase prior to this mandate (2021–2023), Turkish companies were not legally required to report according to these standards, creating a helpful window to see early adaptation actions, institutional readiness, and reporting quality in the transitional regulatory environment. Earlier research shows that sustainability reporting in Türkiye has historically been symbolic, lacking strategic coherence, verifiability, and independent assurance (Bircan & Özcan, 2023). But sectoral dynamics, especially those in the energy sector, can reveal differentiated patterns of voluntary harmonization and institutional responsiveness.

This study seeks to contribute to the emerging literature on IFRS-aligned sustainability reporting in developing economies by offering empirical insights into Türkiye's energy sector. It focuses on the voluntary adoption of IFRS S1 and S2 during the 2021–2023 period, analyzing how companies anticipated and prepared for regulatory enforcement.

The main objectives of this research are to:

1) Examine the theoretical and institutional foundations of IFRS S1 and S2.

2) Evaluate the degree of voluntary compliance among energy companies in Türkiye during the pre-mandatory period.

3) Identify the strategic and operational challenges faced during the transition.

4) Offer policy and managerial recommendations for improving sustainability disclosure practices.

The study applies qualitative content analysis to sustainability, integrated, and annual reports of 10 Borsa Istanbul (BIST) listed energy firms, using an IFRS S1–S2-based scoring framework on transparency, materiality, verification, carbon accounting, climate risk, and net-zero targets. Grounded in legitimacy, agency, and signaling theories, it offers timely insights into Türkiye's energy sector as firms move from symbolic compliance to substantive reporting in a voluntary regulatory phase.

The rest of the paper is structured as follows. Section 2 includes the literature review and conceptual framework. Section 3 presents the methodology. Section 4 provides the findings. Section 5 discusses these findings. Section 6 includes conclusions, policy recommendations, limitations, and suggestions for future research.

2. LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

Sustainability, first introduced in global policy reports such as the 1987 Brundtland Report (Giovannoni & Fabietti, 2013), has evolved since then from a statement of environmental awareness to an integral component of strategic business planning. It is firmly intertwined today with concepts like corporate social responsibility (CSR) and environmental, social, and governance (ESG), providing a multi-dimensional framework in which companies report not only financial but also environmental and social performance. The increased emphasis on sustainability, particularly in investment and credit ratings, has encouraged companies to adopt such practices voluntarily (Hummel & Jobst, 2024).

The shift to sustainability reporting is most visible in high-externality sectors like energy, where transparency and accountability have become strategic (Kusuma & Gani, 2024). Legitimacy theory links disclosures to societal expectations (Nasreen et al., 2025), agency theory to reducing information asymmetry (Sun et al., 2022), stakeholder theory to broader accountability (Freeman, 2010), and signaling theory to market signals (Friske et al., 2023). This study mainly applies agency and legitimacy theory, supplemented by stakeholder and signaling perspectives, to explain how Turkish energy firms adopt IFRS S1 and S2, balancing symbolic legitimacy with independent verification and signaling through verifiable information.

These theoretical foundations have been codified globally in the IFRS S1 and S2 standards released by the ISSB in 2023. Whereas IFRS S1 focuses on disclosure of material sustainability-related information, IFRS S2 specifies detailed climate risk and opportunity reporting (IFRS Foundation, 2023a, 2023b). Empirical evidence from developing countries, however, raises daunting implementation challenges. For Indonesia, Bank Mandiri reports exhibit partial integration and lack strategic coherence (Kusuma & Gani, 2024; Kampanje, 2023). For South Africa, listed companies on the Johannesburg Stock Exchange address risk and governance but neglect strategy and performance measurement (Chonco & Mvunabandi, 2024). Similarly, only 18% of Polish companies disclosed sustainability performance indicators (Indyk, 2022). Girón et al. (2021) found a positive relationship between sustainability reporting and financial performance in large Asian and African companies.

In Türkiye, the institutionalization of sustainability reporting began with the launch of the BIST Sustainability Index in 2014, and then the non-binding Sustainability Compliance Reporting Guide issued by the CMB in 2020 (BIST, 2020). Despite these early steps, the voluntary nature of these standards has led to ongoing challenges in standardization and informational quality in sustainability reports (Akbas, 2022; Kuzey & Uyar, 2017). In 2022, the CMB further developed its activities by announcing a green and sustainable bond framework built on principles of transparency (CMB, 2022), and the Central Bank of the Republic of Türkiye (CBRT) began to build policies in green finance aligned with the nation's 2053 net-zero target (CBRT, 2023). BIST has also supported disclosure practices with its sustainability index and the accompanying compliance criteria (Akdogan et al., 2020).

Despite such regulatory advancements, Türkiye still has structural limitations, specifically in ESG data quality, independent assurance mechanisms, and small and medium enterprises' reporting readiness (Almagtome et al., 2020; Huseyin & Cetin, 2024). Sectoral studies show that larger firms such as Zorlu Enerji, Enerjisa, and Galata Wind have higher IFRS compliance rates, whereas smaller firms fall behind with weak disclosure and strategic integration (Komala & Murtanto, 2024). In addition, several studies emphasize that sustainability reports in Türkiye are symbolic, and there is a lack of climate risk, governance, and strategy content (Bircan & Özcan, 2023). Özdemir (2024) emphasizes that sustainability reporting in Türkiye has historically been largely symbolic, lacking strategic depth, verifiability, and independent assurance. Comparative studies also refer to the significance of institutional infrastructure and legal requirements in the success of IFRS (Baskan & Damayanti, 2022; Osemy, 2025). This reinforces the contention that sustainability reporting must evolve from a symbolic compliance activity to a strategic governance tool integrated into national frameworks (Köse & Çetin, 2023; Pantazi, 2024).

To add to this discussion, an expanding literature discusses the link between ESG performance and corporate financial behavior. Kumar et al. (2025) examine the bilateral interaction between the corporate financial performance (CFP) and ESG performance (ESGP) of Indian firms, describing a virtuous dynamic whereby sound financial performance facilitates ESG initiatives, while ESG commitments sometimes detract from short-term financial performance. Along similar lines, Muttaqi and Nur (2025) demonstrate the effect of board gender diversity in Indonesian firms on the ESG-dividend policy relationship. Their results show that while ESG has a positive impact on dividend payout, increased female board membership would tend to divert funds towards reinvestment in sustainability efforts.

In the context of Vietnam's banking sector, Phan and Tran (2025) highlight the role of leadership qualities and stakeholder pressures in ESG implementation, with the finding that strong ESG approaches improve risk management and operating efficiency. Mayzona and Rusmanto (2025) further explore CSR disclosure's positive influence on firm value in Indonesian infrastructure companies, reinforcing the financial relevance of transparent social responsibility strategies. Findings show that ESG and sustainability reporting are integral to firms' strategy and valuation, though limited by regional and institutional barriers in emerging markets.

3. RESEARCH METHODOLOGY

3.1. Purpose of the study

The objective of this study is to examine how IFRS S1 and IFRS S2 standards have influenced sustainability reporting in Türkiye's energy sector, particularly in key areas such as transparency, accountability, and climate risk disclosures. Given that these standards became mandatory in January 2024, the study focuses on the voluntary reporting period of 2021–2023 to assess the degree of early adoption and institutional readiness among firms (Krippendorff, 2019; Mayring, 2014).

The research specifically analyzes the sustainability reports of energy companies listed on BIST to evaluate their alignment with IFRS S1 and S2, and how this alignment affects the quality of sustainability information. Based on these findings, the study aims to offer policy recommendations to regulators, firms, and stakeholders on how these standards can be effectively implemented and improved in the Turkish context.

The research questions guiding this study are as follows:

RQ1: To what extent have IFRS S1 and S2 standards been integrated into the sustainability reporting practices of companies in Türkiye's energy sector?

RQ2: How do these standards affect the level of transparency and accountability in companies' sustainability reports?

RQ3: What challenges do energy sector companies in Türkiye face during the transition to IFRS S1 and S2?

RQ4: How can the integration of IFRS S1 and S2 into Türkiye's regulatory framework be further strengthened?

RQ5: What types of incentive mechanisms can be developed to encourage the widespread adoption of IFRS S1 and S2 in the Turkish energy sector?

3.2. Research method

Content analysis is a widely used method in sustainability reporting research to identify dominant themes and patterns in corporate disclosures (Adams, 2004; Kolk, 2008). In this study, a qualitative and descriptive content analysis approach is adopted to examine how energy companies in Türkiye align their sustainability reports with IFRS S1 and S2 standards.

The methodological framework is grounded in legitimacy theory (Nasreen et al., 2025), agency theory (Sun et al., 2022), and signaling theory (Friske et al., 2023), which inform the interpretation of corporate reporting behaviors, particularly in relation to transparency, accountability, and market communication.

This approach allows for a systematic review of reports based on key disclosure frameworks, including the IFRS Foundation (2023a, 2023b, 2023c), the Task Force on Climate-related Financial Disclosures (TCFD, 2021), as well as sectoral standards from the Sustainability Accounting Standards Board (SASB, 2022) and Global Reporting Initiative (GRI, n.d.).

The study focuses on three key analytical objectives:

1) Assessing the extent to which Turkish energy companies voluntarily comply with IFRS S1 and S2 standards;

2) Evaluating the influence of these standards on report transparency, auditability, and accountability;

3) Identifying the main challenges companies face in aligning with the evolving regulatory landscape.

Although this study employs a qualitative content analysis approach, alternative research methodologies could also be applied to investigate the applicability of IFRS S1 and IFRS S2 in sustainability reporting. A quantitative approach could involve constructing an index of IFRS compliance and applying statistical tests, such as regression analysis, to examine the relationship between disclosure quality and firm characteristics

(e.g., size, profitability, ownership structure). A mixed-methods design could combine quantitative scoring with semi-structured interviews of corporate sustainability officers, auditors, and regulators to capture deeper insights into the motivations, challenges, and institutional pressures influencing IFRS adoption. In addition, case study analysis of selected high- and low-compliance firms could offer rich contextual understanding of organizational strategies and governance mechanisms. Finally, longitudinal event studies could be employed post-2024 to assess the impact of mandatory IFRS S1 and S2 implementation on disclosure practices and market perceptions. These alternative methodologies would complement content analysis by enabling broader generalization, triangulation of findings, and deeper exploration of causality.

3.2.1. Sample and data set

The sample for this study includes integrated, sustainability, or annual reports with sustainability disclosures of 10 energy companies listed on BIST. These companies were selected based on a set of defined criteria: 1) being listed on the BIST energy index, 2) having published sustainability, integrated, or annual reports for the entire 2021–2023 period, 3) meeting a minimum threshold in terms of market capitalization and public visibility, and 4) representing different ownership structures (e.g., public, private, mixed). These criteria ensure the inclusion of firms that are both information-rich and policy-relevant. The companies also reflect early adopters of IFRS-aligned sustainability disclosure practices within Türkiye's energy sector. Therefore, they offer a theoretically and empirically grounded sample for examining voluntary compliance behavior during the pre-mandatory IFRS S1 and S2 adoption period.

3.2.2. Analysis process

In this study, the number of companies that follow IFRS S1 and S2 in their sustainability reports will be measured using content analysis and a rating technique. Two-stage analyses are as follows:

1) Content analysis: Systematic coding will be used to determine the extent to which companies comply with IFRS S1 and S2 standards in sustainability reports.

2) IFRS compliance rating and comparison: Companies' ratings on compliance with S1 and S2 of IFRS will be on a scale from 0–3, and differences between years of reporting will be compared.

To enhance objectivity in scoring, the 0–3 scale was refined with clear, operational criteria. Each score level is linked to specific disclosure characteristics:

- Score 0 (Not compliant): No reference to IFRS S1/S2 themes or indicators.
- Score 1 (Partially compliant): General sustainability language with no data or audit verification. Example: "We support climate action" with no further details.
- Score 2 (Largely compliant): Specific actions or quantitative targets are disclosed, but lack external assurance. Example: "We reduced carbon emissions by 8% compared to 2022", but without third-party validation.
- Score 3 (Fully compliant): Detailed disclosures, external audit/verification, aligned with IFRS principles. Example: "Scope 1+2 emissions: 110,000 tCO_2, verified by [Audit Firm]; net-zero by 2040 with milestone plan".

Content analysis will be conducted through a systematic coding process to assess the degree of convergence between companies' sustainability reports and the IFRS S1 and S2 standards. Coding will be done using MAXQDA qualitative data analysis software, which permits the examination of large-scale text data, thematic coding, and visualization of relations among coded segments.

To ensure the reliability of the coding process, parallel coding will be performed by two independent researchers, and the coding scheme will be revised through consensus where necessary. Intercoder reliability was statistically measured using Krippendorff's Alpha, resulting in a coefficient of 0.82, which indicates a high level of agreement (Krippendorff, 2019). All discrepancies were reviewed and resolved by consensus to improve reliability and consistency in coding. The analysis process, implemented via MAXQDA, will follow the steps outlined below:

1) Coding process and themes: The coding will be conducted based on predefined themes and keywords. The coding scheme is structured around the following two core categories and their associated keywords:

Table 1. Coding

Category 1: Transparency and accountability (IFRS S1)	
Subheading	***Keywords***
Verifiability of disclosed sustainability data	"transparency", "verifiable data", "independent verification", "reliability", "audit report", "data reliability", "accountability", "IFRS compliance", "sustainability measurement"
Existence of independent audit mechanisms	"independent audit", "auditor report", "external audit", "third party verification", "independent assessment", "CMB compliance", "financial audit", "report transparency"
Stakeholder disclosures and regulatory compliance levels of companies	"stakeholder engagement", "stakeholder disclosures", "regulatory compliance", "regulatory requirements", "corporate governance", "ethical reporting", "legal framework", "compliance policy"
Category 2: Climate risk and emissions disclosures (IFRS S2)	
Subheading	***Keywords***
Detailing carbon emissions	"carbon emissions", "greenhouse gas emissions", "CO_2 emissions", "emission reduction targets", "carbon footprint", "carbon intensity", "renewable energy use"
Identifying transition and physical climate risks	"climate risk", "physical risks", "transition risk", "climate change impacts", "environmental risk assessment", "climate strategy", "climate-related financial risks"
Net zero strategies and greenhouse gas reduction targets	"net zero", "carbon neutral", "greenhouse gas reduction", "emission targets", "2050 net zero target", "carbon reduction plan", "carbon offset", "climate commitments"

These keywords were identified based on the core requirements of IFRS S1 and S2 standards, as well as academic literature on sustainability reporting. While IFRS S1 requires companies to present their sustainability data in a verifiable and independently audited manner (IFRS Foundation, 2023a), IFRS S2 requires companies to make detailed disclosures about climate risks (IFRS Foundation, 2023b).

In addition to keyword frequency, thematic classification was conducted based on conceptual

density and contextual relevance to enhance the interpretative depth of the analysis.

2) IFRS compliance rating system: Companies' compliance with IFRS S1 and S2 will be rated on a scale of 0–3:

Table 2. IFRS S1 and S2 compliance rating scale and definitions

Degree	*Explanation*
0	Not at all compliant (does not contain any disclosures regarding IFRS S1/S2).
1	Partially compliant (limited descriptions but lacking details or verification).
2	Largely compatible (explanations are comprehensive but may have some omissions).
3	Fully compliant (fully compliant with IFRS standards, independent audit available).

This scoring method will be used to systematically measure the level of IFRS compliance achieved in companies' sustainability reports.

Table 3 provides illustrative examples corresponding to each score level, helping to clarify how the rating system was applied in practice.

Table 3. Illustrative examples for IFRS S1 and S2 compliance rating (0–3 scale)

Score	*Label*	*Explanation*	*Example quote from report*
0	Not compliant	No mention of IFRS themes	"We care about the environment"
1	Partially compliant	General statements, no metrics or audit	"We aim to reduce emissions"
2	Largely compliant	Metrics included, but no third-party audit	"Emissions reduced by 10% vs. 2022"
3	Fully compliant	Metrics + audit + strategy + IFRS framework reference	"CO_2 verified by audit firm, target net-zero by 2040"

3) Comparison of data: The data obtained will be compared between 2021 and 2023, and the following analyses will be made:

- Differences in terms of IFRS compliance will be revealed by making comparisons between companies.
- With time series analysis (2021–2023 period), it will be evaluated how companies have progressed in sustainability reporting.
- It will be analyzed whether IFRS compliance ratings are evolving over time or whether companies still make limited disclosures.

4. FINDINGS

4.1. Results based on keywords

Although keyword frequency analysis shows a substantial increase in terms such as "accountability", "carbon emissions", and "net-zero", further qualitative assessment indicates that many of these disclosures remain symbolic in nature. For instance, only three out of 10 companies included quantified carbon reduction pathways that were independently verified. This highlights a gap between rhetorical sustainability communication and substantive, performance-based reporting. As emphasized in the literature, high keyword density does not always equate to meaningful disclosure unless supported by concrete data and third-party assurance (Adams, 2004; Bowen, 2019).

To improve thematic clarity and respond to reviewer concerns, a summary table was created by grouping companies according to their performance in core IFRS S1 and S2 themes. Table 3 presents a thematic summary of company performance grouped into high, medium, and low compliance categories. The classification is based on average keyword frequencies and qualitative indicators of IFRS S1 and S2 alignment.

Table 4. Summary of IFRS S1 and S2 thematic disclosure performance (2023)

No.	*Company*	*Transparency and accountability (IFRS S1)*	*Climate risk and emissions disclosures (IFRS S2)*	*Total keywords*	*Compliance level*
1	Margün	174	213	387	Medium compliance
2	Aydem	160	194	354	Medium compliance
3	Esenboğa	143	163	354	Medium compliance
4	Akenerji	124	171	306	Low compliance
5	Aksa	122	164	295	Low compliance
6	Naturel	113	163	286	Low compliance
7	Enerjisa	249	251	276	High compliance
8	Zorlu	217	253	470	High compliance
9	Smart	217	231	448	High compliance
10	Galata	194	223	417	High compliance

Note: Firms have been grouped according to the total frequency of thematic keywords for IFRS S1 and S2 categories. High compliance: ≥ 400 keywords, medium: 300–399, low: < 300.

Table 4 offers a thematic categorization of disclosure intensity across five primary IFRS S1 and S2 areas. Representative average ranges of keyword frequencies are presented for each theme, and firms are ranked on relative performance. This format facilitates a more substantial report of reporting quality on the basis of content profundity and stability, and not merely on isolated keyword frequencies.

4.1.1. Transparency and accountability (IFRS S1)

The findings of content analysis confirm that companies in the energy sector of Türkiye are demonstrating increased awareness and ability in meeting IFRS S1 and S2 standards in sustainability reporting. In this context, both the quantitative frequency and contextual representation of the key concepts used by the companies reflect a significant transformation in their approach to corporate reporting.

Under IFRS S1, the increasing use of terms such as "transparency", "independent verification", "audit report", and "accountability" in company reports indicates that firms are placing greater emphasis on the principle of transparency in disclosing non-financial information. Seen through a legitimacy theory, the trend points to efforts made by firms to obtain institutional legitimacy through social legitimation and legislative compliance (Lai & Stacchezzini, 2021; Nasreen et al., 2025; Lakhani & Herbert, 2022; Moses et al., 2020).

However, if one looks carefully at the contents, one arrives at the discovery that most of these disclosures are symbolic too, with not enough quantitative data, performance indicators, or third-party warranty. Independent processes of assurance drastically limit the quality of such reports (Mentes, 2020). Selective use of audit reports and lack of third-party assurance of ESG data indicate that the agency theory objective of reducing information asymmetry has not been institutionally embedded yet (Sun et al., 2022). This supports criticism that sustainability reporting in most developing countries remains at the level of a "statement of intent" (Friske et al., 2023; Almagtome et al., 2020).

4.1.2. Climate risk and emissions disclosures (IFRS S2)

According to the perspective of IFRS S2, there has been notable growth in carbon emissions disclosures, greenhouse gas emissions disclosures, and net-zero ambitions. For example, the term "carbon emissions" appeared 341 times in the analyzed reports, indicating that companies are strategically positioning themselves on this issue and seeking to make their net-zero commitments more visible. This effort is also driven by regulatory developments such as the European Green Deal and pressure from international investors (Pantazi, 2024; Komala & Murtanto, 2024).

Nonetheless, critical components of climate-related risks, such as physical risks (e.g., rising temperatures, floods, droughts) and transition risks (e.g., carbon pricing, regulatory changes), are addressed only superficially in most reports. This suggests that companies have not yet achieved full alignment with IFRS S2 disclosure requirements (IFRS Foundation, 2023b; Indyk, 2022). Literature emphasizes that for sustainability reporting to evolve into a strategic governance tool, rather than remaining a symbolic gesture, disclosures must be structured with content consistency and supported by measurable performance indicators (Adams, 2004; Bowen, 2019).

4.2. IFRS compliance rating system

This section evaluates the level of alignment between the sustainability reports of Turkish energy companies and the IFRS S1 and S2 standards. While IFRS S1 emphasizes transparency, accountability, and independent audit mechanisms, IFRS S2 focuses on the disclosure of climate-related risks, carbon emissions, and net-zero targets. The analysis applies a structured content analysis method to integrated, annual, and sustainability reports from 2021 to 2023, using a 0–3 compliance scale.

Each report was assessed across six subcategories derived from IFRS S1 and S2 principles. These include: 1) verifiability and transparency of sustainability data, 2) existence of independent audit mechanisms, 3) stakeholder and regulatory compliance disclosures (S1), 4) carbon emissions reporting, 5) climate risk assessment, and 6) net-zero strategies (S2).

The scoring model, adapted from prior research (Adams, 2004; Kolk, 2008; IFRS Foundation, 2023a, 2023b), is designed to quantify the degree of compliance and facilitate comparison across companies and years.

Table 5. Compliance rating system used for energy companies according to IFRS S1 and S2

Degree	*Explanation*
0	Not at all compliant (does not contain any disclosures regarding IFRS S1/S2).
1	Partially compliant (Limited descriptions but lacking details or verification).
2	Largely compatible (Explanations are comprehensive, but may have some omissions).
3	Fully compliant (fully compliant with IFRS standards, independent audit available).

Note: Rating system is on a 0-to-3 point scale based on thematic codes constructed in accordance with the broad principles of IFRS S1 and S2 standards.

The 0–3 rating scale used to assess corporate compliance with IFRS S1 and S2 is informed by established academic literature and globally recognized sustainability disclosure frameworks. In particular, the scoring approach draws on prior studies that evaluate transparency, accountability, and audit assurance in corporate reporting (Gray, 2006; Adams, 2004; Kolk, 2008).

The audit-related dimensions of the reports were evaluated using criteria from leading global standards, including the IFRS Foundation (2023a), the GRI (2022), and the SASB (2022). The scale explicitly incorporates IFRS S1's focus on verifiability and accountability, as well as IFRS S2's requirements for carbon emissions disclosure and climate risk management (IFRS Foundation, 2023b; TCFD, 2021).

To enhance the clarity and applicability of the scoring system, illustrative examples from the dataset are provided in Table 6. These examples demonstrate how different compliance levels were assigned based on actual company disclosures.

Table 6. Illustrative examples for IFRS S1 and S2 compliance scoring

Score	*Company and year*	*Explanation*
3	Zorlu Energy (2023)	Disclosed GHG emissions with third-party verification, published a net-zero roadmap, and demonstrated stakeholder compliance.
2	Aksa Energy (2022)	Included emission targets and governance mechanisms but lacked independent assurance.
1	Akenerji (2021)	Provided general sustainability goals without numerical targets or external verification.

This scoring model was specifically developed for this study to measure the extent to which sustainability disclosures reflect both the formal requirements and the governance objectives of IFRS S1 and S2. It is anchored in widely accepted methodological frameworks in the sustainability reporting literature.

Table 7. Annual compliance scores of Turkish energy companies based on IFRS S1 and S2 (2021–2023)

Company	*Year*	*Transparency and verifiable data (S1)*	*Independent audit mechanisms (S1)*	*Stakeholder disclosures and regulatory compliance (S1)*	*Carbon emissions disclosures (S2)*	*Climate risk disclosures (S2)*	*Net zero strategies and targets (S2)*	*Overall IFRS compliance score (0–3)*
Akenerji	2021	1	1	1	2	1	1	1.2
	2022	2	2	2	2	2	1	1.8
	2023	3	3	2	3	2	2	2.5
Aksa Energy	2021	1	1	1	2	1	1	1.2
	2022	2	2	2	2	2	1	1.8
	2023	3	2	3	3	2	2	2.5
Aydem Energy	2021	1	1	2	2	1	1	1.3
	2022	2	2	2	2	2	1	1.8
	2023	3	2	3	3	3	2	2.7
Enerjisa	2021	2	2	2	2	1	1	1.7
	2022	2	2	2	3	2	2	2.2
	2023	3	3	3	3	3	3	3.0
Esenboğa Electric	2021	1	1	1	2	1	1	1.2
	2022	2	2	2	2	2	1	1.8
	2023	3	3	3	3	3	2	2.8
Galata Wind	2021	2	1	2	2	1	1	1.5
	2022	2	2	2	3	2	2	2.2
	2023	3	3	3	3	3	3	3.0
Margun Energy	2021	1	1	1	2	1	1	1.2
	2022	2	2	2	3	2	2	2.2
	2023	3	3	3	3	3	3	3.0
Natural Energy	2021	1	1	1	2	1	1	1.2
	2022	2	2	2	3	2	2	2.2
	2023	3	3	3	3	3	3	3.0
Smart Solar Technologies	2021	1	1	1	2	1	1	1.2
	2022	2	2	2	3	2	2	2.2
	2023	3	3	3	3	3	3	3.0
Zorlu Energy	2021	2	2	2	2	2	2	2.0
	2022	3	3	3	3	3	3	3.0
	2023	3	3	3	3	3	3	3.0

Note: Scores were determined based on content analysis in the companies' sustainability reports within the framework of thematic coding based on IFRS S1 and S2.

Table 7, which presents the IFRS S1 and S2 compliance levels of companies in the energy sector, reveals a general trend of improvement between 2021 and 2023. Over this period, companies' disclosures on transparency, verifiable data sharing, and independent audit mechanisms in sustainability reporting have shown notable development. While in 2021, most companies scored within the partially compliant range (between 1.2 and 1.7), by 2023, many had reached largely compliant or fully compliant levels (2.5 to 3.0).

In particular, companies such as Zorlu Enerji, Smart Güneş Teknolojileri, and Galata Wind achieved full compliance (3.0) across all criteria in 2023. These companies made significant strides in areas such as transparency, independent auditing, and regulatory alignment, and provided comprehensive information regarding carbon emissions, climate risk disclosures, and net-zero strategies. Similarly, Enerjisa, Margün Enerji, and Aydem Enerji attained high compliance levels by 2023, although there remain some gaps.

On the other hand, while companies such as Akenerji and Aksa Enerji showed significant improvement, they were not fully compliant with regulatory compliance and net-zero strategy development. In companies such as Esenboğa Elektrik and Naturel Enerji, lower IFRS scores were observed during 2021 and 2022; though overall compliance was higher in 2023, there were shortfalls in climate risk disclosures and net-zero goals.

IFRS S1 and S2 adoption in Türkiye's energy sector has grown gradually: a limited focus in 2021 expanded into more auditable disclosures by 2023, showing their directional impact on reporting (IFRS Foundation, 2023a, 2023b, 2023c; Chonco & Mvunabandi, 2024). While strengthening transparency and accountability, gaps remain in net-zero strategies, climate risk, and regulatory adherence. As literature notes, these standards aim not only at compliance but at reliable investor information (Adams, 2004), requiring firms to enhance emission reduction plans, independent audits, and regulatory alignment (Pantazi, 2024; Indyk, 2022).

4.3. Evaluation of symbolic vs strategic disclosures

While the data demonstrates a notable increase in sustainability-related disclosures, especially terms, such as "carbon neutrality", "transparency," and "net-zero", a deeper assessment reveals that a considerable portion of these disclosures remain largely symbolic in nature. Although companies show rhetorical alignment with IFRS S1 and S2 frameworks, a significant number of them fail to substantiate these claims with quantifiable metrics, third-party assurance, or performance indicators.

This indicates that many disclosures serve more as legitimacy-seeking tools than as components of a strategic governance framework. The frequent absence of independently verified emission targets or detailed implementation roadmaps raises concerns about "greenwashing" tendencies, where firms adopt sustainability language without making substantive commitments (Delmas & Burbano, 2011; Bowen, 2019).

From the perspective of agency theory, symbolic disclosures do little to reduce information asymmetry between firms and stakeholders (Sun et al., 2022). Similarly, signaling theory posits that without verifiability and performance follow-through, such disclosures are unlikely to influence investor perceptions or stakeholder trust (Friske et al., 2023). Therefore, while linguistic alignment with IFRS frameworks is increasing, it must be complemented by measurable and auditable action plans to have a strategic impact.

To transition from symbolic compliance to functional integration, companies should embed sustainability into strategic planning, establish key performance indicators (KPIs) for climate risk and emission reduction, and ensure independent validation of reported data. Without such steps, the growing volume of sustainability disclosures may risk losing credibility in the eyes of both regulators and investors.

4.4. Comparison of data

Figure 1 compares companies' IFRS S1 and S2 compliance scores across the years 2021, 2022, and 2023. Overall, a consistent upward trend is observed in the IFRS compliance scores of all companies. Notably, 2022 emerged as a key transition year, with many companies showing significant progress compared to 2021. While compliance scores in 2021 ranged between 1.2 and 2.0, they rose to 1.8–2.9 in 2022 and reached between 2.5 and 3.0 by 2023.

Companies such as Akenerji, Aksa Enerji, Aydem Enerji, and Esenboğa Elektrik demonstrated moderate progress between 2021 and 2022, followed by substantial improvements in 2023. For example:

- Esenboğa Elektrik improved from 1.2 in 2021 to 1.8 in 2022 and reached 2.8 in 2023;
- Aydem Enerji progressed from 1.3 to 2.0 to 2.7;
- Akenerji moved from 1.2 to 1.8 to 2.5.

These companies significantly enhanced their sustainability reporting practices over time.

Meanwhile, companies such as Enerjisa, Galata Wind, Margün Enerji, Naturel Enerji, Smart Güneş Teknolojileri, and Zorlu Enerji achieved full compliance (3.0) by 2023, reflecting the highest level of alignment in sustainability reporting.

Findings show a steady rise in IFRS S1–S2 adoption: limited disclosures in 2021 grew into comprehensive reports by 2022, reaching high compliance in 2023, though gaps remain in net-zero strategies and regulatory compliance.

Figure 1. Comparison of IFRS compliance scores of energy companies in the 2021–2023 period

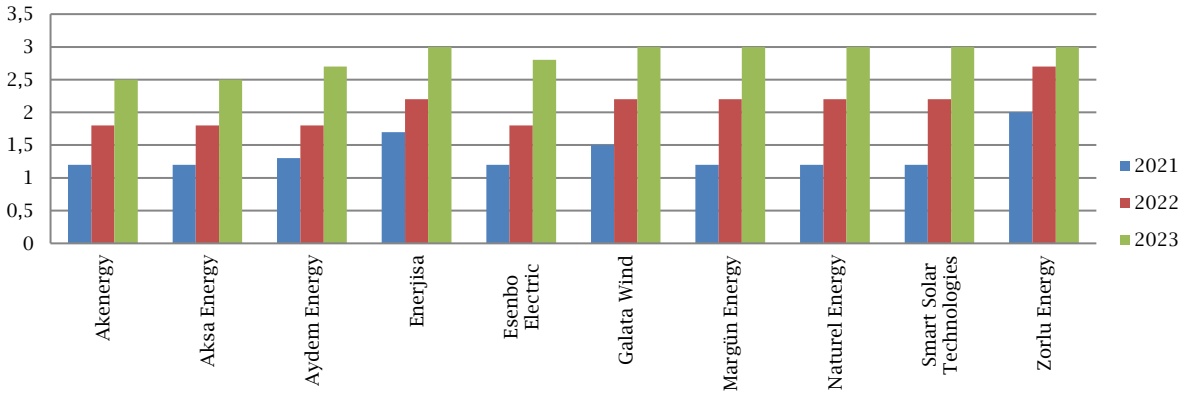


Figure 2 illustrates the change in average energy sector organizations in Türkiye's average IFRS compliance scores during the years 2021–2023. By this, there is a pointer to general and consistent compliance improvement with the general IFRS S1 and S2 standards within the sector.

The compliance score was, on average, 1.4 in 2021, 2.1 in 2022, and 2.8 in 2023. The general trend is that companies have been giving greater priority to transparency, stepping up the use of independent audit mechanisms, and handling climate risk more comprehensively.

The year 2022 marked a turning point as firms rewrote sustainability policies to align with IFRS S1 and S2, and by 2023, some reached near-full compliance with mean scores close to 3.0. This reflects broader adoption that enhanced accountability and transparency, though gaps remain in net-zero plans and full rule compliance.

Figure 2. Change in IFRS compliance over time in the 2021–2023 period

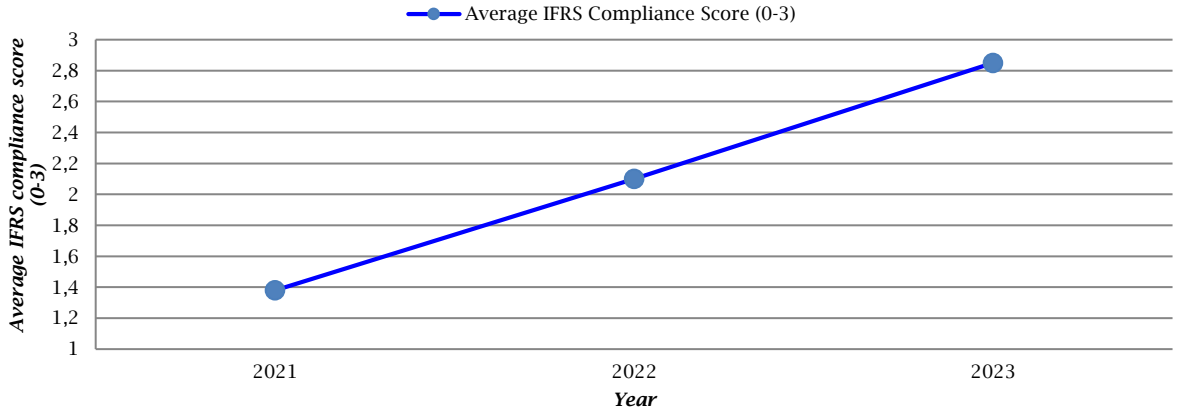
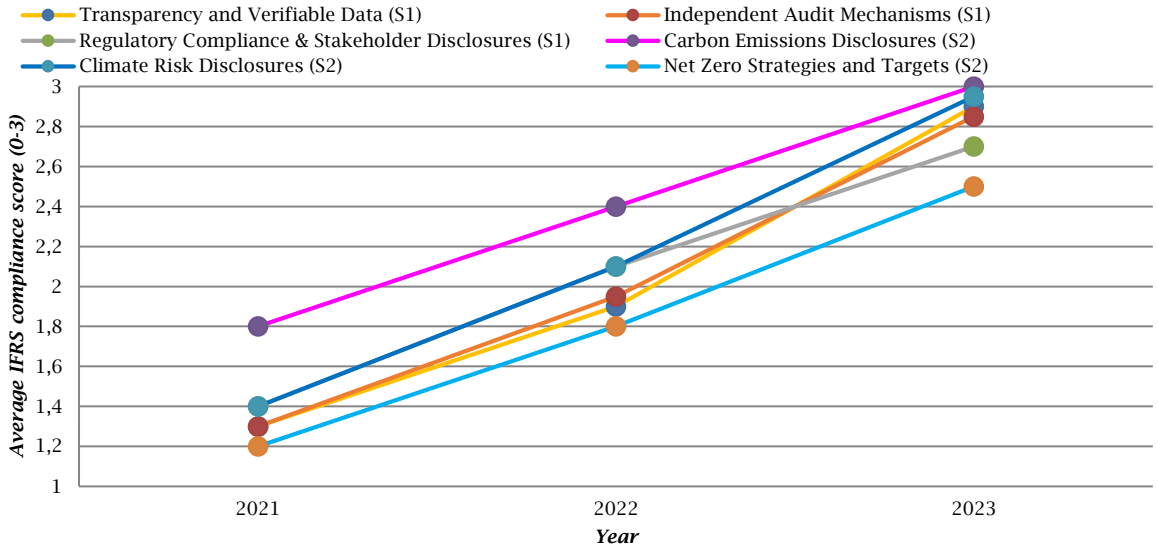


Figure 3 outlines the development of IFRS compliance criteria between the years 2021–2023. The study indicates that although certain criteria are changing at a fast pace, there are still some areas where deficiencies exist.

Figure 3. Development of IFRS criteria in the 2021–2023 period



The study detects an overall improvement in the implementation of IFRS S1 and S2 standards in Türkiye's energy sector. However, the improvement has not been uniform across all the criteria. While firms achieved high levels of compliance in certain aspects, others showed more limited development.

5. DISCUSSION

This study provides empirical evidence on the voluntary implementation of IFRS S1 and IFRS S2 standards in sustainability reporting in the Turkish energy sector during the pre-mandatory period of 2021–2023. Based on a detailed content analysis of the sustainability reports of 10 energy companies, the results show a steady upward trend in compliance with IFRS principles, particularly in transparency, carbon emission disclosure, and independent assurance.

By 2023, numerous companies, including Zorlu Enerji, Galata Wind, and Smart Güneş Teknolojileri, had achieved full or near-full compliance with the relevant standards. This demonstrates a high level of institutional readiness in the sector ahead of the official implementation of TSRS 1 and TSRS 2 in 2024. The data show that average compliance scores increased from 1.4 in 2021 to 2.8 in 2023, marking a significant increase in sustainability disclosure strategies across the sector.

Areas of significant improvement include:

- Carbon emissions disclosures (S2): Scores rose from 1.8 in 2021 to 3.0 in 2023, reflecting more transparent carbon reporting driven by regulatory and investor pressures (Pantazi, 2024; Komala & Murtanto, 2024). This is also used as a sustainability signal (Friske et al., 2023).
- Independent assurance mechanisms (S1): Scores improved from 1.2 to 2.9, showing greater use of third-party assurance to build investor confidence. As the literature notes, this development shifts reporting from symbolic to governance-oriented tools (Adams, 2004; Almagtome et al., 2020) and, under agency theory, reduces information asymmetry (Sun et al., 2022).
- Transparency and verifiable data (S1): Scores increased from 1.3 to 2.8, reflecting stronger accountability supported by quantifiable data. From a legitimacy theory perspective, these disclosures respond to stakeholder demands for social legitimacy (Nasreen et al., 2025; Lai & Stacchezzini, 2021).

Less developed areas include:

- Net-zero strategies and targets (S2): Although scores rose from 1.2 to 2.5, this remains underdeveloped, as firms lack concrete actions to support net-zero ambitions, often criticized as rhetorical without measurable indicators (Indyk, 2022).
- Regulatory compliance & stakeholder disclosures (S1): Scores improved from 1.4 to 2.7, but compliance still lags, indicating that sustainability requires not only external pressure but also internal motivation and governance capacity (Kolk, 2008).

This review shows that while progress is evident across IFRS S1 and S2 categories, adoption is uneven: firms advanced most in carbon emissions reporting and assurance, yet lag in net-zero strategies and regulatory convergence. Companies prioritize transparency, third-party assurance, and emissions, but substantive progress is still needed on long-term goals. This disparity reflects the literature's distinction between symbolic and substantive reporting, indicating whether sustainability reporting is treated as an obligation or a strategy (Delmas & Burbano, 2011; Bowen, 2019).

From a theoretical perspective, the findings confirm legitimacy theory, with companies increasingly issuing disclosures to align with societal and regulatory norms (Nasreen et al., 2025). However, agency theory highlights the lack of mechanisms, such as independent audits, to reduce information asymmetry (Sun et al., 2022). Meanwhile, signaling theory suggests that sustainability reporting (without measurable and verified follow-up) risks undermining investor confidence over time (Friske et al., 2023; Walker & Wan, 2012).

6. CONCLUSION

This study demonstrates that the voluntary adoption of IFRS S1 and S2 in the Turkish energy sector between 2021 and 2023 significantly improved sustainability disclosures, particularly in carbon reporting, transparency, and third-party assurance. However, persistent shortcomings remain in areas such as net-zero strategies and stakeholder disclosures, indicating that reporting is still partly symbolic.

The main implications are twofold. From a regulatory perspective, institutions such as the Public Oversight, Accounting and Auditing Standards Authority (KGK) and CMB should provide sector-specific templates, incentives for SMEs, and affordable assurance mechanisms. From a corporate perspective, companies must embed sustainability into strategic planning through measurable KPIs, capacity-building, and genuine stakeholder engagement.

This study has several limitations. It focuses only on 10 publicly traded energy firms in Türkiye, covering the voluntary adoption period (2021–2023). It captures thematic reporting trends but does not analyze stakeholder reactions, investor impacts, or financial performance outcomes.

Future research should examine the impact of mandatory adoption after 2024, conduct cross-country comparisons in emerging markets, and investigate the relationship between ESG reporting and firm performance. Such studies will help determine whether IFRS S1 and S2 can shift sustainability reporting from a symbolic compliance activity to a transformative governance tool.

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