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THE CONNECTIVITY BETWEEN SUSTAINABILITY DISCLOSURES AND FINANCIAL INFORMATION: AN EXAMINATION IN THE CONTEXT OF TSRS

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ABSTRACT

This study examines how sustainability disclosures were linked to financial information in 2024, the first year of mandatory implementation of the Türkiye Sustainability Reporting Standards (TSRS). To this end, Tüpraş's 2024 Integrated Annual Report was analyzed using qualitative document analysis and content analysis. A five-level coding framework was developed to assess the linkage between sustainability disclosures and financial information at different levels, and a total of 35 analytical units were classified. The findings show that 22.9% of the analytical units were at the potential financial impact level, 31.4% were linked to financial decision-making, and 45.7% were associated with monetary indicators. However, no instances were identified in which sustainability disclosures were directly matched to a specific financial statement line item or note. The results indicate that sustainability information can be linked to financial information through investment decisions, financial planning, and monetary indicators; however, these linkages do not establish a direct and traceable connection to specific financial statement line items or related notes.

Keywords: Sustainability reporting, financial information, connectivity, TSRS, content analysis.

JEL Classification: M41, M14, M48

SÜRDÜRÜLEBİLİRLİK AÇIKLAMALARI İLE FİNANSAL BİLGİLER ARASINDAKİ BAĞLANTILIK: TSRS ÇERÇEVESİNDE BİR İNCELEME

ÖZET

Bu çalışmada, Türkiye Sürdürülebilirlik Raporlama Standartları'nın (TSRS) ilk zorunlu uygulama yılı olan 2024'te sürdürülebilirlik verilerinin finansal bilgilerle nasıl ilişkilendirildiği incelenmektedir. Bu doğrultuda Tüpraş'ın 2024 Entegre Faaliyet Raporu, nitel doküman analizi ve içerik analizi yöntemleriyle ele alınmıştır. Sürdürülebilirlik açıklamaları ile finansal bilgiler arasındaki bağlantıyı farklı düzeylerde değerlendirmek amacıyla beş seviyeli bir kodlama çerçevesi geliştirilmiş ve toplam 35 analiz birimi sınıflandırılmıştır. Bulgular, analiz birimlerinin %22,9'unun potansiyel finansal etki düzeyinde, %31,4'ünün finansal kararlarla bağlantılı ve %45,7'sinin parasal göstergelerle ilişkili olduğunu göstermektedir. Buna karşılık, sürdürülebilirlik açıklamalarının doğrudan belirli bir finansal tablo kalemi veya dipnotla eşleştirildiği herhangi bir örneğe rastlanmamıştır. Sonuçlar, sürdürülebilirlik bilgilerinin yatırım kararları, finansal planlama ve parasal göstergeler üzerinden finansal bilgilerle ilişkilendirilebildiğini, ancak bu ilişkinin belirli finansal tablo kalemleri veya ilgili dipnotlarla doğrudan ve izlenebilir bir bağlantı kurulduğunu kanıtlamadığını ortaya koymaktadır.

Anahtar Kelimeler: Sürdürülebilirlik raporlaması, finansal bilgi, bağlantılılık, TSRS, içerik analizi.

JEL Sınıflandırması: M41, M14, M48

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1. INTRODUCTION

Linking sustainability information with financial information has gained importance as the role of sustainability reporting within corporate reporting has expanded. In particular, IFRS S1 and IFRS S2 require disclosures on the effects of sustainability-related risks and opportunities on an entity's financial position, financial performance, and cash flows. The importance of helping users understand the connections between sustainability-related financial disclosures and the related financial statements is also emphasized in this context (IFRS Foundation, 2024; KGK, 2023).

The Türkiye Sustainability Reporting Standards (TSRS), which are aligned with IFRS S1 and IFRS S2, provide a new context for examining this relationship within corporate reporting in Türkiye (KGK, 2023). However, linking sustainability information to financial information is not a unidimensional process. This relationship may arise at different levels, ranging from the disclosure of potential financial effects to financial decision-making processes and monetary indicators. At a more advanced level, sustainability information may be directly linked to specific financial statement line items.

This study examines how sustainability disclosures were linked to financial information during 2024, the first mandatory reporting year under the TSRS. In this context, the forms and levels of financial connectivity in Tüpraş's 2024 Integrated Annual Report were evaluated. A five-level analytical coding framework was used to classify these forms of connectivity and assess the extent to which sustainability information was linked to financial information.

2. THEORETICAL FRAMEWORK

2.1. The Concept of Connectivity in the Literature

Connectivity, particularly in the integrated reporting literature, refers to identifying the relationships among different information elements within corporate reporting rather than presenting them independently. It also encompasses the interdependencies and integration among these elements. In line with the International Integrated Reporting Council (IIRC) Framework, connectivity reflects the integration, interrelatedness, interconnectedness, and interdependence among material factors that affect an organization's value creation over the short, medium, and long term. The concept is also associated with "integrated thinking," which considers the relationships among different forms of capital, activities, and functional units and their reflection in integrated decision-making processes (Roslan and Mohd Saleh, 2023).

The concept of connectivity encompasses relationships among multiple dimensions of information. IIRC (2013) addresses the connectivity principle through the links among the content elements of a report, different time frames, monetary and non-monetary information, quantitative and qualitative information, and internal and external disclosures. These dimensions are important for examining the relationship between sustainability information and financial information. The fact that sustainability disclosures can be presented in the form of qualitative or quantitative information, current or forward-looking information, and monetary or non-monetary indicators requires these different dimensions to be taken into consideration.

Different approaches have been developed in the literature to measure connectivity. Rivera-Arrubla and Zorio-Grima (2016) developed an IR-connectivity index based on seven characteristics identified by the IIRC and used it to measure the level of connectivity in integrated reports. Ahmed Haji and Anifowose (2016) treated connectivity as a dimension of integrated reporting practice and assessed the scope and quality of reporting practices using a checklist comprising eight main categories, including connectivity. These studies demonstrate that connectivity can be operationalized through different measurement and coding approaches.

More recent studies have examined connectivity in different research contexts. Roslan and Mohd Saleh (2023) show that connectivity research employs different approaches, including indices, scoring methods, expert assessments, and database-based measures. Tirado-Valencia et al. (2024) developed a multidimensional connectivity index to measure the connectedness between financial and non-financial information in integrated reporting. Wang et al. (2024) examined the connectivity between financial and non-financial information in the context of strategic reporting and its relationship with market outcomes.

Rea (2026), in turn, examined the connectivity between financial and sustainability information comprehensively through different typologies and methodological approaches.

In light of this literature, this study examines the concept of connectivity within a more specific framework. The primary focus is on how sustainability information is linked to financial information and financial processes. Accordingly, the study examines how sustainability information is linked to potential financial effects, financial decision-making processes, monetary indicators, and financial statement information. This approach shifts the focus from the broader concept of connectivity to a research framework centered on the linkage between sustainability information and financial information.

2.2. Connectivity Between Sustainability and Financial Information

Connectivity, initially considered a general reporting principle in the integrated reporting literature, has gained greater relevance in the context of considering financial and sustainability information together. In this approach, the key issue concerns the presentation of financial and non-financial information within the same reporting environment as well as the disclosure of the relationships and interdependencies between these forms of information. In this sense, connectivity extends beyond treating sustainability information as a separate disclosure area from financial information and refers to how such information is linked to the value creation process (Grassmann et al., 2019: 878-879).

This approach indicates that the relationship between sustainability information and financial information can take different forms. Viewing connectivity simply as the combination of different report sections or information sets is insufficient for understanding the relationships between financial and non-financial performance. The literature has examined connectivity through additive, textual, relational, and holistic approaches. In addition, the relationships among financial and non-financial information, qualitative and quantitative information, past and forward-looking information, and different information elements represent different dimensions of connectivity (Tirado-Valencia et al., 2024: 1-3).

With the standardization of sustainability-related financial disclosures, the relationship between this information and financial statements has become a more prominent reporting issue. The IFRS Foundation considers the understanding of the connections between sustainability-related financial disclosures and the related financial statements to be an important issue and adopts a connectivity approach based on presenting these disclosures alongside the financial statements. Under IFRS S1 and IFRS S2, consideration of the current and expected effects of sustainability-related risks and opportunities on an entity's prospects, cash flows, access to finance, and cost of capital strengthens the financial relevance of sustainability information. Thus, sustainability disclosures are associated with information that extends beyond a separate set of information on environmental or social performance and that investors and other primary users can use in making decisions about providing resources to the entity (IFRS Foundation, 2024).

An important dimension of this connection is the distinction between current financial effects and anticipated financial effects. In its 2025 publication, the IFRS Foundation defines current financial effects as effects arising on an entity's financial position, financial performance, or cash flows during the relevant reporting period, whereas anticipated financial effects are considered to be effects expected to arise over the short, medium, or long term. It is also stated that, when assessing future effects, consideration may be given to how sustainability-related risks and opportunities are incorporated into the entity's financial planning. This approach indicates that relating sustainability information to financial information is not limited to realized financial outcomes but can also be associated with forward-looking financial planning and investment decisions (IFRS Foundation, 2025).

The literature distinguishes between direct and indirect forms of this financial relationship. Rea (2026) explains direct connectivity in terms of relating sustainability or ESG information to specific financial figures, financial statement items, or accounting measurements. Indirect connectivity, in contrast, is addressed in terms of relationships established through narrative, conceptual, and forward-looking financial effects. Rea also discusses how connectivity is not limited to relationships within a specific reporting period. He notes that temporal linkages, such as sustainability-related effects becoming financially material over time and subsequently being reflected in the financial statements, can also be

considered within this scope. This distinction between direct and indirect connectivity indicates that sustainability information can be related to financial information in different ways. Thus, this distinction provides a basis for evaluating the different forms of these relationships.

One dimension of connectivity is the linking of sustainability information to financial decision-making processes. The integrated thinking approach envisages the joint consideration of different elements of an organization and its value creation processes and the reflection of these relationships in decision-making processes (IIRC, 2021; Dimes and de Villiers, 2024). This approach indicates that sustainability information is not presented solely for external reporting purposes but can also be integrated into planning, performance management, and other management processes. This is consistent with Roslan and Mohd Saleh's (2023) discussion of connectivity in relation to integrated thinking and integrated decision-making processes.

Another dimension of connectivity is the linking of sustainability information to quantitative and monetary indicators. Connectivity is stated to encompass the linking of monetary and non-monetary information, as well as quantitative and qualitative information (Grassmann et al., 2019: 879). The monetization of sustainability variables and their linkage to financial indicators enables the relationship between sustainability and financial performance to be quantitatively demonstrated (Distler et al., 2025). However, expressing sustainability information in monetary terms does not mean that the relevant effect is directly recognized in the financial statements. This distinction requires quantitative or monetary disclosure to be distinguished from financial statement connectivity.

A more technical dimension of connectivity is financial statement connectivity. European Financial Reporting Advisory Group (EFRAG) addresses the connection between financial and sustainability reporting in terms of linking sustainability information to financial statement information, including through cross-referencing and reconciliation (EFRAG, 2024, 2025). David and Giordano-Spring (2022) examine the linkage of climate-related information to financial reporting information as a dimension of the connection between financial and non-financial reporting. The IFRS Foundation considers it important for investors to understand the relationship between sustainability-related risks and opportunities and the financial statements (IFRS Foundation, 2024). However, relating sustainability information to financial decision-making processes or expressing it through monetary indicators does not represent the same phenomenon as directly relating it to a specific financial statement item. Therefore, financial decision connectivity, monetary indicator connectivity, and financial statement connectivity need to be analytically distinguished from one another.

Taken together, the literature suggests that the relationship between sustainability information and financial information can take different forms. The next section explains how these forms of connectivity are operationalized within the analytical coding framework developed for this study.

2.3. Analytical Coding Framework for Financial Connectivity

The operationalization of financial connectivity in this study is based on analytically distinguishing how sustainability information is related to financial information and financial processes. In the previous literature, connectivity has been examined across different dimensions, such as relationships between financial and non-financial value creation elements, direct and indirect connections, integration with managerial and decision-making processes, and relationships among quantitative and monetary information and financial statement information (Grassmann et al., 2019; Roslan and Mohd Saleh, 2023: 76-77; Rea, 2026: 7-8).

In line with this literature, the study classifies the ways in which sustainability information is related to financial information into five analytical levels. The framework ranges from Level 0, where no financial relationship is present, to Level 3, where a sustainability-related effect is directly related to a specific financial statement item and amount. These levels are defined as follows:

- Level 0 – No Linkage
- Level 1 – Potential Financial Impact
- Level 2A – Financial Decision Linkage
- Level 2B – Monetary Indicator Linkage
- Level 3 – Financial Statement Linkage

These levels are based on bringing together, within a single analytical coding framework, the dimensions of connectivity discussed separately in the literature in line with the research purpose of this study.

Level 0 – No Linkage: Refers to a situation in which a sustainability topic is not linked to financial information. At this level, although the sustainability topic may be disclosed, no financial impact, financial decision, monetary indicator, or financial statement linkage is established. Level 0 therefore represents the reference level at which financial connectivity is not observed.

Level 1 – Potential Financial Impact: Refers to the disclosure of current or potential future effects of a sustainability-related issue on financial position, financial performance, cash flows, costs, or assets and liabilities. The IFRS Foundation states that the current and anticipated financial effects of sustainability-related risks and opportunities should be considered, with anticipated effects covering financial effects that may arise over the short, medium, or long term (IFRS Foundation, 2025). Rea (2026) likewise addresses potential and forward-looking financial effects under indirect connectivity that have not yet been linked to a specific financial figure or financial statement item. Therefore, at Level 1, a financial effect is disclosed, but no specific monetary amount or financial decision linkage is required.

Level 2A – Financial Decision Linkage: Refers to a situation in which sustainability information is incorporated into investment, financing, budgeting, strategic planning, or other financial decision-making processes. Rea (2026: 14) explains informational-managerial connectivity in terms of the integration of sustainability information into internal information systems, management control, and decision-making processes. Similarly, Roslan and Mohd Saleh (2023) relate the integrated thinking approach to the consideration of relationships among different capital elements, activities, and functions and their reflection in integrated decision-making processes. Therefore, at Level 2A, sustainability information is not disclosed merely as a potential financial effect but is used as an element of financial decision-making.

Level 2B – Monetary Indicator Linkage: Refers to a situation in which a sustainability topic is explicitly linked to CapEx, OpEx, revenue, investment expenditure, savings, or another monetary indicator. Grassmann et al. (2019: 879) state that connectivity encompasses the linking of monetary and non-monetary information, as well as quantitative and qualitative information. Distler et al. (2025) discuss the monetization of sustainability variables and the linking of sustainability information to financial indicators. In this study, explicit monetary indicators such as environmental investments and operating expenses, sustainability-related capital expenditures, revenues, financial savings, and economic gains were classified as Level 2B. However, the disclosure of a monetary amount does not, by itself, mean that the amount is recognized in the financial statements.

Level 3 – Financial Statement Linkage: Refers to a situation in which a sustainability-related effect is directly linked to a specific financial statement item and amount. Rea (2026: 7-8) discusses direct connectivity in terms of relating sustainability or ESG information to specific financial figures, financial statement items, or accounting measurements. The IFRS Foundation emphasizes the importance of making the connection between sustainability information and matters reflected in the financial statements understandable to investors (IFRS Foundation, 2025). In this study, the presence of a monetary amount related to sustainability alone was not considered sufficient for Level 3; the effect was required to be explicitly and verifiably linked to a specific financial statement item, amount, or accounting measurement.

3. EXISTING LITERATURE IN TÜRKİYE AND THE POSITIONING OF THE STUDY

Initially, studies examining the role of sustainability information within corporate reporting in Türkiye focused on sustainability and integrated reporting practices. Gençoğlu and Aytac (2016) examined the reporting practices of companies included in the BIST Sustainability Index by addressing the presentation of financial and non-financial information together and its linkage to business activities. Gümrah and Büyükipekçi (2019) evaluated sustainability reports published in Türkiye during the 2008–2017 period through content analysis. Sultanoğlu and Akdoğan (2020) examined the use of sustainability information in integrated reporting and its relationship with the value creation process. Köse and

Ağdeniz (2023), in turn, analyzed the 2021 integrated reports of three cement companies in terms of quantitative performance indicators in sustainability accounting.

With the implementation of TSRS, research has increasingly focused on the application of the new standards and disclosure levels. Ataman and Şimşek (2025) examined the theoretical and standards-based relationships between TSRS and TFRS/TMS. Dalkılıç and Özdemir (2026), in turn, examined the 2024 sustainability reports of 12 banks listed on BIST in the first mandatory year of TSRS implementation and evaluated their level of compliance with TSRS 1 and TSRS 2. The study found differences particularly in areas requiring quantitative and verifiable information, and showed that the quantitative reporting of climate-related financial effects was one of the areas requiring improvement.

Recent studies provide more detailed findings on the accounting and financial dimensions of sustainability disclosures. Karayığit Kiriktir (2026) examined the 2024 sustainability and integrated reports of BIST-30 companies and identified areas such as sustainability investments, expenditures, financing, financial effects, and the linkage to financial performance. Zeytin (2026), in turn, examined the 2024 TSRS 2-compliant reports of six insurance companies listed on Borsa İstanbul and showed differences among companies in the quantitative disclosure of financial effects, the integration of sustainability information into financial decision-making processes, and the connections established with financial statement items.

Taken together, these studies show that the financial dimension of sustainability information has been increasingly examined in Türkiye. However, existing studies address this relationship from different perspectives and do not systematically distinguish among potential financial effects, financial decision-making processes, monetary indicators, and specific financial statement information within a single analytical framework. Building on this point, this study examines the financial connectivity of sustainability information during 2024, the first mandatory reporting year under TSRS. For this purpose, a five-level analytical coding framework was developed to distinguish the different ways in which sustainability information is linked to financial information.

4. RESEARCH PURPOSE AND RESEARCH QUESTIONS

This study aims to examine how sustainability information was linked to financial information during 2024, the first mandatory reporting year of the Türkiye Sustainability Reporting Standards (TSRS) in Türkiye. In line with this purpose, the study identifies the differences among the following dimensions:

- **Disclosure of Financial Effects:** Disclosure of current or potential financial effects in sustainability disclosures.
- **Linkage to Financial Decision-Making Processes:** Linking sustainability information to financial decision-making processes such as investment, financing, budgeting, or strategic planning.
- **Presentation of Monetary Indicators:** Explicit presentation of sustainability-related investments, expenditures, revenues, savings, or other monetary indicators.
- **Direct Linkage to Financial Statement Items:** Directly linking sustainability-related effects to specific financial statement items.

For this purpose, Tüpraş's 2024 Integrated Annual Report was examined through document analysis. An analytical coding framework was applied to determine the financial connectivity levels of sustainability disclosures.

In line with the purpose of the study, the following research questions are addressed:

RQ1. To what extent is sustainability information linked to financial information in the first year of mandatory TSRS reporting?

RQ2. How does the linkage of sustainability information to financial information differ in terms of potential financial effects, financial decision-making processes, monetary indicators, and financial statement linkage?

5. RESEARCH METHODOLOGY

5.1. Research Design and Document Examined

This study is based on a qualitative document analysis and content analysis approach to examine how sustainability information is linked to financial information. The empirical setting of the study is corporate reporting for the 2024 period, the first mandatory reporting year of TSRS in Türkiye.

The study examined Tüpraş's 2024 Integrated Annual Report. The report covers the period from January 1 to December 31, 2024, and was prepared in full compliance with TSRS 1 and TSRS 2. As one of Türkiye's largest industrial companies, Tüpraş provides a suitable case for examining sustainability disclosures under TSRS 1 and TSRS 2 alongside financial information. In addition, the analysis was based on the same period and scope as the consolidated financial reports dated December 31, 2024, for Tüpraş and its subsidiaries. The ability to trace disclosures within the scope of TSRS through the TSRS Index enables sustainability disclosures and financial information to be examined together within the same corporate reporting framework.

The purpose of the analysis is not to measure a TSRS compliance score or the entity's financial performance. Instead, it aims to identify and classify the different forms of connectivity between sustainability disclosures and financial information using the five-level analytical coding framework developed in this study. The framework encompasses various forms of connectivity, ranging from potential financial effects and financial decision-making processes to monetary indicators and direct links to specific financial statement items.

5.2. Analysis Unit and Coding Process

The analysis unit was defined as an analytical unit consisting of a specific TSRS disclosure requirement and the verifiable disclosure corresponding to this requirement in the report. The purpose of this approach is to systematically code disclosure examples that are meaningful in terms of financial linkage and analytically distinguishable from one another, rather than evaluating each sentence or paragraph in the report as a separate observation.

In the first stage of the coding process, disclosures included within the scope of TSRS 1 and TSRS 2 in Tüpraş's 2024 Integrated Annual Report that could be analytically evaluated in terms of the relationship between sustainability information and financial information were identified. The identified disclosures were examined in terms of the nature of the financial linkage and the financial information they contained; disclosures that could be analytically distinguished from one another were recorded as separate coding units. For each unit, the relevant TSRS disclosure requirement, the disclosure in the report, the type of financial linkage, any monetary indicator, and the financial connectivity level were evaluated together.

As a result of this process, a total of 35 analytical coding units were created. Of these units, 6 consisted of disclosures within the scope of TSRS 1, while 29 consisted of disclosures within the scope of TSRS 2. The coding units are based on disclosures that could be distinguished from one another in terms of financial linkage in the report. Different financial linkages under the same TSRS disclosure requirement could be coded as separate coding units. Monetary indicators such as investment expenditures, operating expenses, and water and emission reduction expenditures included in different disclosures could be evaluated as separate coding units in terms of the forms of financial linkage. In contrast, where multiple financial indicators were presented together within the same disclosure, they were evaluated as a single analytical unit.

In the second stage of the coding process, the identified units were classified according to the five-level financial connectivity framework developed for this study. The framework was informed by the connectivity approaches discussed in Section 2.3 and was used to distinguish the presence, level, and form of the relationship between sustainability information and financial information.

The five levels distinguish disclosures with no financial linkage (Level 0), potential financial effects without a specific monetary indicator or decision linkage (Level 1), integration into financial decision-making (Level 2A), explicit monetary indicators (Level 2B), and direct, traceable linkage to a specific

financial statement item, amount, or note (Level 3). The coding criteria were applied to the form of linkage evidenced in each disclosure, rather than to the mere presence of financial language.

In determining the coding level, the basis was not only whether the disclosure contained a financial element, but also how the sustainability information was linked to financial information. Situations in which sustainability information served as an input to financial decision-making processes such as investment, financial planning, capital allocation, or investment evaluation were coded as Level 2A. For example, the use of an internal carbon price in investment feasibility and financial assessments or the inclusion of climate-related risks and opportunities in investment decisions were evaluated at this level. Relationships established through explicit monetary indicators such as a specific monetary amount, investment expenditure, operating expense, revenue, or financial savings were coded as Level 2B. In this context, sustainable refining investments, environmental investment and operating expenses, water and emission reduction expenditures, CapEx and revenue indicators under the EU Taxonomy, and financial savings from energy efficiency were evaluated under Level 2B.

The distinction between Level 2B and Level 3 was maintained throughout coding. A monetary amount alone was classified as Level 2B; Level 3 required an explicit and traceable link to a specific financial statement item, amount, or related note. The criteria used to assess direct financial statement linkage are summarized in Appendix B.

To ensure the traceability of the coding decisions, the relevant TSRS disclosure requirement and the supporting evidence from the report were recorded for each coding unit, and all coding units are presented in Appendix A. Thus, each coding decision can be checked by referring back to the original disclosure in the report.

5.3. Data Analysis

Following the completion of the coding process, the 35 analytical units obtained were classified and descriptively analyzed in terms of their financial connectivity levels and their distribution within the scope of TSRS 1 and TSRS 2. The level to which each coding unit belonged was determined, and the frequencies and percentages of the coding units were calculated. Thus, the levels at which sustainability information was linked to financial information and the distribution of this linkage within the scope of TSRS 1 and TSRS 2 were identified.

The disclosures identified under Level 1, Level 2A, and Level 2B were further examined according to their content. Potential financial effects were considered under Level 1; financial decision-making processes under Level 2A; and monetary indicators linked to sustainability information under Level 2B. For Level 3, it was assessed whether any disclosure met the established criteria.

The analysis is descriptive and exploratory in nature and aims to identify the ways in which sustainability information is linked to financial information. Therefore, the coding results were not interpreted as a test of any causal relationship or generalizable financial effect. They were used to identify the disclosure patterns observed in the report examined.

6. ANALYSIS AND FINDINGS

6.1. Financial Connectivity Coding Findings

In the first stage of the analysis, how the sustainability-related disclosures included in Tüpraş's 2024 Integrated Annual Report were linked to financial information and financial decision-making processes was examined. The report was prepared in accordance with TSRS 1 and TSRS 2 for the 2024 reporting period and is based on the same reporting period and scope as the consolidated financial statements.

The disclosures were classified according to the form of financial linkage: potential financial effects, integration into financial decision-making, explicit monetary indicators, and direct links to financial statement items. The five-level framework and its coding criteria are summarized in Table 1.

Table 1. Financial Connectivity Coding Framework

Level	Label	Definition	Coding Criterion / Examples
Level 0	No linkage	Sustainability topic is not linked to financial information.	No financial effect, financial decision, monetary indicator, or financial statement linkage.
Level 1	Potential financial impact	Financial position, performance, cash flow, cost, or asset/liability effects are described as possible/expected.	Potential effect is discussed, but no specific monetary amount or financial decision linkage is established.
Level 2A	Financial decision linkage	Sustainability information is integrated into investment, financing, budgeting, strategic planning, or other financial decisions.	Carbon pricing used in investment evaluation; sustainability risks integrated into investment decisions.
Level 2B	Monetary indicator linkage	Sustainability topic is explicitly linked to CapEx, OpEx, revenue, investment expenditure, savings, or another monetary indicator.	Environmental investment/operating expenses; taxonomy CapEx; zero-carbon electricity revenue; energy-efficiency savings.
Level 3	Financial Statement Linkage	Sustainability effect is directly and traceably linked to a specific financial statement item, amount, or related financial statement note.	Explicit climate-related impairment, provision, asset/liability adjustment, or other recognized financial-statement amount.

Source: Developed by the author based on the literature.

The framework treats financial connectivity as a continuum rather than a binary condition. Level 3 requires direct and traceable linkage to a specific financial statement item or note.

This distinction is particularly important in the case of Tüpraş. Tüpraş explicitly states that the effects of climate-related risks and opportunities on financial position, financial performance, and cash flows are considered and that the relationships between sustainability disclosures and financial statement data are assessed. However, in the coding process of this study, the existence of a financial effect was not assumed; only the level of financial linkage demonstrably established in the report was taken as the basis.

The distribution of the 35 coded observations by financial connectivity level is presented in Table 2.

Table 2. Distribution of Coded Disclosures by Connectivity Level

Connectivity level	Number of observations	Percentage (%)
Level 0	0	0
Level 1	8	22.9
Level 2A	11	31.4
Level 2B	16	45.7
Level 3	0	0
Total	35	100

Source: Prepared by the author.

As shown in Table 2, 8 of the 35 observations (22.9%) were classified as Level 1, reflecting potential financial effects without a specific monetary indicator or decision-making link.

Eleven observations (31.4%) were classified as Level 2A, linking sustainability information to investment evaluation, financial planning, strategic planning, or capital allocation. A further 16 observations (45.7%) were classified as Level 2B because they contained explicit monetary indicators.

No observations fell under Level 0 or Level 3. Although all 35 disclosures showed some form of financial linkage, none provided evidence of a direct and traceable connection to a specific financial statement item, amount, or related note.

Overall, 27 observations (77.1%) were classified as Level 2A or Level 2B, indicating that the most common forms of linkage involved financial decision-making and monetary indicators.

6.2. Sustainability Information in Financial Decision-Making

The connectivity literature emphasizes that, in addition to presenting sustainability information together with financial information, such information is linked to business activities, strategy, and decision-making processes (Roslan and Mohd Saleh, 2023: 76–77).

This section examines the extent to which Tüpraş's sustainability disclosures are integrated into financial decision-making processes through the content analysis of disclosures under TSRS 1 and TSRS 2. It distinguishes the disclosure of potential financial effects from the use of sustainability information in investment decisions, financial planning, and capital allocation.

Table 3 illustrates the distribution of financial connectivity levels across TSRS 1 and TSRS 2.

Table 3. Distribution of TSRS 1 and TSRS 2 Disclosures by Connectivity Level

Standard	Level 1	Level 2A	Level 2B	Level 3	Coded observations
TSRS 1	5 (83.3%)	1 (16.7%)	0 (0.0%)	0 (0.0%)	6
TSRS 2	3 (10.3%)	10 (34.5%)	16 (55.2%)	0 (0.0%)	29
Total	8	11	16	0	35

Source: Prepared by the author.

The findings reveal a clear difference between the two standards. Of the 6 observations coded under TSRS 1, 5 (83.3%) were classified as Level 1 and 1 (16.7%) as Level 2A, while no observations were identified at Level 2B or Level 3. In contrast, of the 29 observations coded under TSRS 2, 3 (10.3%) were classified as Level 1, 10 (34.5%) as Level 2A, and 16 (55.2%) as Level 2B.

This distribution shows that, under TSRS 1, sustainability information remained largely at the level of identifying potential financial effects, whereas under TSRS 2, this information was more directly linked to financial decision-making processes and explicit monetary indicators. The Level 1 observations under TSRS 1 focus on assessing the potential effects of sustainability risks on financial position, financial performance, and cash flows. Tüpraş identifies 61 of its total 160 risks as sustainability-related risks and states that 31 of these may have potential effects on financial position, financial performance, or cash flows. In addition, the potential financial effects of three sustainability risks were assessed as potentially significant.

The distribution under TSRS 2, in turn, shows that sustainability information was linked more concretely to financial decision-making processes. In particular, the disclosures under Level 2A show that climate-related risks and opportunities were incorporated into investment evaluations, financial planning, strategic planning, and capital allocation processes. Tüpraş's linking of the taxonomy assessment for its investment projects to its investment system and its preparation of a taxonomy assessment for all investment projects show that sustainability factors were incorporated into the evaluation of investment decisions.

This linkage becomes even more evident in the application of internal carbon pricing. Tüpraş defines carbon pricing as a tool used in strategic transformation and financial evaluations of investments and

uses shadow carbon prices of USD 25, 33, 38, and 43 per ton of CO₂e for different periods. The use of the carbon pricing tool to support the work of the sustainability, strategy, risk, investment, and finance functions shows that climate-related information is used for financial evaluation and investment decisions as well as for disclosure purposes.

The high proportion of Level 2B observations under TSRS 2 indicates that sustainability information was linked to explicit monetary indicators, including expenditures related to environmental management, water management, emission reduction, and the low-carbon transition. The report also presents forward-looking financial indicators, including investment expenditure, EBITDA, ROIC, and net debt/EBITDA; the main reported monetary amounts are summarized in Table 4.

However, the absence of any Level 3 observations under TSRS 2 reveals an important distinction. The fact that sustainability information is linked to investment decisions, financial planning, and monetary indicators does not mean that these effects are directly recognized as a separate line item in the financial statements. Indeed, Tüpraş states that climate-related risks may lead to significant future adjustments in the carrying amounts of assets and liabilities. However, within the coding framework of this study, no observation was identified showing that these risks were explicitly and traceably linked to a specific financial statement item, amount, or related financial statement note in the 2024 financial statements.

The comparison shows that TSRS 1 disclosures mainly identify and assess potential financial effects, whereas TSRS 2 disclosures more often connect sustainability information to investment decisions, financial planning, capital allocation, and monetary indicators.

6.3. Monetary Indicators Associated with Sustainability Information

Table 4 presents the main monetary indicators reported in Tüpraş's sustainability disclosures. These indicators include investment expenditures, operating expenses, financial savings, and economic gains, as well as future investment amounts projected within the scope of the sustainable transformation. The period information distinguishes between realized financial indicators and future-oriented investment plans.

Table 4. Sustainability-Related Monetary Indicators

Sustainability-Related Monetary Indicator	Reported Amount/Value	Unit	Period
Environmental investments and operating expenses	6.493	billion TL	2024
Environmental investments	4.914	billion TL	2024
Environmental operating expenses	1.580	billion TL	2024
Water-related investments and operating expenses	2.508	billion TL	2024
Water-related investments	1.578	billion TL	2024
Water-related operating expenses	0.930	billion TL	2024
Emission-reduction investments and operating expenses	3.848	billion TL	2024
Emission-reduction investments	3.205	billion TL	2024
Emission-reduction operating expenses	0.642	billion TL	2024
Sustainable refining average annual investment expenditure	190	million USD	2022–2030
Sustainable refining investment	2.3	billion USD	through 2035
Total strategic investments	5.0	billion USD	through 2035
Energy-efficiency financial savings	19.2	million USD	2024
Energy-efficiency material/economic gain	630	million TL	2024
Zero-carbon electricity investment expenditure	17.7	million USD	2024

Source: Compiled by the author based on Tüpraş (2025).

Table 4 summarizes the monetary amounts reported for environmental, water-related, and emission-reduction investments and operating expenses. The table presents both aggregate amounts and their components, allowing the reported expenditure categories to be distinguished.

The report also expresses the outcomes of energy-efficiency projects through financial savings and material/economic gains, and separately reports investment expenditure for zero-carbon electricity. These disclosures show that sustainability-related monetary information includes both expenditure and benefit measures.

The forward-looking figures cover sustainable refining and broader strategic investment plans through 2035, distinguishing longer-term plans from amounts reported for 2024.

Accordingly, the monetary disclosures summarized in Table 4 were classified as Level 2B – Monetary Indicator Linkage.

6.4. Sustainability Information and Financial Statement Linkage

Table 5 assesses whether sustainability-related disclosures are directly linked to specific financial statement items in the 2024 financial statements. In this context, it considers whether the risks, investments, expenditures, and other financial effects reported in sustainability disclosures can be explicitly matched with specific items in the statement of financial position and the statement of profit or loss. Only cases in which an explicit and verifiable relationship between a sustainability-related effect and a specific financial statement item or amount was identified in the report were considered direct financial statement linkages.

Table 5. Sustainability Disclosures and Financial Statement Linkage

Financial Area	Statement	Type of Linkage Identified	Evidence / Interpretation	Level 3 Evidence
Tangible fixed assets		Partial	Sustainability-related investments are disclosed, but no direct and traceable linkage to a specific financial statement item or amount was identified.	No direct and traceable linkage identified
Capital (CapEx)	expenditure	Partial/indirect	Taxonomy CapEx and sustainability-related investment expenditure are separately disclosed.	No direct and traceable linkage to a specific financial statement item or amount demonstrated
Cash flows		Partial	Investment expenditure and savings are disclosed; a specific climate-related cash-flow line was not identified.	No direct and traceable linkage identified
Impairment		Potential	Climate-related risks may affect asset carrying amounts and may lead to impairment or restructuring.	No climate-specific impairment amount directly linked to the financial statements was identified
Provisions		No direct climate linkage identified	Existing provisions were not identified as climate-specific.	No direct and traceable linkage identified
Borrowings / financing		Partial	Financing and investment strategy are discussed in relation to the low-carbon transition, but no specific borrowing amount was directly linked to a sustainability-related effect.	No direct sustainability-linked borrowing amount identified

Deferred tax	No direct climate linkage identified	No climate-specific deferred-tax item was identified.	No direct and traceable linkage identified
Environmental fines	Monetary linkage	Environmental fines are reported as monetary sustainability information, but no distinct financial-statement line item or amount was identified.	No direct and traceable linkage identified
Revenue	Partial	Zero-carbon electricity revenue is separately disclosed in sustainability/taxonomy reporting.	No direct and traceable linkage to a specific financial statement item or amount demonstrated

Source: Author's analysis based on Tüpraş (2025).

Table 5 shows that, although sustainability disclosures are linked to financial decisions and monetary indicators, these linkages are not carried over to specific items in the financial statements to the same extent. Tüpraş's 2024 consolidated financial statements report total assets of TL 454.1 billion, total liabilities of TL 167.9 billion, and total equity of TL 286.2 billion. The statement of profit or loss reports revenue of TL 810.4 billion and net profit attributable to the owners of the parent of TL 18.3 billion.

However, the report does not clearly identify the financial statement items in which these sustainability-related investments, expenditures, and savings are reflected, or the amounts attributable to them. Although the report notes that climate-related risks may lead to future adjustments in asset and liability carrying amounts, it does not identify a specific amount as a climate-related accounting recognition in the 2024 financial statements.

The findings therefore reinforce the distinction between monetary disclosure and direct financial-statement linkage. Reporting a sustainability-related investment or expenditure in monetary terms was not sufficient for Level 3; that level required an explicit, traceable match to a specific financial statement item, amount, or related note.

The findings also have practical implications for sustainability reporting. Companies could improve the transparency and traceability of financial connectivity by explicitly linking sustainability-related investments, expenditures, risks, and opportunities to relevant financial statement items or notes where such links can be established. This would help users distinguish between monetary information disclosed in sustainability reporting and financial effects directly traceable to financial statements.

6.5. Representative Examples of Financial Connectivity

Table 6 provides selected examples of the connectivity patterns identified in the preceding analyses, from potential financial effects to decision-making links and explicit monetary indicators.

The examples illustrate the distinction between potential financial effects (Level 1), the use of sustainability information in investment evaluation and financial decision-making (Level 2A), and explicit monetary indicators (Level 2B). The internal carbon price is one example of sustainability information being incorporated into financial evaluation.

No example met the Level 3 criterion, consistent with the financial-statement review in Section 6.4.

Table 6. Representative Examples of Financial Connectivity

Source Requirement	Sustainability Disclosure	Financial Connection	Monetary / Evidential Detail	Coding Level
TSRS 2.14(a-iv)	Shadow carbon price	Investment evaluation / financial assessment	25 / 33 / 38 / 43 USD per tCO ₂ e	Level 2A
TSRS 2.15(a)	Sustainable refining investments	Investment expenditure	190 million USD average annual expenditure (2022–2030)	Level 2B
TSRS 2.15(a)	Environmental investment and operating expenses	Monetary sustainability indicator	6.493 billion TL	Level 2B
TSRS 2.15(a)	Taxonomy-related CapEx	Capital expenditure	Taxonomy CapEx separately reported	Level 2B
TSRS 2.15(a)	Zero-carbon electricity revenue	Revenue	Separately reported	Level 2B
TSRS 2.16(b)	Potential climate-related impairment/restructuring	Future financial effect	Potential effect; no specific financial statement amount identified	Level 1
TSRS 2.29(c)	Water stress, flooding and corrosion	Potential maintenance/cost effects	Potential financial effects described	Level 1
TSRS 2.29(e)	Sustainable refining investment	Capital allocation	2.3 billion USD sustainable refining investment through 2035	Level 2B
Energy-efficiency projects	Financial savings	Savings / economic gain	19.2 million USD financial savings; 630 million TL material/economic gain	Level 2B
Financial statement review	Direct financial statement linkage	Specific financial-statement line item / note	No explicit sustainability-related linkage identified	Level 3: None identified

Source: Prepared by the author based on the coding results.

7. CONCLUSION

This study examined how sustainability information was linked to financial information during 2024, the first mandatory reporting year of the TSRS in Türkiye. As a result of the document analysis conducted on Tüpraş's 2024 Integrated Annual Report, it was observed that the linkage of sustainability disclosures to financial information did not exhibit a uniform structure; it emerged at different levels, ranging from the disclosure of potential financial effects to financial decision-making processes and explicit monetary indicators. The five-level coding framework developed accordingly provides an analytical basis for distinguishing the ways in which sustainability information is linked to financial information.

These findings can be considered in relation to previous studies highlighting the importance of connectivity between financial and non-financial information and variation in corporate disclosure practices (David and Giordano-Spring, 2022; Wang et al., 2024). In Türkiye, Dalkılıç and Özdemir (2026) also identified differences in banks' TSRS compliance during the first mandatory reporting year, particularly in areas requiring quantitative and verifiable disclosures. The present study adds to this emerging literature by examining different levels of connectivity within a single company's sustainability disclosures.

Of the 35 coding units analyzed, 31.4% were linked to financial decision-making processes, while 45.7% were associated with explicit monetary indicators. The remaining 22.9% concerned potential financial impacts. However, financial connectivity did not take the same form across all disclosures. While some disclosures focused on the potential effects of sustainability-related risks and opportunities on the entity's financial position, performance, or cash flows, some linked this information to investment decisions, capital allocation, and financial planning, while others presented monetary indicators such as investment expenditures, operating expenses, revenues, or savings. This difference suggests that assessing the relationship between sustainability information and financial reporting solely based on the presence of disclosure may be insufficient.

One of the important findings of the study is that the presence of monetary indicators needs to be distinguished from financial statement linkage. Although numerous amounts related to sustainability-related investments, expenditures, revenues, and savings were disclosed in the report examined, no Level 3 coding unit was identified showing that these disclosures were explicitly and traceably linked to specific financial statement items or related notes. This finding indicates that reporting sustainability information at the level of financial decision-making and monetary indicators should not be considered the same reporting practice as directly linking such information to financial statement information.

From this perspective, the study proposes an approach that considers the level and form of linkage rather than assessing the relationship between sustainability and financial reporting solely as "linkage present/absent." The analytical framework developed can be used to systematically examine the points at which firms' sustainability disclosures intersect with financial reporting, particularly during the initial period of TSRS implementation. However, the fact that the study is based on a single firm and a single reporting period limits the direct generalizability of the findings to other firms or sectors. Therefore, future studies may benefit from examining how financial connectivity develops over time by comparing different firms, sectors, and reporting periods.

In conclusion, the analysis of Tüpraş's 2024 Integrated Annual Report shows that sustainability information was linked to financial information through potential financial impacts, financial decision-making processes, and monetary indicators. However, none of the 35 coding units demonstrated an explicit and traceable link between sustainability disclosures and specific financial statement items or related notes. This finding highlights the distinction between reporting monetary information and establishing a direct link to financial statement items.

REFERENCES

- Ahmed Haji, A., & Anifowose, M. (2016). The trend of integrated reporting practice in South Africa: Ceremonial or substantive? *Sustainability Accounting, Management and Policy Journal*, 7(2), 190–224. <https://doi.org/10.1108/SAMPJ-11-2015-0106>
- Ataman, B., & Şimşek, K. (2025). Türkiye sürdürülebilirlik raporlama standartları ile Türkiye finansal raporlama standartları arasındaki ilişki üzerine bir değerlendirme. *Finans Ekonomi ve Sosyal Araştırmalar Dergisi*, 10(4), 529–545. <https://doi.org/10.29106/fesa.1773854>
- Dalkılıç, E., & Özdemir, N. (2026). Türkiye sürdürülebilirlik raporlama standartları'na uyum düzeyi: Türk bankacılık sektörü üzerine ampirik bir değerlendirme. *Erciyes Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, 74, 165–175. <https://doi.org/10.18070/erciyesiibd.1949133>
- David, B., & Giordano-Spring, S. (2022). Connectivity between financial and non-financial reporting: An exploration through climate accounting. *Accounting Auditing Control*, 28(4), 21–50. <https://doi.org/10.3917/cca.284.0021>
- Dimes, R., & de Villiers, C. (2024). Hallmarks of integrated thinking. *The British Accounting Review*, 56(1), 101281. <https://doi.org/10.1016/j.bar.2023.101281>
- Distler, B., Ernstberger, J., Keiling, M., Müller, F., & Szabo, M. (2025). Incorporating carbon emissions into decision-making—The case of transactional connectivity. *Abacus*, 61(4), 1023–1051. <https://doi.org/10.1111/abac.70012>
- European Financial Reporting Advisory Group (EFRAG). (2024). Connectivity considerations and boundaries of different annual report sections. <https://www.efrag.org/en/media/27477>
- European Financial Reporting Advisory Group (EFRAG). (2025). *Connectivity of financial and sustainability reporting*. <https://www.efrag.org/sites/default/files/media/document/2026-02/EFRA%20Discussion%20Paper%20Connectivity%20of%20financial%20and%20sustainability%20reporting.pdf>
- Gençoğlu, Ü. G., & Aytaç, A. (2016). Kurumsal sürdürülebilirlik açısından entegre raporlamanın önemi ve BIST uygulamaları. *Muhasebe ve Finansman Dergisi*, 72, 51–66. <https://doi.org/10.25095/mufad.396719>
- Grassmann, M., Fuhrmann, S., & Guenther, T. W. (2019). Drivers of the disclosed “connectivity of the capitals”: Evidence from integrated reports. *Sustainability Accounting, Management and Policy Journal*, 10(5), 877–908. <https://doi.org/10.1108/SAMPJ-03-2018-0086>
- Gümrah, A., & Büyükepekçi, S. (2019). Türkiye’de sürdürülebilirlik raporlaması: 2008-2017 yılları arası yayınlanmış sürdürülebilirlik raporlarının incelenmesi. *Muhasebe Bilim Dünyası Dergisi*, 21(2), 305–323. <https://doi.org/10.31460/mbdd.521540>
- IFRS Foundation. (2024). Connectivity between the financial statements and sustainability-related financial disclosures. <https://www.ifrs.org/sustainability/knowledge-hub/ifrs-resources/>
- IFRS Foundation. (2025). Disclosing information about anticipated financial effects applying ISSB Standards. <https://www.ifrs.org/content/dam/ifrs/supporting-implementation/issb-standards/disclosing-information-anticipated-financial-effects.pdf>
- IIRC (International Integrated Reporting Council). (2013). The international <IR> framework. <https://integratedreporting.org/wp-content/uploads/2013/12/13-12-08-THE-INTERNATIONAL-IR-FRAMEWORK-2-1.pdf>
- IIRC (International Integrated Reporting Council). (2021). International <IR> framework. <https://www.integratedreporting.org/wp-content/uploads/2021/01/InternationalIntegratedReportingFramework.pdf>
- Karayiğit Kırıktır, T. (2026). Sürdürülebilirlik raporlamanın muhasebe boyutu: İçerik analizi. *Muhasebe ve Denetime Bakış*, 26(79), 253–274. <https://doi.org/10.55322/mdbakis.1896787>
- KGK (Public Oversight, Accounting and Auditing Standards Authority). (2023). Türkiye Sustainability Reporting Standards. <https://www.kgk.gov.tr>
- Köse, T., & Ağdeniz, Ş. (2023). Sürdürülebilirlik muhasebe standartlarının entegre raporlamada kullanımına ilişkin bir araştırma. *Muhasebe Bilim Dünyası Dergisi*, 25(MODAVICA Özel Sayısı), ÖS285–ÖS308.

- Rea, M. A. (2026). Connectivity: A new “portemanteau” concept in corporate reporting? A preliminary literature review on linkages between financial and sustainability information. *Sustainability*, 18, 9228. <https://doi.org/10.3390/su18189228>
- Rivera-Arrubla, Y. A., & Zorio-Grima, A. (2016). Integrated reporting, connectivity, and social media. *Psychology & Marketing*, 33(12), 1159–1165. <https://doi.org/10.1002/mar.20953>
- Roslan, N., & Mohd Saleh, N. (2023). Connectivity in integrated report: A systematic literature review. *Asian Journal of Accounting and Governance*, 20, 76–92. <https://doi.org/10.17576/AJAG-2023-20-06>
- Sultanoglu, B., & Akdoğan, N. (2020). IIRC çerçevesi kapsamında entegre raporlardaki içerik öğelerinin Türkiye ve uluslararası karşılaştırılması ve entegre raporların düzenlenmesinde sürdürülebilirlik raporlarındaki bilgilerin kullanımı. *Muhasebe Bilim Dünyası Dergisi*, 22(Özel Sayı), ÖS20–ÖS46. <https://doi.org/10.31460/mbdd.646683>
- Tirado-Valencia, P., de Vicente-Lama, M., Cordobés-Madueño, M., & Ruiz-Lozano, M. (2024). Determinants of interconnected corporate information: Evidence of the connectivity principle in integrated reporting. *European Research on Management and Business Economics*, 30, 100255. <https://doi.org/10.1016/j.iedeen.2024.100255>
- Türkiye Petrol Rafinerileri A.Ş. (Tüpraş). (2025). 2024 Entegre Faaliyet Raporu [2024 Integrated Annual Report]. <https://www.tupras.com.tr/assets/uploads/entegre-faaliyet/tupras-2024-entegre-faaliyet-raporu.pdf>
- Wang, R., Chua, W. F., Simnett, R., & Zhou, S. (2024). Is greater connectivity of financial and non-financial information in annual reports valued by market participants? *The British Accounting Review*, 56(6), 101407. <https://doi.org/10.1016/j.bar.2024.101407>
- Zeytin, M. (2026). Assessment of climate change-related financial risks in insurance companies within the TSRS 2 framework. *Doğuş Üniversitesi Dergisi*, 27(1), 1567–1587. <https://doi.org/10.31671/doujournal.1899201>

APPENDIX A. 35-Observation Coding Table

No.	TSRS Requirement /	Disclosure Evidence	Financial Connection	Monetary amount	Financial Statement / Source Mapping		Coding Rationale
1	TSRS 1 29(a)	Sustainability risks and future financial adequacy; 160 total risks, 61 sustainability-related risks.	Indirect financial effect / financial adequacy	—	Risk / TSRS disclosure	Level 1	Potential financial effect described, but no specific monetary amount.
2	TSRS 1 29(b)	Effects of sustainability risks and opportunities on business model and value chain.	Business model / financial implications	—	TSRS disclosure	Level 1	Financial connection is described conceptually.
3	TSRS 1 30(a)	31 risks potentially affecting financial position, performance and cash flows; 3 significant financial-effect risks.	Financial position / performance / cash flow	—	Risk inventory / TSRS disclosure	Level 1	Potential financial effects are identified, but no direct recognized amount.
4	TSRS 1 44(a)	Risk monitoring includes financial effects.	Financial risk monitoring	—	Risk management / TSRS disclosure	Level 1	Financial monitoring is described without a specific monetary link.
5	TSRS 1 44(a-i)	Potential changes in cash flow and profitability are considered.	Cash flow / profitability	—	Risk management / TSRS disclosure	Level 1	Potential effects are described rather than recognized.
6	TSRS 1 33(c)	Low/zero-carbon technology and efficiency considerations in strategic and location decisions; efficiency and cost considerations.	Investment / strategic decision	—	Strategy / investment decision	Level 2A	Sustainability information enters financial/strategic decision-making.
7	TSRS 2 9(c)	Internal/shadow carbon pricing used in financial and investment assessment.	Investment / financial evaluation	25–43 USD/tCO ₂ e	Investment evaluation	Level 2A	Carbon price is an input to financial decision-making.

8	TSRS 2 9(d)	Climate risks incorporated into financial planning and investment metrics.	Financial planning / investment	Investment, EBITDA, ROIC, net debt/EBITDA	Financial planning / strategy	Level 2A	Climate considerations are integrated into financial planning.
9	TSRS 2 14(a)	Strategic Transformation Plan includes low-carbon investments.	Capital allocation / strategy	—	Strategic Transformation Plan	Level 2A	Sustainability is integrated into strategic investment planning.
10	TSRS 2 14(a-i)	Taxonomy opinion required for all investment projects.	Investment screening / capital allocation	—	Taxonomy / investment system	Level 2A	Sustainability assessment is embedded in investment approval.
11	TSRS 2 14(a-iv)	Shadow carbon price applied in investment assessment.	Investment evaluation	25/33/38/43 USD/tCO ₂ e	Investment feasibility	Level 2A	Explicit financial decision input.
12	TSRS 2 15(a)	CapEx, financing and investment strategy shaped by low-carbon transition.	CapEx / financing / investment strategy	—	TSRS 2 / strategy	Level 2A	Direct connection to financial decision-making.
13	TSRS 2 15(a)	Sustainable refining investment expenditure.	Investment expenditure	190 million USD per year, 2022–2030	Strategic investment	Level 2B	Explicit monetary investment amount.
14	TSRS 2 15(a)	Environmental investment and operating expenses.	Investment / operating expenditure	6.493 billion TL	Sustainability performance indicators	Level 2B	Explicit monetary indicator.

15	TSRS 2 15(a)	Environmental investments.	Investment expenditure	4.914 billion TL	Sustainability performance indicators	Level 2B	Explicit monetary indicator.
16	TSRS 2 15(a)	Environmental operating expenses.	Operating expenditure	1.580 billion TL	Sustainability performance indicators	Level 2B	Explicit monetary indicator.
17	TSRS 2 15(a)	Water-related operational improvement investment and expenses.	Investment / operating expenditure	2.508 billion TL	Sustainability performance indicators	Level 2B	Explicit monetary indicator.
18	TSRS 2 15(a)	Water-related investments.	Investment expenditure	1.578 billion TL	Sustainability performance indicators	Level 2B	Explicit monetary indicator.
19	TSRS 2 15(a)	Emission-reduction investment and expenses.	Investment / operating expenditure	3.848 billion TL	Sustainability performance indicators	Level 2B	Explicit monetary indicator.
20	TSRS 2 15(a)	Emission-reduction investments.	Investment expenditure	3.205 billion TL	Sustainability performance indicators	Level 2B	Explicit monetary indicator.
21	TSRS 2 15(a)	Climate mitigation/adaptation CapEx separately reported under EU Taxonomy.	Capital expenditure	Separately reported	EU Taxonomy CapEx	Level 2B	Explicit CapEx linkage.

22	TSRS 2 15(a)	Zero-carbon electricity revenue separately reported.	Revenue	Separately reported	EU Taxonomy / sustainability reporting	Level 2B	Explicit revenue linkage.
23	TSRS 2 15(b)	Future financial effects include investment shares, EBITDA, investment expenditure, ROIC, net debt/EBITDA and dividend payout.	Financial performance / capital allocation	Multiple financial metrics	Strategic Transformation Plan	Level 2B	Sustainability-related future effects are connected to monetary/financial metrics.
24	TSRS 2 16(a)	Current financial effects linked to sustainability monetary KPIs, taxonomy CapEx and revenue.	Current financial effects	Multiple monetary indicators	TSRS 2 financial-effects disclosure	Level 2B	Explicit monetary linkage.
25	TSRS 2 16(b)	Climate risks may require adjustments to asset/liability carrying amounts; carbon pricing, ETS and sustainable finance identified as	Asset/liability valuation	Potential impairment/restructuring	Financial statements / accounting implications	Level 1	Potential effect is identified, but no specific recognized amount was identified.
26	TSRS 2 25(b)	Scenario analysis identifies opportunities such as low-carbon products, green hydrogen, biofuels and efficiency.	Opportunity evaluation / investment	—	Scenario analysis	Level 2A	Opportunities are evaluated for financial return and investment prioritization.
27	TSRS 2 25(c)	Climate risks and opportunities integrated into ERM, strategic planning and investment decisions.	Risk management / strategic planning / investment	—	ERM / strategy / investment	Level 2A	Explicit decision linkage.
28	TSRS 2 29(b)	ETS/carbon pricing exposure; 90–95% of activities directly affected.	Potential cost / cash-flow effect	—	Climate risk disclosure	Level 1	Potential financial effect; no recognized monetary amount.

29	TSRS 2 29(c)	Sea-level rise, flooding, corrosion, maintenance costs and water stress risks.	Potential operating / maintenance cost	—	Climate risk disclosure	Level 1	Potential financial cost described without recognized amount.
30	TSRS 2 29(d)	Climate opportunity-aligned investments in sustainable refining, zero-carbon electricity, green hydrogen, biofuels and efficiency.	Investment / capital allocation	—	Climate opportunity disclosure	Level 2A	Sustainability opportunities guide investment allocation.
31	TSRS 2 29(e)	Climate capital allocation: sustainable refining and total strategic investments.	Capital allocation	2.3 billion USD sustainable refining; 5 billion USD total strategic investments	Strategic Transformation Plan	Level 2B	Explicit monetary investment amounts.
32	TSRS 2 29(f-i)	Internal carbon price used in investment feasibility.	Investment evaluation	25/33/38/43 USD/tCO ₂ e	Carbon pricing / investment feasibility	Level 2A	Financial decision input.
33	Related TSRS 2 disclosure	Energy-efficiency projects generate financial savings.	Financial savings	19.2 million USD	Energy-efficiency performance	Level 2B	Explicit monetary savings.
34	Related TSRS 2 disclosure	Energy-efficiency projects generate material/economic gain.	Economic gain	630 million TL	Energy-efficiency performance	Level 2B	Explicit monetary gain.
35	Related TSRS 2 disclosure	Zero-carbon electricity investment expenditure.	Investment expenditure	17.7 million USD	Business model / zero-carbon electricity	Level 2B	Explicit monetary investment amount.

Source: Prepared by the author based on Tüpraş (2025).

Appendix B. Financial Statement Linkage Assessment Checklist

No.	Assessment criterion	Evidence required for direct linkage
1	Identification of the sustainability-related issue	A specific sustainability-related risk, opportunity, investment, or expenditure is identified.
2	Identification of the financial statement item	A specific item in the statement of financial position, statement of profit or loss, cash flow statement, or related notes is identified.
3	Explicit relationship	The report explicitly connects the sustainability-related issue to the identified financial statement item.
4	Monetary traceability	The relevant amount or financial effect can be traced to the identified item or note.
5	Verifiability	The connection can be verified using the report and the related financial statement information.
6	Coding decision	Level 3 is assigned only when the required direct and traceable connection is demonstrated.

Source: Developed by the author based on the analytical coding framework used in this study.