

# EXPLORING SUSTAINABLE TAX POLICY IN TÜRKİYE: A QUALITATIVE ANALYSIS OF CORPORATE AND PUBLIC DISCOURSE IN THE ENERGY SECTOR

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## Abstract

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This article examines the effect of sustainable taxation policies on public policy and institutional strategies for energy in Türkiye. The methodology of the study was to analyze the activity, sustainability, and integrated reports of a select number (10) of energy companies listed in the Borsa Istanbul (BIST) Sustainability Index over the period of 2021–2023 and to include relevant documents from public institutions in the qualitative content analysis. To complete the code creation process, the literature review and policy document analysis were categorized thematically. These categories included border carbon adjustment mechanism [BCAM] (*sinirda karbon düzenleme mekanizması* [SKDM]), carbon taxes, green finance tools, and tax incentives, which were the main themes identified through the thematic analysis. Through the analysis, it was evident that while businesses have not yet implemented the carbon tax model as an intentional strategy, they have made investments in renewable energy, energy-efficient practices, and received government incentives. Therefore, due to the ambiguity of carbon pricing instruments, there is considerable uncertainty regarding their implementation and significant institutional disparities in reporting such instruments, which create obstacles to the sector's transformation. This article contributes to showing how removing uncertainties about carbon pricing, clearly defining incentives, and enhancing the capacity of sustainable finance contribute to the green transformation process in the case of Türkiye. These findings are also supported by the literature (Aydın, 2018; Bakış et al., 2022).

**Keywords:** Energy Sector, Carbon Tax, Sustainability, Green Finance, Emissions Trading System, Renewable Energy

**Authors' individual contribution:** Conceptualization — G.K. and T.U.K.; Methodology — G.K.; Software — G.K.; Formal Analysis — G.K.; Resources — T.U.K.; Data Curation — G.K.; Writing — Original Draft — G.K. and T.U.K.; Writing — Review & Editing — G.K. and T.U.K.; Visualization — G.K.

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## 1. INTRODUCTION

Sustainable development involves a holistic approach that addresses economic, environmental, and social dimensions. Tax policies are among

the key regulatory tools designed to encourage businesses to reduce their environmental impact through carbon taxes, environmental taxes, and numerous financial incentives (Ekawati et al., 2025; Mbama & Mfelam, 2025). In Turkey, while the energy

sector tax structure has been maintained in a traditional form based on fuel and consumption taxes for a long time (Görkem, 2019), carbon pricing mechanisms that would be compliant with the Paris Agreement have become more debated over the last few years (Bakış et al., 2022; Nawaz et al., 2025; Patel et al., 2024). In spite of that, no national carbon tax or operational emissions trading system has ever been implemented.

The main drivers of transition to green tax policies involve the adoption of a carbon tax (Aydın, 2018), the allocation of environmental tax revenues to green programs (Cao & Liu, 2023; Dębniak, 2018; Thanasas et al., 2023; Faijaidee & Sapsanguanboon, 2025), and the use of multi-dimensional tax incentive packages (Değirmenci & Yavuz, 2024). However, long-term effectiveness remains limited due to a failure of the incentives thus far to consider regional and sectoral differences adequately (Serdinova, 2024; He, 2024). Studies in the literature that holistically evaluate the extent to which sustainable tax policies are reflected in corporate strategies, the level of preparedness for international regulations such as carbon pricing and the border carbon adjustment mechanism [BCAM] (*sinirda karbon düzenleme mekanizması* [SKDM]), and the impact of existing incentives on investment decisions are limited, particularly in the Turkish energy sector. This indicates a considerable research gap that exists in the literature.

In this context, the study focuses on the activity, sustainability, and integrated reports of 10 energy companies that are ranked in the Borsa Istanbul (BIST) Sustainability Index with qualitative content and document analysis in the 2021–2023 period. Preparations for carbon tax and emissions trading, the extent to which tax incentives were used over the given period, possible impacts of green financing instruments, including but not limited to green bonds, on corporate strategy, and how renewable energy investments and emission reduction policies are reflected in company practice were analyzed. The findings show that companies have so far not developed a strategy directly linked to the carbon tax; however, companies partially align with policy objectives through renewable energy investments and existing incentive mechanisms. At the same time, reporting discrepancies, regulatory uncertainties, and access to finance challenges persist as big bottlenecks for transformation in this sector.

This study aims to identify the compliance of companies operating in the energy sector in Türkiye with sustainable tax policies and also aims to reveal in detail the impact of this process on corporate strategy and financing behavior. In this context, the research assesses the companies' compliance with national and international sustainability frameworks based on their activities, sustainability, and integrated reports, and key public policy documents such as the National Energy Strategy, the 12th Development Plan for 2024–2028, and the Green Finance Strategy.

The study addresses the following questions:

*RQ1: To what degree do energy companies follow sustainable tax policies?*

*RQ2: How do tax incentives and green financing affect investment decisions?*

*RQ3: How prepared are businesses with existing regulatory mechanisms, for example, the carbon tax?*

*RQ4: What are the most important strategies and gaps in BIST Sustainability Index firms?*

*RQ5: What are the policy recommendations that will improve compliance, and therefore the policy impact?*

The theoretical underpinning for this study is the theories of public finance, especially externality theory, environmental taxation, and the effectiveness of tax incentives.

The Pigouvian tax theory argues for the internalization of negative externalities, such as pollution, through taxation, so that markets show the real cost of environmental degradation (Pigou, 1920).

The theoretical background of environmental taxation rests on the principle of “polluter pays” and assumes that such a tax has revenue and behavioral functions, where it generates income with the purpose of sustainability.

The efficacy theory of tax incentives focuses on the role of state instruments, such as subsidies, tax reductions, and green financing, in channeling private investment into environmental goals. A key example in Türkiye is YEKDEM (Dönmez, 2023).

These theoretical approaches develop the research design through which a firm would align its strategies in response to evolving public policies on sustainable taxation.

The rest of this article is structured as follows. Section 2 examines the literature on sustainable tax policies in Türkiye and internationally. Section 3 describes the research's methodological approach, dataset, and analysis technique. Section 4 presents the findings of the research. Section 5 discusses the findings in the light of the literature. Section 6 provides the conclusion and policy recommendations.

## 2. LITERATURE REVIEW

### 2.1. Carbon pricing efforts and regulatory adaptation in Türkiye

Although Turkey is still a nation that has not openly imposed a carbon tax or an operational Emissions Trading System (ETS), increasing international pressures — namely that of the European Union's (EU) BCAM/SKDM — have pushed carbon pricing into the domestic energy and climate policy agenda (Aydın, 2018; Bakış et al., 2022). The lack of a comprehensive carbon pricing framework is both an example of a regulatory gap and a threat to Turkey's competitiveness in global trade, especially in carbon-intensive sectors. This concern is widely reflected in comparative international analyses showing that countries without carbon pricing instruments face shrinking competitiveness under tightening global climate governance regimes, particularly when cross-border adjustment mechanisms are in place (Thanasas et al., 2023). This finding relates to the importance of governance capacity within the context of carbon pricing in Türkiye.

To meet this new context, several institutional and legislative reforms were initiated by Turkey. State institutions, such as the Ministry of Environment, Urbanization and Climate Change, and the Energy Market Regulatory Authority (*Enerji*

*Piyasası Düzenleme Kurumu* [EPDK]), are among the forerunners of this process. EPDK promotes renewable energy through licensing provisions, while the Ministry controls greenhouse gas inventories and a national climate strategy (Bayar & Varoğlu, 2022; Görkem, 2019). Neither a national carbon tax nor an ETS that is binding to date was enacted, despite attempts (Erdoğan & Pata, 2025). The same challenges in institutional readiness seem to be at play with respect to many other emerging economies, where climate policies develop more quickly compared with concrete carbon pricing frameworks, making for a governance gap between commitment and implementation (Rubab et al., 2025). The econometric analyses conducted within the Turkish context show that environmental taxes provide significant contributions to reducing CO<sub>2</sub> emissions in the long run and thus allow finding evidence regarding carbon pricing potential (Sarıgül & Topçu, 2021).

Instead, reduction strategies for emissions are based more on indirect means of policy, such as the promotion of renewable energy, for example, renewable energy resources support mechanism (*yenilenebilir enerji kaynakları destekleme mekanizması* [YEKDEM]), energy efficiency, and green policy (Dönmez, 2023). Although they may contribute to mitigation, such tools fail to provide immediate carbon price signals that would internalize environmental externalities, something which environmental economists have contended (Aydın, 2018). Analyses of EU countries prove that when designed correctly, environmental taxes reduce emissions and promote green growth (Thanasas et al., 2023). Thus, Türkiye has to adopt a similar policy framework in its transition to carbon pricing.

For example, while the nationally determined contribution determines the emission target, successful implementation has been carried out by the market-based carbon pricing instrument (Bakiş et al., 2022). Relatively, empirical results show that indirect tools such as renewable energy incentives support long-term transitions but cannot substitute for explicit carbon pricing mechanisms, giving clearer investment signals and stronger mitigation incentives. Poor disclosure quality in developing countries negatively affects the efficiency of carbon markets related to carbon accounting and carbon credit-related studies. In this respect, this underlines that reporting standards are among the key issues to be taken into consideration within the ETS preparations of Türkiye.

Standing in line with SKDM and assuring more international alignment, Turkey itself has conducted some special preparatory work, such as mandating disclosure of industrial plant carbon emissions, constructing legal templates for carbon pricing infrastructure, and encouraging the issuance of financing instruments, including carbon credits and green bonds (Cao & Liu, 2023). These reflect an improvement in institutional capacity and hence may enable the eventual rollout of a national carbon pricing system (Sarıgül & Topçu, 2021). Evidence from studies related to sustainable finance has been pointing out the fact that carbon-oriented financial instruments, such as green bonds, climate-linked credits, and carbon disclosure obligations, increase the environmental accountability of firms and

prepare markets for transitions related to carbon pricing (Huang et al., 2025). Findings underlined the role of transparency in preparing for carbon pricing by especially highlighting that climate risk disclosures are affecting the value of the firm and investor confidence.

However, effective carbon pricing will also depend on strong public-private cooperation and socially oriented transition strategies beyond the readiness of the legislative framework in Türkiye. As emphasized by the literature, efficiency in carbon pricing tools is mandatory to achieve competitiveness and mobilize green investments that drive decarbonization in the energy sector, consistent with international pledges related to climate change (Bekun et al., 2025; Cao & Liu, 2023). Besides, it has been stated that carbon pricing needs to be complemented with credible reporting, robust governance structures, and protection against greenwashing if both policy effectiveness and public trust are to be maintained (Huang et al., 2025; Rubab et al., 2025).

## 2.2. Green taxes and tax incentives in Türkiye

Tax credits and government-backed financing tools stand at the heart of stimulating investments in renewables, particularly in the high-cost areas of wind and solar energy in Türkiye. Such mechanisms include the YEKDEM, investment incentive certificates, and green bonds that have significant roles in the reduction of burden cost on investors, making the projects more viable. YEKDEM guarantees purchase prices for renewable electricity production, hence assuring revenues, while encouraging local production with domestic content premiums. Not a substitute for carbon taxation, it provides indirect support to emission reduction by reducing the risks of initial investments. Yet, incentives may not work alone in order to transform environmental performance for enterprises, as, for example, incentive-driven green accounting practices do not make significant changes in profitability within the mining sector (Nurrasyidin et al., 2024).

Other fiscal incentives provided by investment incentive certificates include value-added tax (VAT) and customs duty exemptions, tax exemptions, and insurance premium support, especially for large-scale and strategic projects (Serdinova, 2024). Several studies note that all these incentives are aimed at economic growth but not specifically at environmental goals, hence their limited applicability to sustainability goals (Savranlar et al., 2024). In this regard, it is argued that the direct transfer of revenues from environmental taxes directly to funds of sustainability or to research and development (R&D) programs will ensure the incentives are more effective in the long term (Dębniak, 2018).

Green bonds and especially foreign loans are gaining momentum as a sustainable financing tool. They provide environmentally conditional funding at preferential interest rates, which increases investor appetite and responsibility (He, 2024; Erdoğan & Pata, 2025). International literature indicates that green bonds speed up financial markets in their transformation to sustainability by bringing more transparency and accountability in carbon reduction projects (Huang et al. 2025).

Despite all these developments, there is still a lack of certainty for investors, especially when Organisation for Economic Co-operation and Development (OECD) and EU countries already have a robust mechanism at work for pricing carbon; yet Turkey still has no direct carbon tax or a mechanism of green tax. According to Aydın (2018) and Degirmenci and Yavuz (2024), regulatory harmonization in Türkiye is necessary to match the pace of countries like the OECD and EU countries so that it does not fall behind in low-carbon technological transformation and emission reduction.

### 2.3. Overview of the literature on sustainable tax policies in the energy sector

Literature on the energy sector in Türkiye illustrates a complex interlock among tax policy, environmental sustainability, and economic development. Hence, studies have analyzed the variably consequential functions of taxation, from environmental protection to the attraction of investment, thereby determining their success in promoting a low-carbon economy.

First of all, a number of studies reveal that sustainable taxation is required, which will reconcile growth and environmental goals. Although tax exemptions in Türkiye are widely used to develop the regions, they often dilute the environmental focus and make such incentives less effective in the long term (Serdinova, 2024).

The role of environmental and carbon taxation is increasingly underlined in the literature. Examples from EU countries show that targeted taxation, especially internalization of externalities, reduces emissions and builds green transitions. Contrarily, fuel and motor vehicle taxes in Türkiye serve mainly fiscal purposes, and their contribution to climate targets is limited. Some research indicates that, especially if revenues of carbon taxes are used for green infrastructure or R&D, they can provide a serious boost toward decarbonization.

Thirdly, the experience accumulated so far concerning the development of renewable energy with the help of tax incentives is already well-proven. On one hand, the government grants relevant tax incentives or VAT exemptions and customs duty reliefs, while on the other hand, it uses other tools to promote high-capital renewables projects in Türkiye, such as YEKDEM. The instruments support R&D at the private sector level and enhance the competitiveness of the industries. According to Bayar and Varoğlu (2022), incentive policies for certain industries, including electric vehicles, have not yet reached the EU level, while the overall efficiency of tax incentives is disputed by Ökde (2022).

The call for revenues from future environmental charges to be brought back into sustainability-oriented funds, with a view to making these have their long-term impact, is one common refrain running through the literature.

Finally, econometric and empirical research identifies the two-sided benefit of environmental tax in emissions control and public revenue stabilization (Bekun et al., 2025; Erdoğan & Pata, 2025). Structural efficiency issues exist in Türkiye due to the limited recycling of environmental tax revenues for green

projects (Görkem, 2019). It has also been indicated that carbon risk transparency reporting practices further raise economic resilience at the corporate level and put firms in a better position to meet the upcoming challenges of a low-carbon transition.

The aspect of interdisciplinarity with regard to the coupling of taxation with innovation policy and institutional reform in supporting ideal climate outcomes can be shared by such scholars as Deniz and Eroğlu (2024) and Sarıgül and Topçu (2021).

To put it briefly, here is the clear message from the literature: while Türkiye has made the alignment of its fiscal instruments with environmental objectives more coherent, full tax reform is a key element of revenue recycling and long-term planning for green transition success.

## 3. RESEARCH METHODOLOGY

### 3.1. Research method

This information is summarized in Table 2, including the data sources, keywords, and analytic criteria.

The analysis done in the present work covered the following aspects:

- Carbon pricing mechanisms: Firm preparedness due to the possible carbon tax, ETS, and SKDM regulations in particular, for exportations oriented at the EU.

- Tax incentives and green finance: The extent to which incentives are taken up, such as YEKDEM, and other instruments, including green bonds.

- Renewable energy investments: Evaluation of net-zero objectives concerning hybrid projects, including the case of battery storage, considering environmental impact and fiscal drivers.

- Corporate approaches to sustainable tax policy: How the tax strategy is aligned with environmental, social, and governance (ESG) objectives, including tax ethics and low-carbon transition plans in light of public finance policy. This integrated deductive-inductive approach avoids interpretive bias and thus links strategies in the private sector with the evolving carbon pricing agenda in Türkiye.

Quantitative methods based on surveys may provide managerial perceptions concerning sustainable tax policies. Still, a dearth of accessibility and the inability to examine historical reporting practices reduce their feasibility for the approach adopted in this study. Semi-structured interviews may provide rich qualitative data. However, practical considerations, such as time, accessibility, and issues of confidentiality, have made this option a less feasible alternative. This, therefore, leaves the document-based qualitative content analysis as the best means to conduct this study, as it allows an in-depth, systematic, and context-sensitive assessment of the way in which companies articulate their strategies in relation to evolving sustainable tax policies.

### 3.2. Sample selection

The sample of this study consists of 10 companies operating in the energy sector and included in the BIST Sustainability Index (see Table 1). The companies in question were selected because

they are included in the index by considering ESG performance criteria. In addition, the central role of the energy sector in Türkiye's green transformation process and the advanced sustainability reporting practices of these companies were also determining factors in sample selection.

The study examined the activity, sustainability, and integrated reports published by these companies between 2021 and 2023. This period represents a period when global policies, such as the EU's SKDM, were on Türkiye's agenda, and a significant increase was observed in companies' sustainability-focused policies and reporting.

**Table 1.** Companies examined

No.	Company	Website	Subject reports of the study
1	Akenerji	<a href="https://www.akenerji.com.tr/entegre-faaliyet-raporlari">https://www.akenerji.com.tr/entegre-faaliyet-raporlari</a>	2021-2022-2023 Integrated Reports
2	Aksa Enerji	<a href="https://www.aksaenerji.com.tr/etki/surdurulebilirlik">https://www.aksaenerji.com.tr/etki/surdurulebilirlik</a>	2021-2022-2023 Sustainability Reports
3	Aydem Enerji	<a href="https://www.aydemrenewablesinvestorrelations.com.tr/raporlar/surdurulebilirlik-raporlari">https://www.aydemrenewablesinvestorrelations.com.tr/raporlar/surdurulebilirlik-raporlari</a>	2021-2022 Sustainability Reports, 2023 Integrated Report
4	Enerjisa	<a href="https://www.enerjisainvestorrelations.com/surdurulebilirlik/surdurulebilirlik-raporlari">https://www.enerjisainvestorrelations.com/surdurulebilirlik/surdurulebilirlik-raporlari</a>	2021-2023 Sustainability Reports
5	Esenboğa Elektrik	<a href="https://esenbogaelektrik.com.tr/yatirimci-iliskileri/faaliyet-raporlari">https://esenbogaelektrik.com.tr/yatirimci-iliskileri/faaliyet-raporlari</a>	2021-2022 Activity Reports, 2023 Sustainability Report
6	Galata Wind	<a href="https://www.galatawindenerji.com/surdurulebilirlik/surdurulebilirlik-yonetimi/surdurulebilirlik-raporu">https://www.galatawindenerji.com/surdurulebilirlik/surdurulebilirlik-yonetimi/surdurulebilirlik-raporu</a>	2021 Activity Report, 2022-2023 Sustainability Reports
7	Margün Enerji	<a href="https://www.margunenerji.com.tr/yatirimci-iliskileri/surdurulebilirlik-uyum-raporu">https://www.margunenerji.com.tr/yatirimci-iliskileri/surdurulebilirlik-uyum-raporu</a>	2021-2022 Activity Reports, 2023 Sustainability Report
8	Naturel Enerji	<a href="https://www.naturelenerji.com.tr/yatirimci-iliskileri/surdurulebilirlik-uyum-raporu">https://www.naturelenerji.com.tr/yatirimci-iliskileri/surdurulebilirlik-uyum-raporu</a>	2021-2022 Activity Reports, 2023 Sustainability Report
9	Smart Enerji	<a href="https://www.smartsolar.com.tr/surdurulebilirlik-dokumanlari.aspx">https://www.smartsolar.com.tr/surdurulebilirlik-dokumanlari.aspx</a>	2021 Activity Report, 2022-2023 Sustainability Report
10	Zorlu Enerji	<a href="https://www.zorluenerji.com.tr/tr/surdurulebilirlik/surdurulebilirlik-yonetimi/surdurulebilirlik-raporlari">https://www.zorluenerji.com.tr/tr/surdurulebilirlik/surdurulebilirlik-yonetimi/surdurulebilirlik-raporlari</a>	2021-2022-2023 Integrated Reports

These companies were subjected to content analysis in line with the following criteria:

- Renewable energy investments and environmental impact reduction strategies;
- Levels of benefiting from government incentives and supports;
- Direct or indirect approaches to sustainable tax policies;
- Levels of integration with national and international regulations (e.g., SKDM).

Thanks to this analysis, the relationships of companies with public policies from a sustainability perspective and the effects of these policies on the sector were evaluated in a holistic manner.

### 3.3. Data collection process

The data collection process of this research is based on a qualitative document review. Within the scope of the sample, the activity, sustainability, and integrated reports of 10 energy companies included in the BIST Sustainability Index for the period 2021-2023 were analyzed. These documents were used as the primary data source to evaluate the companies' approaches to sustainable tax policies, their levels of institutional compliance with national policies, and their environmental strategies.

#### 3.3.1. Company reports and financial data

The following elements were evaluated within the scope of qualitative content analysis to understand the companies' institutional strategies and their levels of integration with public policies:

- Strategies for international carbon pricing systems, such as carbon tax and SKDM;
- Renewable energy investments, use of incentives under YEKDEM, and sustainable financing instruments (e.g., green bonds);
- Level of compliance with emission reduction targets and international standards such as

the Science Based Targets initiative, Carbon Disclosure Project;

- Impact of tax incentives applied in Türkiye on the companies' environmental and managerial strategies.

Financial data were evaluated based on the strategic explanations and policy approaches presented in the report content, rather than numerical data analysis, and were addressed within the scope of qualitative analysis.

#### 3.3.2. Public documents and state policies

In addition to company documents, basic strategy documents regarding public policies also constitute the secondary data sources of the research. These documents were selected as decisive texts in terms of the energy sector and the green transformation process, which contain content that will enable a comparative analysis of private sector strategies with public policies.

During the selection process, the following criteria were considered:

- Policy-making nature;
- Proximity to the date of analysis;
- Direct relevance to the thematic framework of the study was taken into consideration.

Public documents used:

- EPDK National Energy Strategy Documents (2015): Renewable energy incentives, governance, and regulations.
- 12th Development Plan (2024-2028): Integration into carbon markets and sustainable development targets.
- Ministry of Treasury and Finance Green Finance Strategy (2021): Green bond markets and sustainable debt strategies.
- Energy Efficiency Development Program (2015): Energy efficiency investments and public-private sector collaborations.

The 2021-2023 period has been determined as a transition period in which Türkiye's green

transformation policies gain momentum and the adaptation process to international carbon regulations takes shape. In this context, the institutional responses of companies to this transformation process and the level of compliance they demonstrate with policy documents have been systematically analyzed.

### 3.4. Data analysis method

Data were analyzed in MAXQDA with a semi-structured coding frame built from the literature and policy documents. Two researchers independently generated an initial codebook, applied it to company reports and public regulations, and refined it iteratively by combining deductive (literature-driven) and inductive (emerging) codes. Coding disagreements were resolved by discussion; unresolved cases were decided by a third expert to ensure reliability. Patterns were explored using the frequency and context facilities in MAXQDA.

The codes have been grouped under four themes, namely: 1) carbon pricing mechanisms; 2) tax incentives and green finance; 3) renewable-energy investments and sustainability strategies; and 4) corporate approaches to sustainable tax policy. This study is based on an interpretative qualitative research design by combining document review with the content analysis of energy companies listed in the BIST Sustainability Index, along with their approaches concerning sustainable tax policies. The content analysis of company reports and policy documents was enabled through the use of the MAXQDA software.

This dataset consists of 30 reports, which cover activity reports, sustainability reports, and integrated reports of 10 companies during the period of 2021-2023. Besides these, national policy documents that were developed by

institutions such as EPDK, the Ministry of Treasury and Finance, and the Presidency of Strategy and Budget were studied by the researchers (Ministry of Energy and Natural Resources, 2015; Ministry of Treasury and Finance, 2021; Decision regarding the approval of the twelfth development plan (2024-2028), 2023).

Coding was developed with the preliminary categories identified through literature and relevant policy texts in mind. Key codes included:

- Carbon tax;
- Green incentives;
- Renewable energy investments;
- Lack of regulation.

These were grouped into three core themes:

- 1) Fiscal policies for climate change;
- 2) How the private sector is adapting to sustainability;
- 3) Obstacles to the implementation of sustainable tax policies.

Two researchers independently coded the dataset, and any differences were reconciled through discussion. The analytical framework has provided an organized way to explore how businesses implement the tax policies associated with sustainability, take advantage of existing incentives, and build environmental responsibility into their overall corporate strategies. The qualitative content analysis method used in this study was one of several ways to examine the same information using different research methods. One example of an additional research approach that could have been used is quantitative content analysis. A quantitative content analysis would provide overall statistical counts of words and identify how common words or phrases appeared in company documents; however, a quantitative approach does not provide as much insight into how a company's sustainability narrative conveys its strategic and contextual meaning.

**Table 2.** Themes and evaluation criteria examined in the analysis process

Theme	Keywords	Data sources	Examined elements
1. Carbon pricing mechanisms	Carbon tax, SKDM, ETS, carbon markets	Company reports, SKDM and ETS regulations, EPDK	<ul style="list-style-type: none"> <li>- Companies' preparedness level for carbon pricing policies;</li> <li>- Efforts to comply with SKDM regulations;</li> <li>- Participation strategies in emissions trading.</li> </ul>
2. Tax incentives and green finance instruments	Green taxes, tax incentives, YEKDEM, green bonds, sustainable finance models, green finance, environmental taxes	Company reports, Ministry of Treasury and Finance's Green Finance Strategy, Strategy and Budget Directorate's 12th Development Plan	<ul style="list-style-type: none"> <li>- Incentives utilized by companies and their fiscal impact;</li> <li>- Usage of green finance instruments;</li> <li>- The effect of tax incentives on companies' investment decisions.</li> </ul>
3. Renewable energy investments and sustainability strategies	Hybrid energy projects, net zero targets, carbon-neutral strategies, battery storage systems, renewable energy, emission reduction, energy efficiency	Company reports, EPDK National Energy Strategy Documents, Energy Efficiency Improvement Program	<ul style="list-style-type: none"> <li>- Companies' orientation toward renewable energy investments;</li> <li>- Projects supported by government incentives;</li> <li>- Strategies toward achieving net-zero goals.</li> </ul>
4. Companies' general approach to sustainable tax policies	Corporate sustainability strategies and tax compliance, social responsibility and tax ethics, financial sustainability and transition to a low-carbon economy, transparency and accountability, and environmental regulations	Company reports, strategic documents of the Ministry of Treasury and Finance	<ul style="list-style-type: none"> <li>- Level of integration of sustainability strategies into tax policies;</li> <li>- Perspectives on tax policies in terms of social responsibility;</li> <li>- Transition plans toward a low-carbon economy.</li> </ul>

### 3.5. Validity and reliability

Two researchers completed coding separately to validate and ensure reliability, with consensus reached on any differences in how the coding was completed. The coding framework incorporated both deduction from published literature and policy documents, and induction from analysis of the data through an “evolving” process.

Reliability was increased by providing clear descriptions of the process, establishing reproducibility of the thematic coding process, and providing a documented, systematic procedure to follow regarding how the coding was to be completed. To ensure consistency in the results of the findings, the results were confirmed against other published academic studies in the same area. To ensure validity, the information used in preparing the company reports and policy documents was acquired from an appropriate and current official source that was publicly available. The transparency and contextual relevance of these sources enhanced the credibility and robustness of the analysis.

### 3.6. Limitations of the study

This research only covers energy companies in the BIST Sustainability Index and cannot, therefore, be generalized for other sectors. The reports analyzed cover the years 2021–2023, so long-term trends may not be captured. Variances in reporting by the analyzed companies and differences in terminology used posed a challenge in data analysis. While document and content analysis methods were performed within a systematic framework, the change of expressions according to context carries the risk of interpretation subjectivity. In consideration of all the limitations, the findings reflect general trends of sustainable tax policies in the energy sector.

## 4. FINDINGS AND ANALYSIS

### 4.1. Results within the scope of keywords examined in the analysis process

In this part, the frequency analysis of the keywords determined within the scope of the reports examined between 2021 and 2023, and the findings obtained are evaluated. The frequencies of keywords are shown in Table 3.

**Table 3.** Keyword frequency from sustainability reports by energy companies, 2021–2023

No.	Keyword	Frequency	Percentage
1	Renewable energy	382	9%
2	Green finance	259	6%
3	Energy efficiency	245	6%
4	Emission reduction	244	6%
5	SKDM	225	6%
6	Financial sustainability	219	5%
7	Sustainable finance	197	5%
8	Corporate sustainability strategies and tax compliance	184	5%
9	ETS	166	4%
10	YEKDEM	166	4%
11	Carbon markets	164	4%
12	Low-carbon economy	164	4%
13	Carbon tax	148	4%
14	Tax incentives	141	3%
15	Transparency and accountability	141	3%
16	Net-zero targets	129	3%
17	Green bonds	119	3%
18	Social responsibility and tax ethics	118	3%
19	Environmental taxes	117	3%
20	Environmental regulations	117	3%
21	Green taxes	115	3%
22	Battery storage systems	104	3%
23	Carbon-neutral strategies	97	2%
24	Hybrid energy projects	94	2%
<b>Total</b>		<b>4055</b>	<b>100%</b>

Table 3 is showing that renewable energy at 382 mentions (9%), green financing at 259 (6%), and emission reduction at 244 (6%) are dominant themes. High frequencies of energy efficiency at 245 (6%) and SKDM at 225 (6%) indicate a growing emphasis on EU-aligned carbon reduction compliance.

Keywords such as “financial sustainability” (219, 5%), “sustainable finance” (197, 5%), and “green bonds” (119, 3%) deal with increasing dependency on financial mechanisms to support low-carbon projects. Significant other keywords were: carbon tax 148, ETS 166, and carbon markets 164, all of which reflect sector expectations around carbon price frameworks.

Other governance-related terms showing companies’ ESG alignment include tax compliance at 184 and 5%, and transparency at 141 and 3%. Less prominent emerging terms include net-zero targets at 129, carbon-neutral strategies at 97, battery storage at 104, and hybrid projects at 94, representing the direction of future investments.

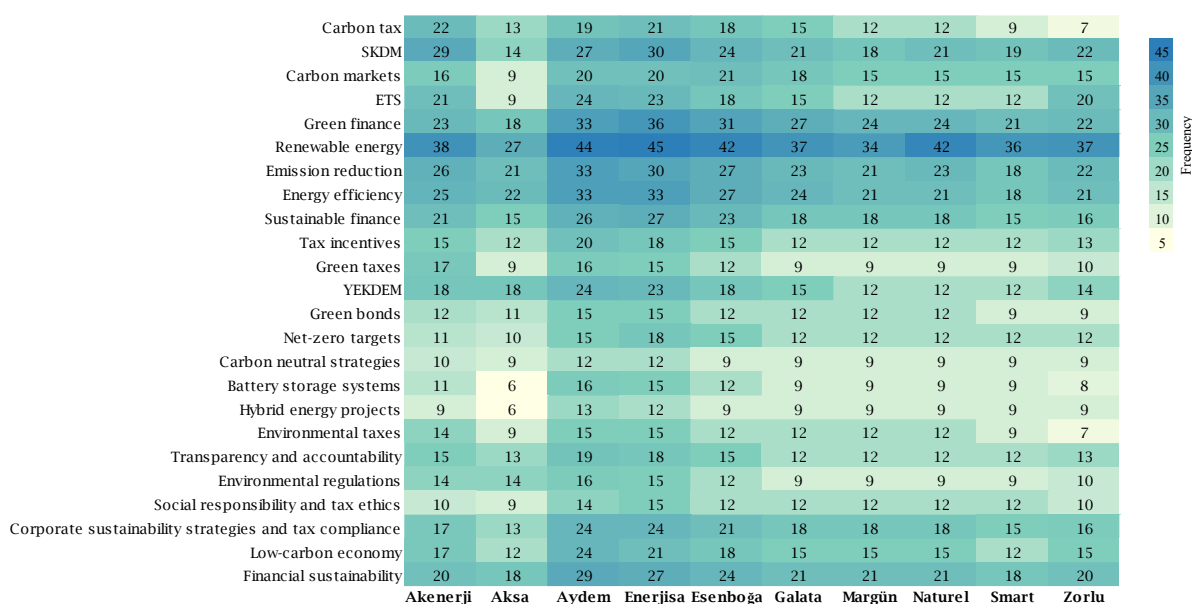
The trend is that Turkish energy companies focus on renewable energy and carbon management, driven by incentives and regulatory pressure. This tendency has been supported by the literature: tax incentives — Dönmez (2023), EU regulation — Aydın (2018), green financing tools — Cao and Liu (2023),

play a facilitator role in setting a corporate sustainability agenda (Bekun et al., 2025).

The findings of the keyword frequency analysis across the sustainability reports from 2021 to 2023

are further interpreted by showing, in Figure 1 below, a heatmap that summarizes the distribution of 24 key themes across 10 energy companies listed in the BIST Sustainability Index.

**Figure 1.** Keyword frequency heatmap across energy companies (2021–2023)



This is again evidenced by the heatmap, where “Renewable energy” is the most-mentioned theme, especially by companies such as Aydem, Enerjisa, Zorlu, and Smart, and reflects alignment with the 2053 Net Zero Target of Türkiye and EU climate regulations such as SKDM and ETS.

The repeated use of “Green finance”, “Financial sustainability”, and “Sustainable finance” also signifies the extent of reliance on financial tools in the form of green bonds and carbon credits. This indeed makes Aydem and Enerjisa unusually remarkable in that respect, aligned with their proactive investment strategy.

In companies like Akenerji and Enerjisa, policy-related terms include “Carbon tax”, “ETS”, and “SKDM”; these indicate growing awareness and preparedness against the future carbon pricing framework in Türkiye.

Other keywords related to governance are “Corporate sustainability and tax compliance” and “Transparency”, which have been emphasized by companies like Aydem and Akenerji that are showing stronger ESG alignment.

On the other extreme, the emergent “Battery storage” and “Hybrid projects” pop up less frequently, further evidencing investment in those areas as limited. In general, this heatmap strengthens the findings that Turkish energy firms are focused on renewable energy and regulatory alignment while next-generation technologies remain at an early stage.

All of these key phrase patterns taken together may indicate that sustainability reporting in the Turkish energy sector is driven mainly by regulatory pressures and incentive mechanisms rather than voluntary strategic transformation. The fact that renewable energy and finance-related terms are dominant may signal tactical firm responses to the existing incentive structure, while

low emphasis on emerging technologies is indicative of a cautious, risk-averse investment approach. That is, it means that firms tend to act according to binding or externally induced expectations rather than taking the initiative to adopt innovative decarbonization tools. In this respect, keyword distribution not only signals existing strategic priorities but also indicates lacunas that might be an obstacle to long-term competitiveness in view of the evolving EU carbon regulations.

#### 4.2. Thematic results of the company analysis

Companies in the energy sector included in the BIST Sustainability Index between 2021 and 2023 demonstrate that although the national carbon tax and ETS have not yet been implemented in the country, international mechanisms such as SKDM accelerate carbon management and sustainable finance in Türkiye. Most companies have not directly entered carbon trading but have taken emission reduction strategies by investing in renewable energy and efficiency gains in energy use. For example, although Enerjisa aims for net zero in 2035, the goal of Aydem is a 25% reduction in emissions in 2030, while one of the most detailed carbon strategies to date has come from Zorlu Enerji, with a declared aim of total neutrality by 2050.

Companies actively benefit from green financial tools like YEKDEM, tax incentives, green bonds, and low-interest loans. More than \$250 million in green bonds have been issued in the sector by 2023, especially by Zorlu Enerji (\$100 million), Enerjisa (\$75 million), and Akenerji (\$50 million). Furthermore, besides government incentives and international funds, European Bank for Reconstruction and Development (EBRD) support for green hydrogen (Naturel Enerji) has facilitated firms’

access to capital for low-carbon technologies. Compared to the EU, however, Türkiye's incentive framework remains limited, and there are various regulatory gaps (Deniz & Eroğlu, 2024).

Renewable energy investments are done by almost every player: as of 2023, 55% of the installed capacity belonged to renewable energy resources in Türkiye; companies like Galata Wind and Esenboğa Elektrik totally base their installed capacities on renewables, while firms such as Margün and Smart Güneş are investing in leading-edge technologies like battery storage and photovoltaic manufacturing. All companies together have invested over \$2 billion during this period, bringing about an estimated 2 million tons of CO<sub>2</sub> emission reductions. (Dönmez, 2023; Bekun et al., 2025)

Although most firms fulfill the carbon-related expectations indirectly, their ever-growing interest in carbon pricing terms, such as "carbon tax", "ETS", and "SKDM", shows that they strategically prepare for upcoming regulations. The development of carbon markets and green bonds is gradually aligning firms with international standards (Erdoğan & Pata, 2025), which also confirms the literature findings that carbon governance, tax incentives, and green finance are the intrinsic parts of the sustainability strategies of the Turkish energy sector heralded by Sarıgül and Topçu (2021), He (2024), Cao and Liu (2023). Overall, these thematic findings show that there is a dual-track adaptation pattern in this industry: while leading companies proactively integrate carbon management, green finance, and renewable investments, others follow in a more compliance-oriented and incentive-dependent manner. This divergence points to the fact that sector change is highly unbalanced, and company size, export dependence, and access to finance are strongly influencing this change. Beyond this, results have underlined the primary demand for more transparent regulatory guidelines and carbon pricing instruments at a national level, as their absence is a source of uncertainty that postpones business strategic alignment. This outcome is in line with other literature that stresses the relevance of predictable fiscal and environmental policies for accelerating private sector investments in sustainability.

### **4.3. Reflections of Türkiye's sustainable energy policies on companies**

The main elements of Türkiye's sustainable energy policy include mechanisms for carbon pricing, ETS, green financing instruments, and tax incentives for the acceleration of a transition to a low-carbon economy. Moreover, the assurance of energy supply security is envisaged, with enhanced interest in investments regarding renewable energy. However, compliance by companies varies: some firms quickly adapt, while others have not yet determined a direct strategy.

#### *4.3.1. The impact of carbon pricing mechanisms*

Based on the literature, such a prediction of how future ETS would directly affect large-scale energy producers in Türkiye matches findings that show carbon pricing shapes corporate strategy (Aydın, 2018). While investments in renewables align Zorlu

Enerji and Enerjisa with ETS, efficiency improvements would lead to indirect compliance at Aksa Enerji and Galata Wind.

Although ETS and SKDM impose extra costs on high-emission firms, they are also long-term opportunities for those moving toward renewables. Carbon pricing tools, especially the SKDM and ETS, penalize operations based on fossil fuels but increase the global competitiveness of firms investing in clean energy, as reiterated in the literature (Bekun et al., 2025; Erdoğan & Pata, 2025; Su et al., 2023).

Therefore, the adoption of carbon pricing by Türkiye would reduce the competitiveness of fossil-dependent firms and increase the benefit for renewable-focused investors. Companies need to revise their strategies on sustainability urgently in order to fulfill their international obligations and remain competitive. Delays in the adaptation process will bring about an increase in carbon costs and loss of trade competitiveness. Proactive carbon management, therefore, is not an option but a strategic necessity.

#### *4.3.2. The impact of tax incentives and green financing instruments on companies*

Tax incentives, low-interest loans, and green bonds support the green transformation of Türkiye, which is in line with findings in the literature, indicating that green finance accelerates renewable energy investment and attracts private capital.

Green bonds, envisioned as a key financing tool for companies to increase their capacity to finance carbon-reducing projects, are emerging. For example, Zorlu Energy and Enerjisa have issued a total of \$175 million in green bonds by 2023. This data is consistent with studies showing that the development of green bond markets plays a key role in paving the way for renewable investments.

While Aksa Energy and Esenboğa Elektrik have not issued any green bonds, they have secured financing through government support and subsidized loans. This data is consistent with findings that public incentives have significantly reduced investment barriers for renewable energy sources.

Türkiye's target of issuing \$20 billion in green bonds by the end of 2028 has highlighted new tools for financing hybrid and storage technologies for companies like Margün Energy and Smart Solar Technologies. This data is consistent with studies showing how green financing facilitates low-carbon technology development.

#### *4.3.3. The impact of renewable energy investments on companies*

This consequently creates a new set of opportunities and challenges for enterprises operating in Türkiye within the framework of renewable energy technologies. New low-carbon transition tools like battery storage, green hydrogen, and hybrid systems, considerably facilitated through novel financing and incentive mechanisms, have gained remarkable momentum as of now. Economically, while carbon-reducing investments come with financial gains, firms lagging behind in compliance may experience losses in competitiveness.

For example, the \$350 million investment by Aydem Enerji will achieve the goal of reducing 25% emissions by 2030. Galata Wind and Esenboğa Elektrik generate electricity only from renewables, while Margün and Smart Güneş Teknolojileri invest in storage and solar technologies. Of these, battery storage plays a key role in reducing emissions and increasing flexibility in the grid.

However, this slow adaptation of some firms stands to threaten the climate targets of Türkiye for 2030 and 2050. Major producers are being driven toward carbon trading by regulations in the form of SKDM and the future ETS, with green finance and state incentives offering a competitive advantage. As such mechanisms continue to expand, noncompliance will raise carbon costs and lower market competitiveness even further (Aydın, 2018; Bekun et al., 2025). Lastly, carbon pricing is changing the game in investment decisions since fossil-based production has become unviable under it (He, 2024; Erdoğan & Pata, 2025; Deniz & Eroğlu, 2024).

These observations put together demonstrate how the development of sustainable energy policies in Türkiye creates different strategic responses among companies, given the level of technological capacity and financial resilience. While renewable energy leaders effectively tap green financing and incentive mechanisms, others are reactive due to regulatory ambiguity and limited capital resources. This asymmetry may reduce the collective progress of Türkiye toward its 2030 and 2053 targets, unless more homogeneous policy signals with sector-specific support mechanisms are developed.

## 5. DISCUSSION

This study discussed the impacts of the green tax measures on the Turkish energy sector and explored the strategies of transforming into a low-carbon economy. Tax measures, carbon and green finance, and governance are some of the critical tools in the quest for sustainability (Deniz & Eroğlu, 2024; Sargül & Topçu, 2021). The EU policy affects the carbon emissions reduction and transition to renewable energy policies of Türkiye, and corporations' alignment with such processes becomes increasingly relevant (Aydın, 2018; Erdoğan & Pata, 2025).

In fact, carbon pricing policies and policies such as SKDM-ETS are most critical nowadays, especially for European export-oriented firms. However, since carbon tax and emission trading systems in Türkiye are not in force, enterprises are still uncertain about their future strategy. This uncertainty corroborates findings that inconsistencies in carbon disclosures limit the effectiveness of carbon markets. This, therefore, implies that reform in taxation to support integration into the carbon market is essential.

Green financing instruments and incentive programs have key roles in driving investment in low-carbon activities. Incentives like green bonds, sustainable financing loans, and YEKDEM redirect companies to green projects. However, the long-term effectiveness of such incentives and coherence with sustainability objectives need to be considered in a more critical light.

With tax compliance gaining speed in the context of corporate sustainability, corporations

are recommended to commit to ESG principles. Findings that climate risk disclosures increase firm value also signal that firms should attach structural importance to regulatory compliance processes (Abdallah et al., 2025). However, because there are sectoral differences, the practices that companies developed within the framework of tax transparency and social responsibility also diverge (Savranlar et al., 2024). Increasing comparative studies can help eliminate the lack of information in this area.

In this regard, Deniz and Eroğlu (2024) anticipated an increasing effect of sustainable tax policy in Türkiye on the energy sector in the period to come. Introduction of carbon tax and ETSs, incentives diversification, and strengthening carbon markets will gain pace the transition to the low-carbon economy. Expanding incentive mechanisms and increasing sectoral adaptability of sustainable tax policies are critical requirements for full integration with international regulations.

## 6. CONCLUSION

The study assessed corporate strategy, public policy orientation, and sectoral low-carbon transformation dynamics for their potential to align the Turkish energy sector with sustainable taxation policies. Indeed, energy companies have gradually embarked on increasing their investments in areas of sustainability and attempt to improve carbon management, especially through renewable energy projects and green financing mechanisms, but the level of compliance is inconsistent across companies.

While some firms actively act on SKDM, carbon tax, and ETS regulations as a proactive approach, others act more through incentives, being reactive and capacity-constrained. That can mean that policy coordination needs to be strengthened with a holistic and balanced transformation of the sector in mind.

It follows from these findings that for sustainable tax policies, carbon pricing mechanisms urgently need to be brought in for Türkiye, along with making the existing incentives more transparent and the green financing instruments more accessible throughout the sector.

In addition, integrating sustainable strategies with tax policies will also reduce the financial risks and increase the international competitiveness on a long-term basis.

These will be the firms that are more resistant to future carbon-related costs, whose focus is channeled toward renewable energies, battery storage, hybrid energy systems, and green hydrogen. It provides a significant addition to the existing literature, since few studies have pursued the relationship between sustainable tax policies and corporate strategies in the Turkish energy sector from a holistic point of view. Qualitative content analysis was a strong tool for depicting the shifts along both the temporal and thematic axes of company reports; however, methodological reliance on reports limited the findings to the declared strategies of companies. Furthermore, another significant limitation regarding data comparability is the variance in terminology within company reports.

The value of this study to further research lies in the fact that it systematically reveals, for the first

time, institutional responses of the energy sector in Türkiye during a period in which sustainable tax reform and carbon pricing architecture are about to take shape. Future studies applying micro-datasets can investigate the impacts of carbon taxes on production, employment, regional development, and competitiveness through quantitative models. There are, further, the social dimensions related to the welfare of households, energy poverty, income

distribution, and equitable transition. Measuring the financial performance from the perspective of sustainable tax compliance through econometric analysis would add immense corporate value. Alignment of corporate reporting on carbon management with tax compliance to international standards for monitoring the long-term impacts of sustainable tax policies also emerges as a critical area for future research.

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