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ABSTRACT

Since the second half of the 18th century, developments in nearly all aspects of social and economic life because of the Industrial Revolution have increased dependence on energy resources. Energy production, supply, and use have become one of the most fundamental needs, particularly in developed and developing countries. Energy resources—especially petroleum—are of critical significance for global development; however, they also produce serious environmental impacts. Although petroleum production is criticized for its high carbon emissions and environmental impacts, it plays a crucial role in ensuring energy security.

The petroleum industry also plays a central role in Türkiye's national energy security and industrial development; however, the environmental pressures resulting from exploration, production, transportation, refining, and consumption processes have made sustainability a critical strategic priority for the industry. This book examines the environmental sustainability practices of the Turkish petroleum industry with a specific focus on the national oil company, Turkish Petroleum Corporation (Türkiye Petrolleri Anonim Ortaklığı - TPAO). The analysis integrates literature review, document and policy analysis, case study and qualitative research findings obtained from semi-structured interviews with mid- and senior-level managers responsible for environmental and sustainability-related decision-making. The research employs the Success Case Study Method, which is frequently used for analysing organizational strategies and management practices in real-world settings. Findings indicate that while TPAO has institutionalized environmental management through ISO certification systems, sustainability reporting, and carbon management initiatives, structural challenges persist in embedding sustainability culture, reducing greenhouse gas emissions, and diversifying energy resources. The discussion highlights the need for an industry-wide transition from compliance-based environmental management towards innovation-driven, low-carbon transformation strategies that align with global climate objectives and Türkiye's commitments under the Paris Agreement.

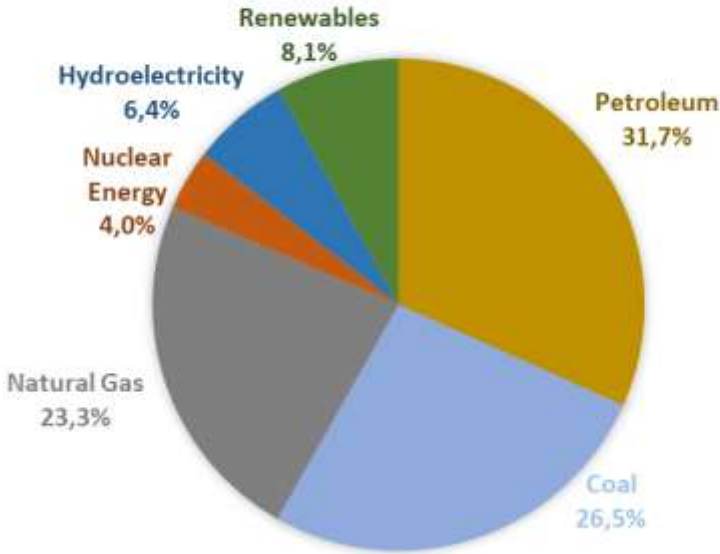
Keywords – Petroleum industry, environment, sustainability, environmental sustainability, energy security, carbon management, Turkish Petroleum Corporation

INTRODUCTION

With the impact of the industrial revolution, significant transformations took place in many areas of social and economic life from the second half of the 18th century onwards, which increased dependence on energy resources. Today, particularly for developed and developing countries, energy production, supply, and consumption have become among the most basic needs. Hydrocarbons—especially petroleum and natural gas—occupy an important place across sectors such as industry, transportation, residential heating, and lighting, and thus rank among the critical energy resources. In addition, the safe development and continuous provision of petroleum and natural gas reserves play a vital role in ensuring energy supply security and supporting sustainable development. The petroleum industry has become one of the fundamental components of global industry and the world economy and has long been accepted as a primary energy source (Hasan, Thomas ve Tomos, 2024; Florescu, Ceptureanu, Cruceru ve Ceptureanu, 2019; Ceptureanu, Ceptureanu, Olaru ve Bogdan, 2018; Ceptureanu, Ceptureanu, Radulescu ve Ionescu, 2018).

In 2023, global energy consumption reached 620 exajoules (approximately 172 million tons of oil equivalent), setting a record—an increase of 2% compared to the previous year. Regionally, Asia holds the largest share with energy consumption of 6.9 billion tons of oil equivalent. In 2023, China became the world's largest energy consumer with approximately 170.7 exajoules. Although renewable energy consumption has doubled over the last five years, its share in the global energy market remains relatively low. Fossil fuels supply 80% of global energy consumption. According to 2023 data, the largest share of primary energy demand worldwide is met by oil, which provides 31.7% of global energy consumption, followed by natural gas at 23.3% (Figure 1) (Energy Institute, Statistical Review of World Energy 2024).

2023 WORLD PRIMARY ENERGY CONSUMPTION



Source: Energy Institute, Statistical Review of World Energy 2024
Figure 1. World Primary Energy Consumption in 2023

Today, the petroleum industry must contend with serious problems created by climate change. The increasing frequency of extreme weather events, rising sea levels, and changing environmental conditions are among the significant challenges facing the industry. As a natural consequence of economic growth, rising energy demand has also led to a noticeable increase in environmental pollution (Koçman ve Atay, 2021; Koçman, Atay ve Zehir, 2025).

CONCEPTUAL FRAMEWORK

Environmental Impacts of the Petroleum Industry

Industrialization has significantly influenced the emergence of environmental problems, and this interaction became particularly evident with the Industrial Revolution. During this period, the transition to mass production led to a substantial increase in the consumption of natural

resources and energy, which in turn intensified the scale of environmental impacts. The rapid transformation in production processes also increased both the variety and quantity of waste released into the environment, resulting in serious environmental issues such as air, soil, and water pollution.

The unregulated progression of industrial production caused these issues to be overlooked for many years. However, since the 1960s, the realization that global warming and related climate changes pose serious threats has raised awareness of environmental problems. During this period, the interdependence between economic development and environmental impacts was emphasized, highlighting the necessity of adopting sustainable production methods. This understanding encouraged the implementation of environmentally friendly technologies and cleaner production practices, particularly in the industrial sector.

From a social responsibility perspective, it has become increasingly widespread that businesses must operate in ways that do not negatively affect the environment and public health. This understanding requires enterprises to adopt environmentally responsible policies in order to achieve long-term sustainable success.

Today, it is widely acknowledged that energy use is indispensable both in commercial activities and in the household heating and transportation sectors. In this context, the efficient use of energy resources and the secure provision of energy supply are of great importance. However, fossil fuels used in energy production—particularly petroleum, coal, and natural gas—continue to cause environmental degradation. Ensuring that the energy sector operates in an environmentally conscious manner is essential for maintaining ecological balance and enabling the effective and sustainable use of energy.

The global petroleum industry represents an integrated sector including both national and multinational companies engaged in exploration and production, transportation, refining, and marketing. This study conceptualizes activities related to crude oil extraction within the framework of the “petroleum industry.”

Although the petroleum industry supplies a significant portion of global energy production, it remains highly controversial due to its environmental impacts. Petroleum, while the most widely used fossil fuel, leaves substantial and lasting negative effects on the environment.

Petroleum production is a process that requires particular environmental attention. Oil extraction not only affects natural landscapes but also directly impacts water resources, soil, and air quality. The environmental consequences of oil production encompass a range of factors that threaten both local ecosystems and the global environment. The main environmental impacts include the following:

- **Destruction of Natural Areas:** Petroleum extraction typically occurs in large and ecologically sensitive regions. Forests, wetlands, and marine ecosystems suffer significant damage due to drilling and extraction operations. Large land areas are cleared to create sites for oil exploration and production, leading to habitat loss, reduced biodiversity, and species extinction.

- **Soil and Water Pollution:** Waste materials generated during petroleum extraction can contaminate soil and water resources. In particular, oil spills and chemical substances may pollute groundwater and surface water during drilling. Wastewater and other chemicals released from oil wells can degrade soil structure and contaminate water supplies, resulting in long-term negative consequences for agriculture, drinking water, and ecosystems (Koçman, 2022).

- **Oil Spills:** Accidents and leaks occurring during oil production can cause severe environmental damage. Such spills lead to long-term and irreversible harm to marine waters and coastal ecosystems. Oil spills cause the deaths of marine birds, whales, and other marine life, severely endangering marine ecosystems. For example, oil spills associated with the petroleum industry in the Niger Delta have significantly damaged agricultural lands, drinking water sources, mangrove forests, and fishing grounds. Consequently, populations of fish, crabs, molluscs, sea snails, and birds have drastically declined. The widespread destruction of mangroves has adversely affected both terrestrial and marine ecosystems (Kadafa, 2012).

- **Carbon Emissions and Global Warming:** Petroleum production releases large quantities of greenhouse gases during the processing of underground resources. In particular, the release of gas and methane from oil fields accelerates global warming. Furthermore, the energy resources and processes used in oil production contribute to a significant carbon footprint (Koçman, 2022).

- **Air Pollution and Human Health Impacts:** Gases emitted during oil production, along with soil and water contamination, contribute to air pollution. Pollutant gases released during refining and other production processes can cause respiratory illnesses and other health problems. These gases also weaken the ozone layer and accelerate climate change.

- **Water Usage:** Petroleum production requires large volumes of water. Heavy crude oil extraction and processing consume substantial amounts of water, which can deplete water resources and limit access to water for surrounding ecosystems. Moreover, the water used in heavy petroleum extraction often becomes contaminated with petroleum residues and chemicals, contributing to water and soil pollution (O'Rourke and Connolley, 2003).

- **Impacts on Biological Diversity:** Petroleum production threatens biodiversity by destroying and contaminating natural habitats. Flora and fauna living in regions where petroleum is extracted face extinction due to habitat destruction and pollution. Particularly in sensitive ecosystems, species are placed under severe environmental stress. The petroleum industry affects species, populations, communities, and ecosystems by altering various ecological parameters such as species diversity, biomass, and productivity (Bathrinath, Abuthakir, Koppiahraj, Saravanasankar, Rajpradeesh, Manikandan, 2021).

The environmental impacts of petroleum production largely stem from outdated technologies and inadequate management approaches used in the sector. Therefore, the adoption of sustainable production practices, the implementation of environmentally friendly technologies, and compliance with environmental regulations are critical to preventing environmental degradation in the petroleum industry. Additionally, reducing dependence on fossil fuels and transitioning to renewable energy sources is an important step toward long-term environmental protection.

Environmental Sustainability and International Developments

In general, sustainability emerges as a normative concept that enhances responsibilities toward future generations, shapes the development of environmental awareness, and influences the orientation of human activities (Baumgärtner & Quaas, 2010).

Environmental sustainability refers to meeting the resource and service needs of present and future generations without compromising the health of the ecosystems that provide these resources. It encompasses practices that preserve the resilience, flexibility, and interconnectedness of ecosystems while respecting their capacity for self-renewal and avoiding the reduction of biodiversity (Morelli, 2011).

In this context, environmental sustainability implies maintaining the scale of the human economic subsystem within the biophysical limits of the overarching ecosystem, which requires sustainable production and consumption patterns (Goodland, 1995). Environmental sustainability can also be regarded as an approach that emphasizes the preservation of natural capital. Natural capital refers to the entirety of environmental assets provided by nature, such as soil, forests, water, and the atmosphere, while conservation denotes the protection or at least non-depletion of these environmental assets (Goodland & Daly, 1996).

Decision-makers have increasingly focused on research and proactive policies aimed at predicting and minimizing environmental harm. For instance, following similar practices in France, the Netherlands, and the United Kingdom, the introduction of paid plastic bags in Türkiye in 2019 resulted in a 77.27% reduction in plastic bag usage (T.C. Çevre ve Şehircilik Bakanlığı, 2025).

In order to address the global challenges posed by climate change, significant international conferences were held in Rio in 1992 and Kyoto in 1997 (Koçman, 2022). These conferences aimed to limit global warming to below 2°C by reducing emissions. However, the rapid increase in global emissions could not be halted, and the proposed measures were not effectively implemented. In 2005 and 2006, the importance of limiting global temperature rise to 2°C re-emerged, and the goal was officially endorsed at the 2009 Copenhagen Summit attended by 192 countries. The principle behind emission reduction efforts was based on leaving fossil fuel reserves underground. Accordingly, one-third of global oil reserves, half of natural gas reserves, and 80% of coal reserves would need to remain unextracted. Achieving these targets requires strong political commitment. Despite broad international agreement, substantial progress in combating climate change has not been achieved (Koçman, Atay & Zehir, 2025).

A major milestone in global climate policy, the Paris Agreement entered into force on November 4, 2016, after being ratified by at least 55 countries representing 55% of global greenhouse gas emissions. The agreement encourages developed countries to maintain absolute emission reduction targets, while urging developing countries to adopt targets that are more ambitious based on their national circumstances. Türkiye ratified the Paris Agreement on October 7, 2021, through a Presidential Decree and committed to reducing its projected 2030 emissions by 41% (T.C. Dışışleri Bakanlığı, 2025).

Five years after the Paris Agreement, the 26th Conference of the Parties (COP26) was held in Glasgow between October 31 and November 12, 2021, with the participation of 197 countries. The summit resulted in several key decisions, including the gradual reduction of coal use, regular revision of emission reduction targets, and increased financial support for developing countries. Notably, the term “phasing down coal” appeared for the first time in the final agreement text. The Glasgow Climate Pact aimed to make the 2020s a decisive decade for climate action, increasing resilience, reducing emissions, and strengthening climate finance (Koçman, 2022).

The 27th Conference of the Parties (COP27) took place in Sharm El-Sheikh, Egypt, between November 6 and 20, 2022. The main outcomes can be summarized as follows (United Nations Climate Change, COP27):

- Establishment of a “Loss and Damage” Fund for countries most affected by climate change impacts.
- Maintenance of the 1.5°C temperature limit target, emphasizing the need for determined action.
- Strengthening accountability for commitments made by corporations and institutions.
- Increased financial support for developing countries in adaptation and mitigation efforts.
- A shift toward implementation, emphasizing concrete execution of climate policies.

A key outcome of COP27 was the agreement to establish a financing mechanism to address loss and damage in vulnerable developing countries. However, limited progress was made concerning binding commitments to

reduce fossil fuel use and emissions. This shortcoming indicates that current efforts are insufficient to keep global warming within the 1.5°C target.

The 28th Conference of the Parties (COP28) was held in Dubai, United Arab Emirates, from November 30 to December 12, 2023, marking the first Global Stocktake of the Paris Agreement. Key outcomes include (United Nations Climate Change, COP28):

- Recognition of the “beginning of the end” of the fossil fuel era, emphasizing accelerated transition to renewable energy.
- New financial contributions to the Loss and Damage Fund for climate-vulnerable countries.
- Strengthening global cooperation to build climate-resilient societies.
- Integration of climate action with biodiversity conservation and nature-based solutions.
- Promotion of practical climate solutions such as renewable energy expansion and energy efficiency.
- A roadmap encouraging governments to adopt stronger national commitments and increase climate finance.

Despite these advances, some oil- and gas-producing countries avoided binding emission reduction commitments, which was one of the most debated outcomes.

The 29th Conference of the Parties (COP29), held in Baku, Azerbaijan, between November 11 and 22, 2024, focused primarily on climate finance, adaptation strategies, and carbon market mechanisms. A major outcome was the adoption of a global finance target requiring developed countries to mobilize 300 billion USD annually for developing countries by 2035 (United Nations Climate Change, COP29).

The COP30 summit was held in Belém, Brazil between November 10 and November 21, 2025, with the participation of over 190 countries (United Nations Climate Change, COP30).

Key outcomes included:

- Recognition of the Amazon region’s central role in the global climate system and host country’s emphasis on forest-protection and Indigenous rights.

- A strong focus on scaling up climate finance: a “Roadmap” from Baku to Belém envisaged mobilising 1.3 trillion USD annually for developing countries by 2035.
- Emphasis on a just transition away from fossil fuels, with initial agreements on indicators and pathways for phasing out coal and oil/gas in a fair manner.
- Strengthening measurable adaptation and resilience metrics, particularly for vulnerable countries and forest-ecosystems.
- Integration of biodiversity, forest-conservation and nature-based solutions into the climate agenda, especially given the Amazon-hosting context.

However, like the earlier COPs, COP30 also faced criticism: binding commitments on fossil fuel phase-out remained limited and the pace of change was judged insufficient to meet the 1.5°C target.

Recent international climate conferences—from COP26 in Glasgow through COP30 in Belém—illustrate a gradual yet noteworthy evolution in the architecture of global climate governance. COP26 constituted a symbolic inflection point, introducing for the first time a collective commitment to “phasing down coal” while reaffirming the need for more ambitious national emission reduction targets and expanded financial assistance for developing countries (Koçman, 2022). COP27 further advanced this trajectory with the establishment of the Loss and Damage Fund and the renewed endorsement of the 1.5°C objective, though the summit fell short of delivering binding commitments on fossil fuel phase-out (United Nations Climate Change, COP27). COP28, through the inaugural Global Stocktake, reinforced the recognition that the global energy system is entering what was described as the “beginning of the end” of the fossil fuel era, underscoring the urgency of scaling renewable energy deployment and integrating nature-based solutions into national climate strategies (United Nations Climate Change, COP28). COP29 in Baku shifted the emphasis decisively toward climate finance, culminating in a global target requiring developed countries to mobilize 300 billion USD annually by 2035 (United Nations Climate Change, COP29). Most recently, COP30 in Belém highlighted the ecological and climatic centrality of the Amazon basin, emphasized the protection of Indigenous peoples, and sought to consolidate long-term climate finance commitments

under the emerging “Baku-to-Belém Roadmap” (United Nations Climate Change, COP30).

Notwithstanding these advancements, the cumulative outcomes of COP26–COP30 have been met with ongoing critiques concerning the limited enforceability of negotiated commitments. The persistent discrepancy between aspirational declarations and the adoption of concrete, binding policy measures—particularly with respect to fossil fuel production, greenhouse gas mitigation, and large-scale energy transitions—reflects a structural limitation of the current multilateral climate regime. Achieving the ambition required to maintain global warming within 1.5°C necessitates a shift from predominantly voluntary pledges toward legally binding and enforceable frameworks that can drive substantive emission reductions, accelerate renewable energy transitions, curb deforestation, and sustain adequate climate finance. In this regard, the period between COP26 and COP30 reveals both meaningful progress in agenda setting and cooperation, and the enduring need for more decisive political will, institutional accountability, and strengthened compliance mechanisms to translate global commitments into effective climate action.

RESEARCH METHODOLOGY

This study aims to evaluate the environmental sustainability strategies and practices implemented within the Turkish petroleum sector, with a particular focus on the Turkish Petroleum Corporation (Türkiye Petrolleri Anonim Ortaklığı -TPAO), the largest national actor in the industry. In line with this aim, a qualitative research design was adopted, as it enables a deeper contextual understanding of organizational practices, managerial perspectives, and institutional sustainability approaches, which cannot be adequately captured through quantitative measurement alone (Becker, 1970).

Research Design

The research employs the Success Case Study Method, which is frequently used for analysing organizational strategies and management practices in real-world settings. This method provides a systematic structure for identifying how and why certain sustainability initiatives emerge, evolve,

and influence organizational behaviour. The approach is also suitable for examining the internal dynamics of petroleum companies and their responses to environmental expectations, regulatory pressures, and global climate governance frameworks.

As the largest company in the Turkish petroleum industry in terms of workforce, TPAO employs 69.5% of the sector’s total labour force. This scale is directly linked to its operational capacity as well as its central role in petroleum and natural gas exploration, production, and operational activities. Accordingly, TPAO’s share of industry-wide employment constitutes a significant indicator of the labour dynamics and institutional structures within Türkiye’s petroleum sector (Table 1).

Table 1: The 2023 workforce status of Türkiye’s petroleum industry and company size by labour force.

Company	Manager	Non-managerial Employee	Total Employee	Nationwide Scale of Türkiye
TPAO	323	3299	3622	69,5%
GÜNEY YILDIZI	95	957	1052	20,2%
AME	12	113	125	2,4%
ARAR	6	97	103	2,0%
DIXSTONE	12	76	88	1,7%
TEMI	7	79	86	1,7%
TBNG+CRBV	7	64	71	1,4%
ÇALIK	7	26	33	0,6%
PARK PLACE	4	14	18	0,3%
MARSA	2	8	10	0,2%
İPEK ENERJİ	2	1	3	0,1%
GRAND TOTAL	477	4734	5211	100,0%

Source: Obtained from the Human Resources Department managers of the respective companies, 2024

In this context, TPAO was selected as the case institution due to its dominant role in Türkiye’s petroleum production, accounting for approximately 87% of crude oil and 95% of natural gas production nationally (TPAO, 2024). Its strategic position, historical evolution, and

recent moves toward sustainability reporting make it an analytically relevant and empirically rich case.

Data Collection

Data triangulation was conducted to increase the reliability and validity of findings. The following sources were utilized:

- **Comprehensive Literature Review:** Academic studies on petroleum industry sustainability, environmental policy development, ecological economics, and corporate sustainability frameworks were reviewed.
- **Document and Policy Analysis:** National legal frameworks, environmental regulations, and strategic energy policy documents were examined alongside TPAO's 2024 Sector Report and 2023 Sustainability Report (TPAO, 2024; TPAO, 2023).
- **Semi-Structured Interviews:** In-depth semi-structured interviews were conducted with mid-level and senior-level managers responsible for sustainability, environmental management, and operational compliance within TPAO.

The interview guide included questions on:

- Institutional sustainability history and evolution
- Current sustainability priorities and performance targets
- Internal organizational structure and governance mechanisms
- Challenges in sustainability implementation
- Expectations for the future in the context of national energy security

All interviews were carried out face-to-face at TPAO headquarters. Each interview lasted between 45 and 90 minutes, recorded with participant consent, and later transcribed for thematic analysis.

Data Analysis Method

A thematic content analysis approach was used to interpret the interview transcripts and documents. Themes were developed inductively based on the recurring concepts identified in participants' narratives and organizational texts. This allowed for identifying patterns related to sustainability governance, organizational culture, environmental policy

implementation, and the integration of sustainability performance monitoring systems.

Thematic categories focused on:

- Environmental management systems and regulatory compliance (ISO 14001 and related standards)
- Resource efficiency and emission reduction practices
- Corporate reporting and stakeholder accountability
- Constraints related to cultural, financial, and technological capacity

Scope and Limitations

This research focuses specifically on TPAO's sustainability-oriented environmental protection strategies within Türkiye. Although the petroleum sector includes private and multinational firms, public ownership and national strategic priorities significantly shape TPAO's sustainability framework. Therefore, findings reflect a state-led organizational context, which may differ from private-sector sustainability logic.

Furthermore, as sustainability reporting in the Turkish petroleum industry is still developing and evolving, some quantitative performance indicators remain limited, which restricts comparative cross-firm analysis. However, the strength of the study lies in its rich qualitative insights into the internal policy-making and strategy formation processes of a key national energy institution.

CASE STUDY: TURKISH PETROLEUM CORPORATION (TÜRKİYE PETROLLERİ ANONİM ORTAKLIĞI - TPAO)

TPAO, established in 1954, is Türkiye's national oil company responsible for the exploration, drilling, production, and development of domestic petroleum and natural gas resources. The institution plays a strategic role in ensuring national energy security, reducing import dependency, and maintaining stable supply within Türkiye's energy system (TPAO, 2024). As domestic production constitutes only a limited share of total national demand, TPAO's activities have significant geopolitical, economic, and environmental implications (Koçman and Atay, 2021; Atay and Koçman, 2024). In particular, its activities intersect directly with

Türkiye's long-term energy transition goals, carbon mitigation commitments, and regional development dynamics.

Organizational Structure and Strategic Orientation

TPAO operates within a state-led governance framework, aligning its strategic objectives with national energy policy priorities. Over the past decade, the company has undergone a gradual yet notable internal transformation in which environmental considerations—once viewed primarily as compliance obligations—have begun to permeate higher-level strategic decision-making processes.

Internal policy documents reveal the establishment of a series of institutional mechanisms designed to facilitate this transition:

- Carbon Management Department tasked with coordinating environmental governance and cross-departmental integration,
- interdepartmental environmental performance monitoring systems that enable more systematic tracking of operational impacts,
- project-level Environmental Impact Assessment (EIA) procedures embedded into planning and investment cycles,
- emission monitoring and reporting infrastructures aligned with national regulatory and technical standards.

This structure reflects a shift from reactive environmental compliance toward more strategic sustainability-driven management, although the transition remains ongoing (Koçman, 2022).

Environmental Management Systems

TPAO has adopted several formalized environmental management systems and internationally recognized standards as part of its efforts to strengthen institutional capacity for environmental risk governance (Table 2). These instruments are intended to enhance operational consistency, reduce environmental liabilities, and support alignment with Türkiye's evolving environmental policy architecture.

Table 2: TPAO's Environmental Management Systems

Institutional Tool	Purpose
ISO 14001 Environmental Management System	Establishing standardized procedures for environmental risk identification, mitigation, and continuous improvement
Environmental Impact Assessment (EIA) compliance processes	Ensuring conformity with national environmental legislation and project-level risk assessment norms
Hazardous waste monitoring and disposal protocols	Preventing soil, groundwater, and surface water contamination through controlled waste management
Energy and emission performance tracking systems	Supporting national climate transition targets through systematic monitoring of energy use and greenhouse gas (GHG) emissions

Senior sustainability personnel emphasize that these systems have tangibly strengthened the company's ability to measure, assess, and manage environmental risks. However, implementation remains differentiated across regions and operational units. In older production fields, technical limits, inherited infrastructure, and operational inertia often hinder full alignment with contemporary environmental management standards. This reflects a broader challenge encountered by mature state-owned oil companies globally, namely the coexistence of modern sustainability tools with legacy operational models.

Corporate Sustainability Reporting

TPAO publishes annual Sustainability Reports, which present environmental performance indicators, emission inventories, waste and water management statistics, and priority policy commitments (TPAO Sürdürülebilirlik Raporu, 2023). These reports demonstrate an incremental but consistent institutional effort toward enhancing transparency and public accountability. Specifically, the reporting framework provides detailed information on:

- operational greenhouse gas emissions,
- waste generation volumes and treatment/disposal methods,
- water abstraction, consumption, and recycling,
- land rehabilitation practices and biodiversity protection measures.

Despite these advances, the reporting structure remains predominantly descriptive rather than evaluative. Türkiye has not yet fully introduced mandatory, standardized environmental disclosure regulations comparable to the EU Corporate Sustainability Reporting Directive (CSRD), which limits cross-company comparability and industry-wide performance benchmarking (Koçman, Atay and Zehir, 2025). Consequently, while the availability of data is increasing, its analytical utility for external stakeholders’ remains constrained.

Findings of the Semi-Structured Interviews

Semi-structured interviews conducted with managers responsible for environmental oversight provide deeper insights into the institutional dynamics underlying TPAO’s sustainability transition. These interviews reveal a growing recognition of environmental and sustainability concerns at strategic levels, yet they also highlight persistent organizational and structural constraints.

Key themes emerging from the interviews include (Table 3):

Table 3: Interview Themes and Insights	
Theme	Insight (expressed by interview participants)
Strategic awareness of sustainability	“Sustainability is no longer just an environmental requirement. It is becoming a strategic expectation in state energy planning.” (Senior Energy Strategy Manager)
Operational constraints	Technical limitations in emission reduction and waste management persist, largely due to aging facilities, inherited technologies, and long-standing production methods.
Financial prioritization tensions	Environmental investments often compete with production-driven capital allocations, leading to internal trade-offs where short-term national energy security objectives constrain long-term sustainability commitments.
Capacity and training gaps	Sustainability expertise remains concentrated within specific units, indicating that sustainability has yet to become a fully integrated organizational culture.

Collectively, these findings illustrate that TPAO is in a transitional phase: it is moving away from a predominantly compliance-based environmental management approach toward a more integrated governance model. However, this transition is heavily mediated by external political-economic imperatives, most notably the state's prioritization of domestic energy production to enhance energy security.

Summary of the Case Study Findings

The case study shows that TPAO increasingly treats sustainability as an important part of its overall strategy, but its environmental governance system is still developing and not yet fully established. The introduction of formal environmental management tools represents a step toward strengthening the company's ability to assess and manage environmental risks. However, these tools are not applied consistently across all operations, partly because older production sites and long-standing technical practices limit full implementation. TPAO's sustainability reporting has improved the transparency of its environmental performance, yet the lack of clear performance indicators and the absence of industry-wide reporting standards make it difficult to evaluate or compare results in a systematic way. In addition, sustainability has not yet been fully integrated in the organizational culture, and differences in staff knowledge and skills continue to slow progress. For TPAO to move toward a more effective and integrated sustainability approach, it will need to strengthen internal capacities, improve consistency across project sites, and ensure that sustainability principles are understood and applied throughout the entire organization.

RESULTS & DISCUSSION

The findings of this study reveal that environmental sustainability has become increasingly institutionalized within TPAO's strategic and operational frameworks. However, the extent to which sustainability is integrated into organizational culture, resource allocation processes, and long-term planning varies across departments and operational sites. This section discusses the results through three overarching dimensions: strategic

orientation, operational implementation, and organizational culture and capacity.

Sustainability as Strategic Imperative

Interview results indicate a clear recognition among senior management that sustainability is no longer a peripheral environmental concern but a strategic requirement in the context of Türkiye's energy security goals and international climate commitments. This aligns with the theoretical discussions highlighting the shift in global petroleum governance toward responsibility-centred operational strategies (Goodland, 1995; Goodland & Daly, 1996; Baumgärtner & Quaas, 2010).

One senior manager responsible for corporate strategy stated:

“Sustainability today is tied directly to national energy planning. It is not optional. It is a state-level expectation that shapes how we design future projects.”

This perspective demonstrates that sustainability is increasingly understood as an integral element of institutional legitimacy and strategic resilience.

Operational Implementation Constraints

Although sustainability has been defined strategically, implementation remains uneven across field operations. This aligns with the literature emphasizing that sustainability transitions in extractive industries often encounter technical and infrastructural constraints, especially in mature production fields (Kadafa, 2012; Bathrinath et al., 2021).

Interview participants highlighted several core challenges:

- Aging production infrastructure limits emission reduction capacity.
- Budget allocation prioritizes production expansion over environmental upgrades.
- Monitoring and data systems are operational but not standardized across all field sites.
- Environmental responsibilities remain concentrated within specialized units.

One senior operational manager summarized this tension:

“Environmental performance depends heavily on field conditions. Older wells and equipment require higher investment to meet sustainability targets, which must be balanced with production obligations.”

This finding suggests that sustainability advances are contingent on technological modernization and infrastructure investment, rather than solely policy change.

Organizational Culture and Internal Capacity

The development of an internal sustainability culture remains in progress. While formal structures such as environmental management units and sustainability reporting frameworks have been established, sustainability values are not yet fully embedded across all organizational layers.

This reflects earlier findings in sustainability implementation literature, which argue that organizational learning, employee participation, and knowledge transfer are essential to achieving meaningful sustainability transitions (Florescu et al., 2019; Ceptureanu et al., 2018).

Interviewees from the Corporate Governance and Quality Directorate involved in sustainability reporting emphasized the need for the aims below:

- Cross-departmental sustainability training programs
- Clear performance-based sustainability indicators
- Integration of sustainability into job descriptions and evaluation systems

A sustainability specialist noted:

“Sustainability awareness is present at the strategic level, but we need mechanisms that make it part of everyone’s daily operational mindset.”

This illustrates that cultural integration is currently the most critical challenge in the institutionalization of sustainability at TPAO.

Summary of the Results

Overall, results indicate that TPAO is transitioning from compliance-based environmental management toward strategic sustainability governance, but the transition remains partial, shaped by structural resource constraints and national production priorities (Table 4).

Table 4. Summary of Current Progress and Remaining Challenges

Dimension	Current Progress	Remaining Challenge
Strategic Orientation	Sustainability recognized as strategic and linked to national energy security	Need for clearer long-term carbon reduction roadmap
Operational Implementation	EM systems (ISO, EIA) in active use; reporting improving	Infrastructure modernization and consistent performance monitoring needed
Organizational Culture	Sustainability units established and reporting institutionalized	Integrating sustainability into everyday operational behaviour remains ongoing

CONCLUSION & POLICY RECOMMENDATIONS

This book has shown that Turkish Petroleum Corporation (Türkiye Petrolleri Anonim Ortaklığı -TPAO) is experiencing an important moment of institutional change as global climate priorities increasingly shape national energy policies. The analysis throughout the study demonstrates that sustainability has become more visible in TPAO's strategic agenda, especially after Türkiye's ratification of the Paris Agreement and the growing public demand for environmentally responsible practices (T.C. Dışişleri Bakanlığı, 2025; Koçman & Atay, 2021). However, this shift in discourse and strategy does not yet translate fully into uniform operational practices across the organization.

The evidence indicates that TPAO has introduced several formal mechanisms—such as environmental management systems, dedicated sustainability units, and structured reporting tools—that provide an important foundation for long-term transformation. These mechanisms show that the company is moving away from a compliance-only approach toward a more planned and systematic understanding of sustainability. Still, the operational realities of the petroleum sector continue to limit the speed and depth of this transition. Many production sites rely on older technologies, and environmental expertise is not evenly distributed across different units. As a result, sustainability goals and environmental performance vary greatly between regions and projects. This mirrors common challenges faced by

many national oil companies worldwide, where existing infrastructure and long-established practices slow down sustainability improvements.

A second major finding is the importance of organizational culture. Although TPAO now has formal structures dedicated to sustainability, the idea of sustainability has not yet become a shared value across the entire institution. Production targets and operational efficiency still guide most daily decisions. For sustainability to become part of the organizational culture, it must be included in staff training, managerial incentives, and the overall decision-making framework. Without this cultural shift, formal policies alone will not lead to meaningful and lasting change.

The analysis also highlights the need for continuous investment in technology and human capacity. Modernization of infrastructure—such as pipelines, monitoring systems, and well operations—is essential for reducing emissions and improving environmental performance. Similarly, stronger training programs and interdisciplinary collaboration will help staff understand how sustainability connects with engineering, planning, and operational work. Clear performance indicators and better reporting methods will also help TPAO evaluate progress and communicate its achievements more effectively. These steps will increase transparency and allow comparisons with international standards.

In the broader context, TPAO's future sustainability performance will depend on how well the company balances several competing priorities: national energy security, economic constraints, climate commitments, and the technical limitations of the existing system. This balance is complex, but it also creates an opportunity for TPAO to redefine its long-term role in Türkiye's energy transition. If the company continues to invest in capacity building, strengthen its reporting practices, and adopt modern technologies, it will be better positioned to contribute meaningfully to national and international climate goals (Koçman, Atay & Zehir, 2025; TPAO, 2023).

In conclusion, TPAO has begun an important sustainability journey, but the transformation is still incomplete. The company has taken promising steps toward building the institutional foundations required for environmental governance, yet deeper operational, cultural, and technological changes must still follow. The success of this transition will depend on sustained leadership, long-term investment, and a commitment to integrating sustainability into every level of the organization. How TPAO

manages this process will influence not only the future of the national petroleum sector, but also Türkiye's overall ability to respond to global climate challenges in the years ahead.

BIOGRAPHIES

Özge Koçman

Özge Koçman is the Sales and Marketing Manager at the Turkish Petroleum Corporation (TPAO), where she has held specialist and managerial positions since 2006. She also serves as a part-time Lecturer in the Department of Business Administration at Ankara University, teaching Strategic Management and Business Ethics. Her professional career in the petroleum industry is complemented by academic research on sustainability, green management, and strategic energy practices.

Koçman began her career at TPAO as a Specialist in Joint Operations. She later became Chief Specialist in Joint Operations, managing the financial provisions of joint exploration and production agreements with major international oil companies. Since 2018, she has been responsible for domestic crude oil pricing, national and international crude oil and natural gas sales operations, market analysis, tender procedures, and negotiations for sales agreements. She also manages overseas crude oil marketing operations and contributes to corporate strategy through pricing assessments and market intelligence.

Koçman holds a PhD in Management and Organization from Ankara University. She earned a Master's Degree in Marketing from Ege University and a Master's in International Accounting and Finance from Bayes Business School, City University of London, where she studied on a full scholarship.

She has presentations at international conferences and international/ national journal articles. She has received several early-career awards and completed international trainings in petroleum economics, contracts, and management. Koçman is fluent in English and is a native Turkish speaker.

Özlem Atay

Özlem Atay is a professor of Management at the Faculty of Political Sciences, Ankara University, Ankara, Türkiye. She is the Head of Management and Organization Chair in the Department of Business Administration. She worked at Turkish National Productivity Centre as a specialist between 1988 and 1996. She has led a number of training/consulting/research missions in public and private sector enterprises.

She specializes in management and organization, organizational behaviour, productivity improvement techniques, strategic human resources management, strategic management, energy and quality management, gender and women studies, green management. She is the author of 10 books, chapters in 17 books published by international publication companies and many academic articles/conference presentations in English/Turkish. She has received research scholarships from the World Bank, the Turkish Academy of Sciences, Ankara University, Curtin University, Turkish Scientific and Technical Research Institute, Turkish Higher Education Institution...etc. She was a visiting professor at Curtin University Graduate School of Business, Perth, Australia; Aalborg University College of Business, Aalborg, Denmark, Valparaiso University College of Business Administration, Valparaiso, USA, Northern Illinois University College of Business, Management Department, DeKalb, USA and Warsaw University of Life Sciences, Warsaw, Poland. She has won Ankara University Science Awards (2024 and 2025) as well as Best Paper Awards (2022, 2017 and 2011), Award of Excellence (2000) and Success Award (2011). She represents Türkiye at the international gender research consortium, the Women in Higher Education Management (WHEM) Network since 2008. The WHEM Network brings together internationally-recognized gender in HE researchers in 14 countries; Australia, Austria, Ireland, New Zealand, Portugal, Sweden, South Africa, Türkiye, India, Czech Republic, the United Arab Emirates, Germany, USA and the UK. She can speak fluent English, good German. She has many international and national journal peer-review and “Editorial Board Membership” responsibilities.

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