Chapter 2

Examining Turquality-Supported Automotive Companies from an Environmental Sustainability Perspective ⚭

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Abstract

The aim of this study is to examine Turquality-supported automotive companies in the context of environmental sustainability on the axis of their sustainability reports. Accordingly, Turquality-supported companies that published sustainability reports in 2024 were examined using the document analysis technique, which is one of the qualitative research methods. In this study, in which the visibility of environmental sustainability in sustainability reports is investigated; A comprehensive content analysis was made in the context of the keywords in the literature. In the analysis, it was determined that words such as "emission", "product", "production", "energy", "waste" came to the fore in the reports. On the other hand, it has been determined that words such as "green building", "restoration", "biodiversity", "eco-product", "eco-efficiency", "land use" are very low visibility in company reports. In the company-based comparison, it was determined that Assan Hanil was ahead of other companies in terms of environmental sustainability visibility, followed by Otokar and Karsan with close scores. Ditaş, on the other hand, has been revealed that the visibility of the environmental sustainability phenomenon is less than other companies in terms of reports.

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1. Introduction

The automotive industry is widely regarded as one of the most critical sectors of any national economy and plays a significant role in driving economic growth. Often described as the "industry of industries," it exerts substantial influence through its extensive backward and forward linkages. In today's globalized environment, the competitive strength of the automotive sector has become increasingly vital, shaped by both domestic and international factors. The evolving competitive landscape has compelled manufacturing industries, including the automotive sector, to redesign their strategic orientations. The intense competition within the industry clearly demonstrates that firms must continuously strive to achieve and sustain competitive advantage across all operational and strategic dimensions (Czuchry et al., 2009). The intensive use of energy and natural resources during automotive production processes, the generation of various forms of waste, and the significant increase in carbon emissions throughout the vehicle-use phase position the automotive industry at the center of environmental sustainability debates. The global climate crisis, growing regulatory pressures, and the rising environmental awareness of consumers have made it imperative for automotive companies to adopt sustainable production practices.

In Türkiye, sustainability policies have gained substantial momentum in recent years, supported robustly by both public authorities and the private sector. Within this context, Turquality, recognized as the world's first state-supported branding program, aims to strengthen the international competitiveness of firms while providing a comprehensive framework that enhances corporate governance, quality, efficiency, and strategic transformation processes (Askin,2016: 210). Although the program's primary focus is branding, the institutional capacity-building it promotes also contributes to the environmental sustainability performance of participating firms. Turquality encourages companies to adopt modern management systems, improve their reporting practices, and align with global standards. Therefore, examining the sustainability approaches of Turquality-supported firms operating in the resource-intensive automotive sector is meaningful from both a theoretical and practical perspective.

Sustainability reports have increasingly become essential corporate communication tools that reveal how firms manage their environmental impacts, establish priorities, and position their responsibilities toward society (Aybeysekera, 2022: 1402). This study aims to analyze the sustainability reports of Turquality-supported automotive main industry firms in order to

assess the extent to which they address environmental sustainability indicators, identify salient themes, and uncover sectoral patterns in reporting. By integrating qualitative document analysis with text-mining techniques, the findings provide insight into the current landscape of sustainability practices in Türkiye and enable a comprehensive evaluation of the environmental sustainability discourse adopted by firms within the Turquality program.

2. Conceptual Framework

2.1. Turquality Program

Branding is regarded as a critical strategic investment for businesses, as it enables firms to differentiate their service portfolios, strengthen market positioning, and build a reputable image in the eyes of consumers. Regardless of their scale—small or large, local or global—companies that construct a reputation through customer-oriented product portfolios are more likely to achieve sustainable competitive advantages in the long term. Today, the transformation of global competitive dynamics and the paradigm shift in consumer preferences compel both national economies and firms seeking presence in international markets to adopt branding-oriented strategic approaches (Davis et al., 2011). In this context, Türkiye's export performance in competitive sectors such as textiles and ready-made garments, automotive, electronics, and food is emphasized to be directly linked to the level of branding achieved. Strong brand identities in these sectors not only enhance the country's efficiency in international trade but also contribute to global recognition and perceived value, thereby shaping the national image in a positive direction (Özbaysal et al., 2018: 187-189).

Aligned with the strategic initiatives of the Ministry of Economy of the Republic of Türkiye, Turquality® was officially launched on 23 November 2004 as the first and only state-supported branding program in the world. According to Communiqué No. 2006/4, titled "Branding of Turkish Products Abroad, Establishing a Turkish Goods Image, and Supporting Turquality," the program is defined as follows: "Turquality is a branding program established with the aim of enabling enterprises that possess product groups with competitive advantages and branding potential to become global players in international markets under their own brands. The program encompasses the development of all marketing activities that begin with production and continue with after-sales services, thereby contributing to the establishment of a positive 'Turkish Goods' image" (Ministry of Economy, Communiqué No. 2006/4).

Turquality® is a comprehensive, state-supported program that aims to enhance the brand-based competitive strength of firms operating in product groups where Türkiye holds competitive advantages and branding potential. Addressing production, marketing, service provision, sales, and post-sales processes through an integrated and holistic perspective, the program offers support in critical areas such as managerial capacity development, design innovation, corporate structuring, and operational optimization. The core purpose of this support is to facilitate firms' ability to position themselves globally with distinctive brand identities, to reconstruct the "Turkish goods" image around principles of quality and trust, and to promote the dissemination of Turkish cultural values as symbolic assets in international markets (TIM, 2025). As a pioneering model grounded in public–private collaboration, the program represents Türkiye's most structured and visionary attempt to cultivate globally competitive brands (Kadat & Teker., 2019: 222). The Turquality Program encompasses a diverse set of support mechanisms, including Turquality Incentives, Brand Support Schemes, Branding Development Roadmaps, Executive Development Programs, and Vision Seminars. Among these instruments, the Turquality and Brand support mechanisms share similar thematic scopes; however, they differ significantly in terms of funding limits and duration of eligibility (Sönmez et al., 2020: 195).

2.2. Environmental Sustainability

The concept of sustainability is most frequently linked to the definition articulated in the 1987 Brundtland Report, which characterizes sustainable development as a form of progress that satisfies the needs of the present generation without compromising the capacity of future generations to meet their own needs. However, the contemporary understanding of sustainability extends significantly beyond this foundational definition. It has evolved into a comprehensive, multidimensional framework that encompasses environmental, economic, and social dimensions, reflecting the complex and interconnected challenges of modern development processes (Brundtland Report, 1987).

The transformation and reshaping of the environment accelerated with the advent of the human era, often referred to as the Anthropocene (Worldwatch Institute, 2014: 36). The emergence of humans, their population growth, and the activities carried out to sustain their lives gradually generated adverse impacts on the natural environment (Gana & Toba, 2015: 1). During the Holocene, as conditions became more suitable for human habitation, agriculture advanced, and villages as well as urban settlements

expanded (Worldwatch Institute, 2014: 30). Although human-induced environmental degradation was relatively limited in the early periods of human history, increasing consumption impulses over time led to a growing pattern of ecological disruption. Given the strong interdependence between human activities and environmental change (Bălteanu & Dogaru, 2011: 1), human actions and behaviors have ultimately become central drivers of contemporary environmental problems (Keleş, 2015: 134). Environmental sustainability refers to environmentally friendly practices, policies, and initiatives designed to reduce the negative impacts that firms impose on the natural environment through emissions, pollution, and waste. In contrast, environmental sustainability orientation (ESO) denotes a broader, proactive strategic posture in which environmental considerations are systematically integrated into the overall business strategy (Roxas & Coetzer, 2012; Swaim et al., 2014).

In the contemporary marketplace, there has been a marked increase in consumers who exhibit heightened environmental consciousness and a strong sensitivity to ecological concerns. Consequently, these individuals place growing expectations on firms to demonstrate a more rigorous commitment to environmental stewardship and the protection of natural ecosystems (Taşer & Çelebi, 2022: 329). Environmental sustainability refers to ensuring the long-term continuity of natural resources. This requires that the rate at which resources are consumed does not exceed their natural regeneration capacity, and that the level of pollutants released into the environment remains below the ecosystem's ability to absorb and process them. The protection of biodiversity, human health, and the quality of air, water, and soil, as well as the preservation of plant and animal life, are also integral components of environmental sustainability (Kaypak, 2011: 26). In this regard, the necessity of initiating efforts to safeguard and enhance environmental sustainability through objective and effective policy measures was formally recognized during the 1992 Environment and Development Summit held in Rio de Janeiro, Brazil.

It can be argued that contemporary firms, regardless of the sector in which they operate, increasingly recognize that they cannot sustain their existence without demonstrating sensitivity to environmental issues. In line with this evolving perspective, companies are now obliged to incorporate the environmental implications of all their activities into their business strategies and long-term planning processes and to implement these considerations in practice (Atay & Dilek, 2013, p. 204).In recent years, the growing environmental awareness of consumers, the increasing influence of environmental organizations, global environmental summits,

and government-led sustainability programs have compelled firms to adopt green business practices. Environmental sensitivity has become a key determinant of competitive advantage across virtually all markets, shifting sustainability from a moral obligation to a strategic necessity. Adopting green business practices not only enables firms to respond to environmental and consumer needs but also offers significant economic benefits. Through resource-efficient production, cost-reduction strategies, and the integration of renewable energy sources, firms can lower operational expenses while benefiting from rising consumer demand for environmentally friendly products. Consequently, green business practices provide firms with a holistic competitive edge, enhancing both market performance and environmental responsibility (Şenocak & Mohan, 2018: 161).

2.3. Environmental Sustainability in the Automotive Sector

The automotive industry constitutes a major industrial sector that encompasses both the main industry responsible for manufacturing motor vehicles and the supplier industry producing original or equivalent components, parts, modules, and systems in accordance with the technical specifications set by the main manufacturers (Manteghi, 2013: 2018). In all industrialized countries, the automotive sector together with its extensive supplier network is regarded as the driving force of the economy and plays a significant role in shaping economic fluctuations (OECD, 2011). The automotive industry originated in Europe under the leadership of Germany and France, and later advanced and gained strength in the United States. With a history spanning more than a century, the sector initially emerged with the production of passenger automobiles, and during the First World War expanded into the manufacturing of commercial vehicles. Since then, automotive production dominated largely by passenger cars has undergone continuous development and transformation (Bayrakçeken, 2005). With the rapid technological advancements characterizing Industry 4.0, the automotive sector is undergoing a profound transformation that directly influences its approach to environmental sustainability. Emerging technologies—such as automation, artificial intelligence, the Internet of Things, and data-driven production systems—not only enhance operational efficiency but also create significant opportunities to reduce energy consumption, minimize waste generation, and lower the industry's overall carbon footprint. In this new industrial paradigm, automotive firms must reassess their organizational structures, production methods, and environmental performance criteria, while redefining employee roles to support and strengthen sustainable practices. Consequently, Industry 4.0 has become a strategic enabler for

advancing environmental sustainability within the automotive sector (Çelebi, 2023: 88).

To ensure a sustainable future, it is essential to take the necessary measures to protect the environment. In today's rapidly developing world, numerous factors contribute to environmental degradation, with the fast-growing automotive industry standing out as one of the most significant. The use of motor vehicles has increased sharply over the past decade. For instance, while the number of automobiles in Türkiye was 3,750,678 in 1990, this figure rose to 23,156,975 by 2019, indicating a nearly sixfold increase over a period of approximately thirty years (Tören & Mollahasanoglu, 2022). The rapid increase in automobile use has several adverse environmental consequences. However, the environmental impact of the automotive industry extends far beyond the rising number of motor vehicles. The production processes, operational stages, and end-of-life phases of vehicles also impose significant environmental burdens. Consequently, the automotive industry carries substantial responsibility for mitigating environmental harm and contributing to environmental protection. In response to these obligations, the sector has undertaken a variety of sustainability initiatives aimed at reducing its ecological footprint and promoting more environmentally responsible practices (Şengel, 2024: 91).

Automobiles exert a range of environmental impacts throughout their entire life cycle. Prior to becoming operational, a vehicle requires the use of numerous materials—such as plastics, rubber, glass, and steel—along with several other components that are difficult and costly to recycle or dispose of. Additionally, fuel consumption during use contributes to air pollution, which deteriorates air quality and exacerbates global warming. Given the significant economic and environmental implications of the automotive sector, the effective management of this industry has become essential for ensuring societal well-being. In response to these concerns, automotive companies have increasingly begun adopting specific practices that integrate sustainability measures into their operational processes (Masoumi, Kazemi, & Abdul-Rashid, 2019). Due to the various solid, liquid, and gaseous wastes generated within the automotive industry, automobile manufacturers worldwide have increasingly sought to develop vehicles that consume less fuel, emit minimal or no emissions, are fully recyclable, and contain no hazardous materials. This competitive drive is shaped by the objective of making vehicles more environmentally friendly throughout their entire life cycle (Katip et al., 2014: 51).

The environmental impacts of the automotive sector can be examined comprehensively but are generally categorized into three main areas: (1) environmental effects arising during the production phase, including atmospheric emissions, wastewater, and solid or hazardous wastes; (2) impacts generated during vehicle use, such as emissions and various solid and liquid wastes released throughout the vehicle's operational life; and (3) effects associated with end-of-life vehicles, particularly the solid and liquid wastes produced when vehicles are scrapped. Automotive manufacturers are required to submit annual reports to the Ministry of Environment and Urbanization regarding emissions and wastes generated during production. Moreover, emissions and wastes resulting from vehicle use constitute a significant environmental burden linked to both individual driving and road-based passenger and freight transport. End-of-life vehicles must also be recovered and disposed of using appropriate methods to minimize environmental harm (Kaplan, 2002; Buluç & Yazıcı, 2013).

In sum, the automotive industry generates multifaceted environmental impacts across every stage of its life cycle from production to vehicle use and end-of-life processes—thereby underscoring the imperative for manufacturers, regulators, and stakeholders to adopt comprehensive sustainability-oriented strategies. The sector's expanding scale, increasing resource intensity, and significant contribution to emissions and waste demonstrate that effective environmental management is not only a regulatory requirement but a strategic necessity for safeguarding ecological integrity and ensuring long-term societal well-being.

3. Method

In this study, a qualitative research design was adopted to examine the environmental sustainability practices of Turquality-supported firms. The qualitative approach was preferred because it enables an in-depth and contextualized understanding of the research phenomenon (Bogdan and Biklen, 1997). As the data collection technique, document analysis was employed, which allows for the systematic examination of materials that contain information about the phenomenon under investigation (Sak et al., 2021).

The research population consists of firms operating in the "Automotive Main Industry" sector under the "Goods Export" category within the Turquality Support Program of the Ministry of Trade of the Republic of Türkiye. Through relevant filtering conducted on the web page where Turquality-supported firms are listed (https://turquality.com.tr/tr/default),

specifically selecting "All Programs" and "All" years, a total of 12 firms were identified.

From these 12 firms, a sample was selected using purposive sampling to ensure that the study is based on a meaningful and up-to-date dataset. The sampling criterion was the availability of a sustainability report for the year 2024 published on the firm's official website. Four firms (Assan Hanil, Karsan, Otokar, and Ditaş) that met this criterion constituted the final sample. During the data collection phase, the most recent sustainability reports of these firms were downloaded from their websites and prepared for analysis. Within the scope of this research, these reports were considered primary data sources that reflect the firms' official discourse and priorities regarding sustainability.

The collected data were analyzed using Voyant Tools, a computer-assisted text analysis software commonly employed in the examination of large volumes of qualitative data (Welsh, 2014; Miller, 2018; Bradley, 2018). During the analysis process, each firm's sustainability report was uploaded to Voyant Tools, and systematic analyses were conducted from an environmental sustainability perspective based on indicators such as word frequency, keyword-in-context patterns, and keyword distribution. This analytical technique aimed to identify key themes and dominant concepts within the reports through quantitative indicators. The outputs obtained from Voyant Tools were used to comparatively interpret the environmental sustainability approaches of the firms in the sample and to provide an overarching framework on the topic.

Furthermore, to systematically examine the qualitative content and to identify environmental sustainability indicators within the reports, the conceptual framework proposed by Lozano and Huisingh (2011) was adopted. Based on this framework, the keywords used in the analysis include: Greenhouse Gas, Emission/, Wastewater, Energy, Eco-Efficiency, Cleaner Production, Green Buildings, Noise, Production, Product, Eco-Products, Waste, Recycling, Water, Land Use, Restoration, Biodiversity, Supply Chain, and Certification.

4. Findings

In this section, the findings obtained from the analysis of the sustainability reports of Turquality-supported automotive main industry firms using the Voyant Tools software are presented. The findings illustrate the environmental discourse map of the firms in the sample and reveal their

conceptual intensities within the reports, as well as the priorities they assign to key environmental commitments, supported by quantitative indicators.

Table 1. Otokar Firm Frequency Analysis

Words	Frequency	Percentage Rate (%)
Product	118	19.90%
Water	91	15.35%
Emission	84	14.17%
Energy	74	12.48%
Production	72	12.14%
Waste	69	11.64%
Greenhouse Gas	24	4.05%
Waste Water	19	3.20%
Supply Chain	19	3.20%
Recycling	13	2.19%
Certificate	7	1.18%
Biodiversity	2	0.34%
Noise	1	0.17%
Green Building	0	0.00%
Cleaner Production	0	0.00%
Eco-Product	0	0.00%
Eco-Efficiency	0	0.00%
Land Use	0	0.00%
Restoration	0	0.00%
Totally	**593**	**100%**

Table 1 presents the frequency analysis of Otokar. In the analysis, traces of the concept of environmental sustainability were sought within the company's 2024 sustainability report. The results indicate that terms such as "product" (118), "water" (91), "emission" (84), "energy" (74), "production" (72), and "waste" (69) stand out prominently. On the other hand, concepts such as "green building," "cleaner production," "eco-product," "eco-efficiency," "land use," and "restoration" were not observed in the sustainability report.

Figure 1.Otokar Firm Word Cloud Analysis

Figure 1 presents the word-cloud analysis generated after examining Otokar's sustainability report, illustrating the most frequently recurring terms. Consistent with the frequency analysis, words such as "emission," "product," "energy," and "production" appear prominently in darker colors and larger font sizes. In contrast, terms with lower frequencies such as "noise," "biodiversity," and "certification" are displayed in relatively smaller font sizes and lighter color tones.

Table 2. Assan Hanil Firms Frequency Analysis

Word	Frequency	Percentage Rate %
Energy	213	19.43%
Product	175	15.97%
Waste	149	13.59%
Production	145	13.23%
Emission	117	10.68%
Water	92	8.39%
Certification	59	5.38%
Greenhouse Gas	50	4.56%
Supply Chain	34	3.10%
Recycle	27	2.46%
Biodiversity	17	1.55%
Waste Water	15	1.37%
Green Building	1	0.09%
Land Use	1	0.09%

Restoration	1	0.09%
Noise	0	0.00%
Cleaner Production	0	0.00%
Eco-Product	0	0.00%
Eco-Efficiency	0	0.00%
Totally	**1096**	**100%**

Table 2 presents the frequency analysis of Assan Hanil. In the analysis, traces of the concept of environmental sustainability were examined within the company's 2024 sustainability report. The results indicate that terms such as "energy" (213), "product" (175), "waste" (149), "production" (145), "emission" (117), and "water" (92) stand out prominently. On the other hand, concepts such as "noise," "cleaner production," "eco-product," and "eco-efficiency" were not observed in the sustainability report.

Figure 2. Assan Hanil Firm Word Cloud Analysis

Figure 2 presents the word-cloud analysis generated after examining Assan Hanil's sustainability report, illustrating the most frequently recurring terms. Consistent with the frequency analysis, words such as "waste," "product," "energy," and "production" appear prominently in darker colors and larger font sizes. In contrast, terms with lower frequencies such as "green building," "restoration," and "land use" are displayed in relatively smaller font sizes and lighter color tones.

Table 3. Karsan Firm Frequency Analysis

Words	Sıklık (Frekans)	Yüzdelik Oran (%)
Production	100	21.32%
Emission	84	17.91%
Energy	83	17.70%
Product	54	11.51%
Greenhouse Gas	40	8.53%
Water	39	8.32%
Supply Chain	34	7.25%
Recycle	14	2.99%
Certificate	11	2.35%
Waste	7	1.49%
Waste Water	3	0.64%
Cleaner Production	0	0.00%
Green Building	0	0.00%
Noise	0	0.00%
Eco-Efficiency	0	0.00%
Eco-Product	0	0.00%
Land Use	0	0.00%
Restoration	0	0.00%
Biodiversity	0	0.00%
Totally	**469**	**100%**

Table 3 presents the frequency analysis of Karsan. In the analysis, traces of the concept of environmental sustainability were examined within the company's 2024 sustainability report. The results indicate that terms such as "production" (100), "emission" (84), "energy" (83), "product" (54), "greenhouse gas" (40), and "water" (39) stand out prominently. On the other hand, concepts such as "noise," "cleaner production," "green building," "eco-product," "eco-efficiency," "land use," "restoration," and "biodiversity" were not observed in the sustainability report.

Figure 3. Karsan Firm Word Cloud Analysis

Figure 3 presents the word-cloud analysis generated after examining Karsan's sustainability report, illustrating the most frequently recurring terms. Consistent with the frequency analysis, words such as "emission," "product," "energy," and "production" appear prominently in darker colors and larger font sizes. In contrast, terms with lower frequencies such as "wastewater," "waste," and "certification" are displayed in relatively smaller font sizes and lighter color tones

Table 4. Ditaş Firm Frequency Analysis

Word	Frequency	Percentage Rate (%)
Emission	83	36.24%
Production	47	20.52%
Greenhouse Gas	35	15.28%
Product	26	11.35%
Energy	20	8.73%
Supply Chain	12	5.24%
Recycle	2	0.87%
Water	2	0.87%
Waste	1	0.44%
Certification	1	0.44%
WasteWater	0	0.00%
Eco-Efficiency	0	0.00%
Cleaner Production	0	0.00%
Green Building	0	0.00%

Noise	0	0.00%
Eco-Product	0	0.00%
Land Use	0	0.00%
Restoration	0	0.00%
Biodiversity	0	0.00%
Totally	**229**	**100%**

Table 4 presents the frequency analysis of Ditaş. In the analysis, traces of the concept of environmental sustainability were examined within the company's 2024 sustainability report. The results indicate that terms such as "emission" (83), "production" (47), "greenhouse gas" (35), "product" (26), "energy" (20), and "supply chain" (12) stand out prominently. On the other hand, concepts such as "cleaner production," "wastewater," "green building," "noise," "eco-product," "eco-efficiency," "land use," "restoration," and "biodiversity" were not observed in the sustainability report.

Figure 4. Ditaş Firm Word Cloud Analysis

Figure 4 presents the word-cloud analysis generated after examining Ditaş's sustainability report, illustrating the most frequently recurring terms. Consistent with the frequency analysis, words such as "emission," "product," "energy," and "production" appear prominently in darker colors and larger font sizes. In contrast, terms with lower frequencies—such as "water," "waste," and "certification"—are displayed in relatively smaller font sizes and lighter color tones.

Table 5. Firm-Based Frequency Analysis

Firm Name	Environmental Sustainability Score	Environmental Sustainability Percentage
Assan Hanil	1096	%45.92
Otokar	593	%24.84
Karsan	469	%19.65
Ditaş	229	%9.59
Tottaly	**2387**	**100**

When the firms' environmental sustainability scores are examined, an asymmetric distribution of performance is observed across the companies. Assan Hanil, which alone accounts for nearly half of the total score volume (45.92%), stands out prominently within the sample group by creating a substantial gap between itself and its closest follower, Otokar (24.84%). Otokar and Karsan (19.65%) form the mid-range segment, exhibiting relatively similar profiles, whereas Ditaş, with a share of 9.59%, differentiates itself as the firm with the lowest emphasis on environmental sustainability. These findings indicate that environmental sustainability awareness or reporting practices within the sector are not homogeneous across firms, and that the scores are largely concentrated around the leading firm.

5. Conclusion and Discussion

Within the scope of this study, the sustainability reports of Turquality-supported automotive firms were examined to assess the environmental impacts arising from both the production processes and product-use phases of the automotive industry, which holds significant economic importance globally and in Türkiye. As population growth continues worldwide and nationally, economic expansion accelerates; consequently, production volumes increase, leading to higher levels of solid, liquid, and gaseous waste. This situation has prompted consumers to increasingly prefer environmentally friendly products. In response to consumer expectations as well as regulatory requirements, economic pressures, competitive dynamics, and rising environmental awareness automotive companies have adopted various sustainability-oriented practices, including eco-design, environmental certification, clean technologies, the use of eco-friendly materials, recycling initiatives, waste management, and life-cycle assessment. Particularly in the context of the global energy crisis, improving the efficiency of energy use in both production and consumption stages is critically important for Türkiye.

Furthermore, Türkiye's geographic proximity to European, Asian, Middle Eastern, and African markets offers a significant economic advantage. Strengthening this advantage through "green" practices would enhance the country's economic and environmental performance, supporting the sustainable use of natural resources (KPMG, 2012).

Methods aimed at reducing natural resource consumption in the automotive industry play a pivotal role in achieving ecological sustainability objectives. Water usage, positioned at the core of these goals, has become a primary environmental concern for automotive manufacturers. Techniques such as reverse osmosis, closed-loop cooling towers, and wastewater recovery are increasingly adopted, as they enhance water-use efficiency and contribute to the conservation of natural resources (Şengel, 2024).

In parallel with the present study, the existing literature also encompasses a number of research works addressing similar themes and analytical perspectives. Gökçen and Kayacan (2024) found that automotive companies in the BIST Sustainability 25 Index demonstrate strong sensitivity to environmental and climate issues, particularly complying with GRI 300 standards on energy, water and waste management. However, they report limited disclosure on biodiversity, environmental compliance and supplier environmental assessments. Vaz, Rauen and Lezana (2017) highlight that although the automotive sector is structurally advanced in sustainability and process innovation, it still requires more radical innovations to meet evolving environmental standards, emphasizing practices such as emission reduction, cleaner production and eco-innovation. Sukitsch, et al., (2015) show that European automotive manufacturers rely on key policy instruments such as environmental management systems and organizational adjustments to implement corporate sustainability, while highlighting that some firms act as leaders and others as laggards in this process. Choi and Cho (2021) show that high-performing automotive companies emphasize environmental themes such as society, electric mobility, technology and global standards in their CEO messages, indicating more advanced environmental management approaches that can serve as benchmarks for lower-performing firms. Chalak et al. (2020) identified 41 ISO 14031–based environmental performance indicators covering areas such as waste management, carbon emissions, energy use and environmental management, demonstrating that these metrics provide a uniform and comprehensive framework for assessing and comparing environmental sustainability performance across automotive companies.

The environmental impacts of the automotive sector extend beyond the production stage, as vehicle use also generates significant ecological burdens. Rising CO_2 emissions stemming from fuel types adversely affect air quality and exacerbate environmental problems. Given that a substantial portion of Turkey's CO_2 emissions originates from industry and transportation, the responsibilities of the automotive sector become even more evident (Bilen et al., 2008: 1530). Accordingly, the industry must develop strategies to reduce emissions in line with ecological sustainability objectives. One of the most effective approaches is the increasing emphasis of automotive manufacturers on electric and hybrid vehicle technologies.

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